Using SAS® Visual Analytics to Develop a Real-Time Business Metrics Command Center for Your Office

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ABSTRACT

Seeing business metrics in real time enables a company to understand and respond to ever-changing customer demands. In reality, though, obtaining such metrics in real time is not always easy. However, SAS Australia and New Zealand Technical Support solved that problem by using SAS® Visual Analytics to develop a 16-display command center in the Sydney office. Using this center to provide real-time data enables the Sydney office to respond to customer demands across the entire South Asia region.

The success of this deployment makes reporting capabilities and data available for Technical Support hubs in Wellington, Mumbai, Kuala Lumpur, and Singapore—covering a total distance of 12,360 kilometers (approximately 7,680 miles). By sharing SAS Visual Analytics report metrics on displays spanning multiple time zones that cover a 7-hour time difference, SAS Australia and New Zealand Technical Support has started a new journey of breaking barriers, collaborating more closely, and providing fuel for innovation and change for an entire region. This paper is aimed at individuals or companies who want to learn how SAS Australia and New Zealand Technical Support developed its command center and who are inspired to do the same for their offices!

INTRODUCTION

Recent years have witnessed the explosive development of new technologies that have become available to consumers. As a result, there is now the expectation— the demand, even—that data and business reporting be accurate and readily available. This is particularly true for corporate CEOs, who must quickly evaluate and understand rapidly changing data and make mission-critical decisions. And with the huge amount of data that is available, it is extremely important that reports be prepared in a way that can be easily consumed by individuals so that they can make swift, informed decisions about their businesses. To achieve this goal, organizations must be able to handle and manipulate big data.

The term *big data* refers to the massive amounts of structured and unstructured data that business organizations must handle on a daily basis. With the growth of big data, every organization is challenged with how to harness relevant data from various sources to help their people make key business decisions. And, decision making is often constrained because people must wait for analytical reports to be run or for requests for ad hoc reports to be acted upon. In addition, data can be unstructured or can contain anomalies, either of which can lead to misleading results or incorrect conclusions.

This paper illustrates how SAS Australia and New Zealand (ANZ) Technical Support took on this challenge by incorporating a number of SAS® products to build a command center in its office. While SAS Visual Analytics is the centerpiece of the command center architecture, the ANZ Technical Support team combined it with other SAS products to develop a command center system. Using SAS Visual Analytics along with the other SAS products enables the team to create a visual representation of its tracked customer data, all delivered on 16 monitors that hang from the command center ceiling.

This paper describes the different data sources and data structures that ANZ Technical Support uses in its command center. It also discusses how that data is accessed by the system. The team developed a metadata-driven extract, transform, and load (ETL) process to load data into the memory of SAS® LASR™ Analytic Server and deliver real-time business metrics. The discussion also explains how the team deals with data-quality issues, schedules ETL flows, implements security measures, and creates methods to auto-refresh SAS Visual Analytics reports for SAS® Visual Analytics Server.

Finally, this paper highlights the following benefits that derived from the development and use of the command center and how this enabled ANZ Technical Support to transform itself into a learning organization:

- ANZ Technical Support and the South Asia region developed a shared vision as a result of using the command center

- The team better understands customers' issues as a result of using powerful analytics from SAS Visual Analytics reports

- The command center sparked innovation and change in the way that ANZ Technical Support handled its workload

SCOPING REQUIREMENTS FOR THE COMMAND CENTER

Before ANZ Technical Support began constructing the command center, the team met to discuss the requirements to create such an end-to-end business solution.

LEVERAGING SAS® VISUAL ANALYTICS TECHNOLOGY

SAS Visual Analytics is a data-visualization solution that enables you to explore data and build reports interactively in a user-friendly, drag-and-drop environment. SAS Visual Analytics provides a self-service approach to performing analytics and enables organizations to quickly gain insight into their own data. This approach is achieved by loading data into SAS LASR Analytic Server, which essentially provides a platform for concurrent access to data in-memory. As a result, users who build the data visualizations and reports can access billions of rows of data instantaneously. Analytical in-memory processing empowers users and businesses to visually explore their own data, to discover trends or relationships, and to build reports interactively—all at the speed of RAM.

Figure 1 shows how visual-analytics capabilities leverage SAS LASR Analytic Server. SAS LASR Analytic Server provides a highly scalable, secure analytics infrastructure that is optimized for small and large volumes of data for computing complex calculations. Using this tool, an organization can scale everything from small tables consisting of just a few megabytes to large amounts of data in many terabytes.
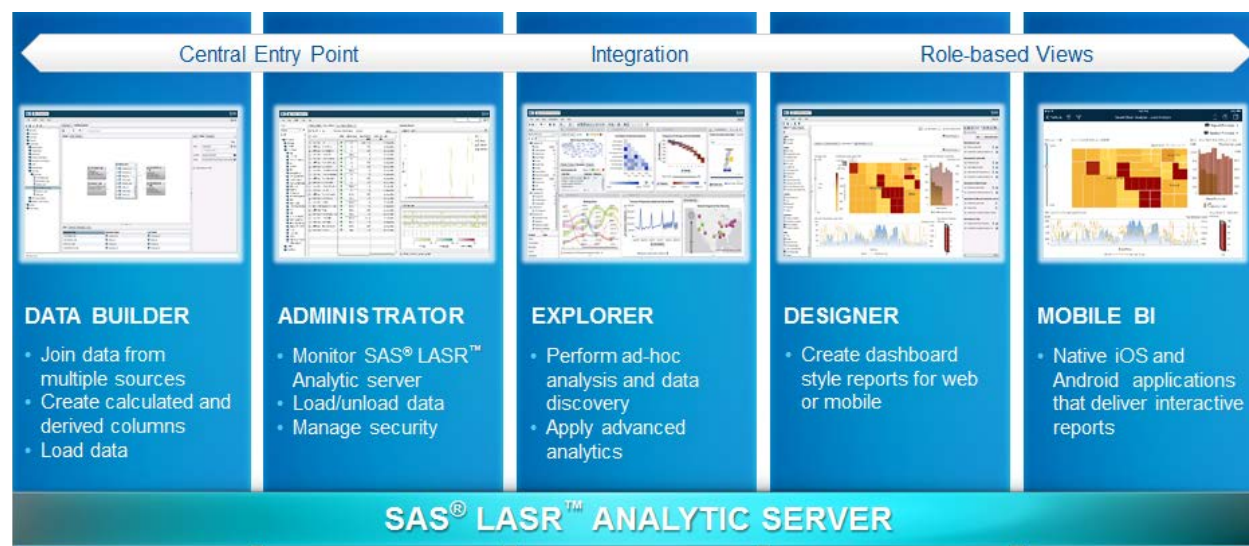

Figure 1. Visual Analytics Capabilities

ACCESSING DATA SOURCES

The first step in ANZ Technical Support's project was to document the data requirements and locations of the stored data that is used to provide business metrics for the command center. These data sources are accessed from different geographic locations through the Local Area Network (LAN) and Wide Area Network (WAN).

USING SAS TRACKING-ENTRY DATA

Problem-specific data is generated 24 hours a day, 7 days a week (24 x 7), each time customers contact SAS Technical Support about an issue they have encountered. When a SAS user contacts Technical Support for help, a tracking entry (track) is created for that issue. Each track contains useful information such as the customer's company name, the SAS product or products in use, their SAS release, the specific issue, and so on. Until the track is resolved, interactions between that customer and Technical Support are recorded in the track. This tracking system provides a mechanism for structuring data for storage in the data warehouse.

ENRICHING DATA BY USING MIXED DATA SOURCES

The team also identified other data sources that are used to enrich ANZ Technical Support's data. These sources include Microsoft SQL Server, the MySQL database, Microsoft Excel Files, text files, and SAS tables, as shown below in Figure 2. For example, the SAS Hot Fix database, which provides detailed information about the life cycle of a hot fix and its release date, resides in the MySQL database.
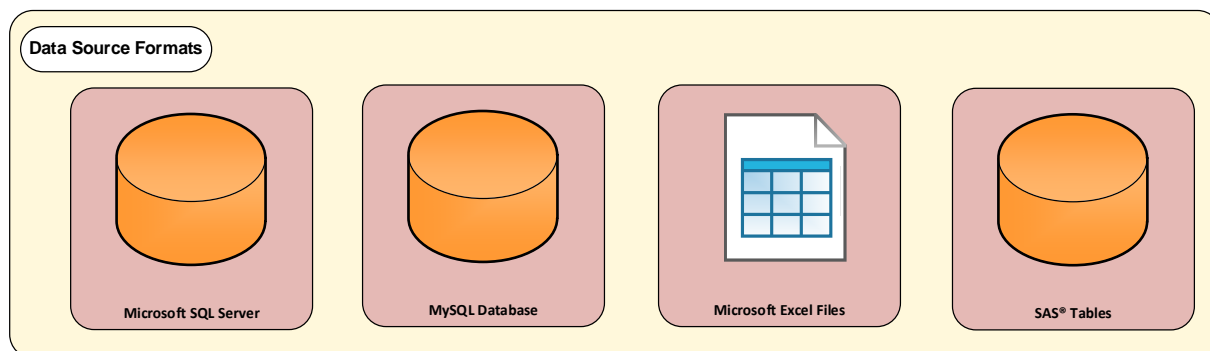

Figure 2. Data Source Formats Used by the Command Center

In other cases, managers use Excel spreadsheets for resource management. In addition, ANZ Technical Support uses a taxonomy to help categorize all of the SAS products. The use of all of these data sources means that a number of different data formats are necessary in order to provide the data that is required for the command center. Manipulating all of these formats is a straightforward task in SAS thanks to SAS/ACCESS® engines.

DESIGNING THE COMMAND CENTER

After ANZ Technical Support scoped out the data requirements for the command center, their next step was to design and build the environment. The team decided to put the ETL processing and SAS Visual Analytics Server onto separate servers. This design simplified the role of each server and made it easier to maintain the environment and to troubleshoot any technical issues encountered during the design phase or after the project went live.

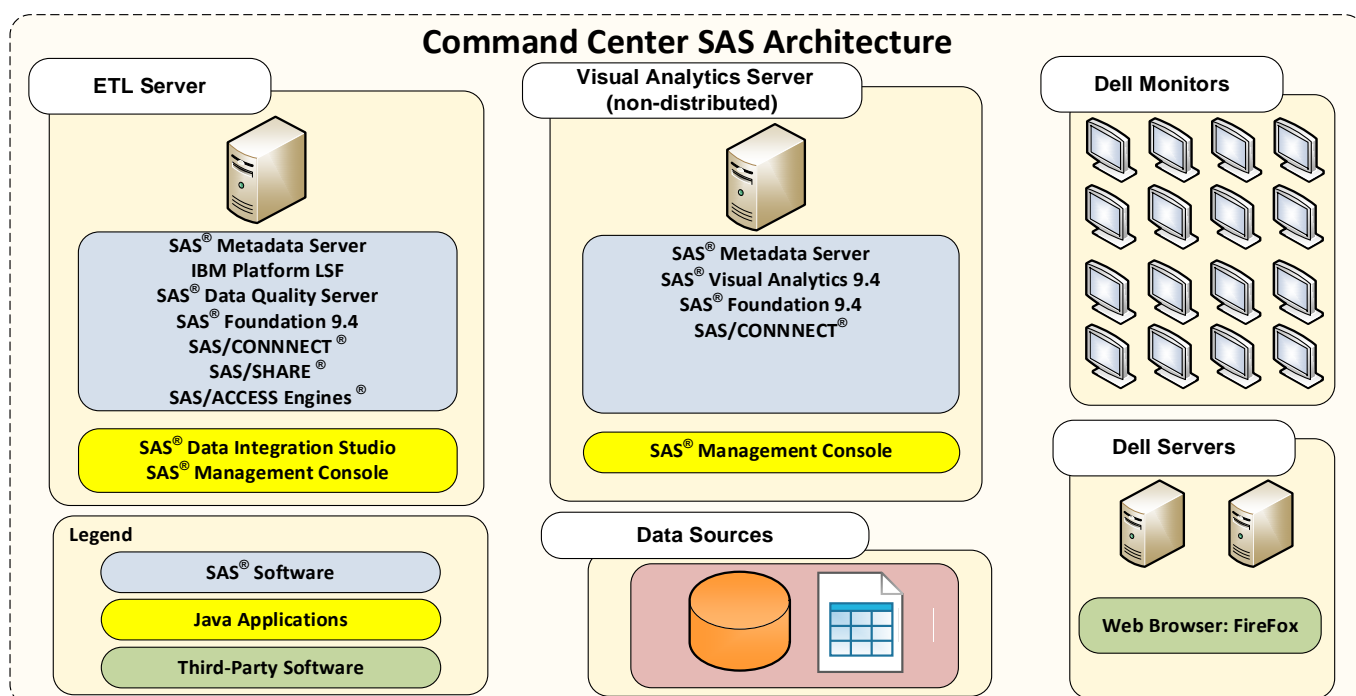Figure 3 shows the SAS components that are installed on the ETL server and the Visual Analytics server.

Command Center SAS Architecture

ETL Server
- SAS® Metadata Server
- IBM Platform LSF
- SAS® Data Quality Server
- SAS® Foundation 9.4
- SAS/CONNNECT®
- SAS/SHARE®
- SAS/ACCESS Engines®
- SAS® Data Integration Studio
- SAS® Management Console

Visual Analytics Server (non-distributed)
- SAS® Metadata Server
- SAS® Visual Analytics 9.4
- SAS® Foundation 9.4
- SAS/CONNNECT®
- SAS® Management Console

Dell Monitors

Dell Servers
- Web Browser: FireFox

Legend
- SAS® Software
- Java Applications
- Third-Party Software

Data Sources

Figure 3. The SAS Architecture for the Command Center

A diagram of the complete command center architecture is provided in Appendix 1.

A requirement to build a second SAS environment for disaster recovery was not necessary because the ETL server and Visual Analytics server are both installed on virtual machines. VMware provides the functionality to take snapshots that can be used for backup and recovery.

ACCESSING THE DATA

ANZ Technical Support needed to develop a process to access the various data sources and to load structured data into SAS LASR Analytic Server in order for SAS Visual Analytics to serve the reports in the command center. The team took a modern approach and followed industry best practices for data management.

DEVELOPING A METADATA-DRIVEN ETL PROCESS

ANZ Technical Support used SAS® Data Integration Studio to build a metadata-driven ETL process for extracting data and loading it into SAS LASR Analytic Server. The key requirements for this approach included the following:

- Ensuring consistent data definitions from the data that is gathered from the various data sources

- Providing automatically documented data flows that assist with management and maintenance

- Using metadata to implement a data-security model and to manage data access

Display 1 shows how ANZ Technical Support created separate metadata folders for each stage in the ETL process:
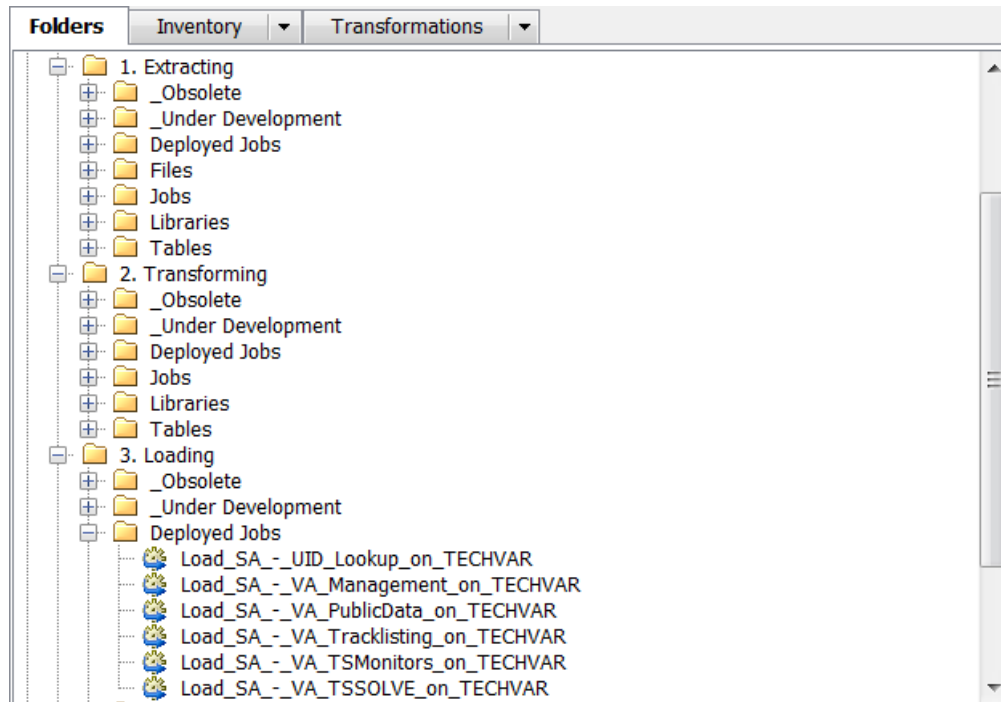
Display 1. The Tree of Metadata Folders in SAS Data Integration Studio

Here is a detailed description about how the team structured the ETL process:

1. **Extract**—To keep the process as simple as possible, ANZ Technical Support created separate jobs for each data source or system that is accessed. Using SAS Data Integration Studio and incorporating SAS/ACCESS engines enabled the team to efficiently access only the data that was needed and to reduce overall storage requirements. The extracted data is saved as SAS data sets in the staging area that is located on the ETL server. The capability to efficiently retrieve data is particularly important in order for the team in Sydney to access data that is located in the data warehouse maintained at SAS world headquarters in the United States. The team was able to minimize the data footprint by incrementally loading new data into the staging area. By taking this approach, ANZ Technical Support significantly reduced the extraction time from hours to minutes.

2. **Transform**—In order to build reports successfully, it is recommended to structure data appropriately and to derive required columns before the data is loaded into SAS LASR Analytic Server. Otherwise, time is unnecessarily spent having to restructure the data during the SAS Visual Analytics phase, which can become a harder task to accomplish and to develop an automated process.

3. **Load**—The decision to have a separate ETL server and Visual Analytics server presented a new challenge in how the team loads data into SAS LASR Analytic Server. If all the SAS components were installed on the same server, then the team could simply use the SAS LASR Analytic Server engine (SASIOLA) for loading data. However, in the command center environment, SASIOLA is not installed on the ETL server where the team initiates the data load. This problem was easily overcome by using the SAS/CONNECT® software that allows a SAS session to connect to a remote SAS session and to submit code. SAS/CONNECT must be installed, configured, and licensed on both SAS servers.

This is an example of the logic used for loading data in a SAS/CONNECT session:

```
/* Define connection details to SAS Visual Analytics Server */
%let SASVAServer=<server-name> <port-number>;

/* signon using account */
signon SASVAServer user='<user-ID>' password='<password>';

/* Submit code to SAS Visual Analytics Server */
rsubmit;

/* Define LASR library on SAS Visual Analytics Server */
LIBNAME <LASR-library-name> SASIOLA  TAG=<tag-name> PORT=<port-number>
SIGNER="https://<server-name>:<port-number>/SASLASRAuthorization"
HOST="<server-name>";

/* Define SAS library and path to source data*/
LIBNAME DATA_SOURCE '<path-name>';

/* Set system options */
%LET VDB_GRIDHOST=<server-name>;
%LET VDB_GRIDINSTALLLOC=/opt/TKGrid;
options set=GRIDHOST="<server-name>";
options set=GRIDINSTALLLOC="/opt/TKGrid";

/*Delete existing LASR table*/
proc datasets library=<LASR-library-name> nolist;
   delete <LASR-table-name>;
quit;

/* Load source data into SAS LASR library */
data <LASR-library-name>.<LASR-table-name>;
   set DATA_SOURCE.<Source-table-name>;
run;

endrsubmit;
```

In future development plans, the team intends to use a different method to load data into SAS LASR Analytic Server. Starting in SAS® 9.4 14w41, the SASIOLA library engine became available in Base SAS®. This engine enables SAS Data Integration Studio to move data between a SAS session and SAS LASR Analytic Server. This capability makes the use of SAS/CONNECT software redundant. However, using the SASIOLA engine does have special requirements, the primary one being that SAS Visual Analytics reside in a Linux operating environment.

ADDRESSING DATA-QUALITY ISSUES

Even if you can access and analyze data quickly, decision making might be compromised if your data is deemed inaccurate. This problem can occur with the results of any data analysis, and it is typically solved by a diligent analyst reading through swathes of data and reviewing output. However, this approach becomes unmanageable if you are working with enormous amounts of data.

ANZ Technical Support took a proactive approach to this issue by using data visualizations provided by SAS® Visual Analytics Explorer to investigate and uncover any anomalies or inconsistencies in the data. The team documented issues that impacted data quality and proposed solutions to those issues. As a result, the team was able to add new logic into the ETL process to improve the data-refinement step. This process was not a one-time effort. It involved several cycles of refining the data. However, because the

team had taken a structured approach to building ETL jobs, the steps of finding and fixing data-quality issues were far easier to complete.

STANDARDIZING COMPANY NAMES

One of the requirements for SAS Visual Analytics reports is to provide business metrics based on the company name. However, the raw data that the ETL job extracts does not have this information readily available. The extracted data does contain the Site Name that is given in the SAS license. The challenge in using the Site Name as the company name is that the Site Name is inconsistent and can be written in different ways. Therefore, ANZ Technical Support had to create a method to standardize company names. This problem was easily overcome using the Create Match Code transformation in SAS Data Integration Studio, which requires the use of SAS® Data Quality Server and the data quality locale. The data quality locales contain a set of match definitions that are used to generate match codes using algorithms in the SAS Data Quality Server. The same organization is identified based on identical matching code.

Display 2 shows the steps used to structure the data prior to the Create Match Code transformation:
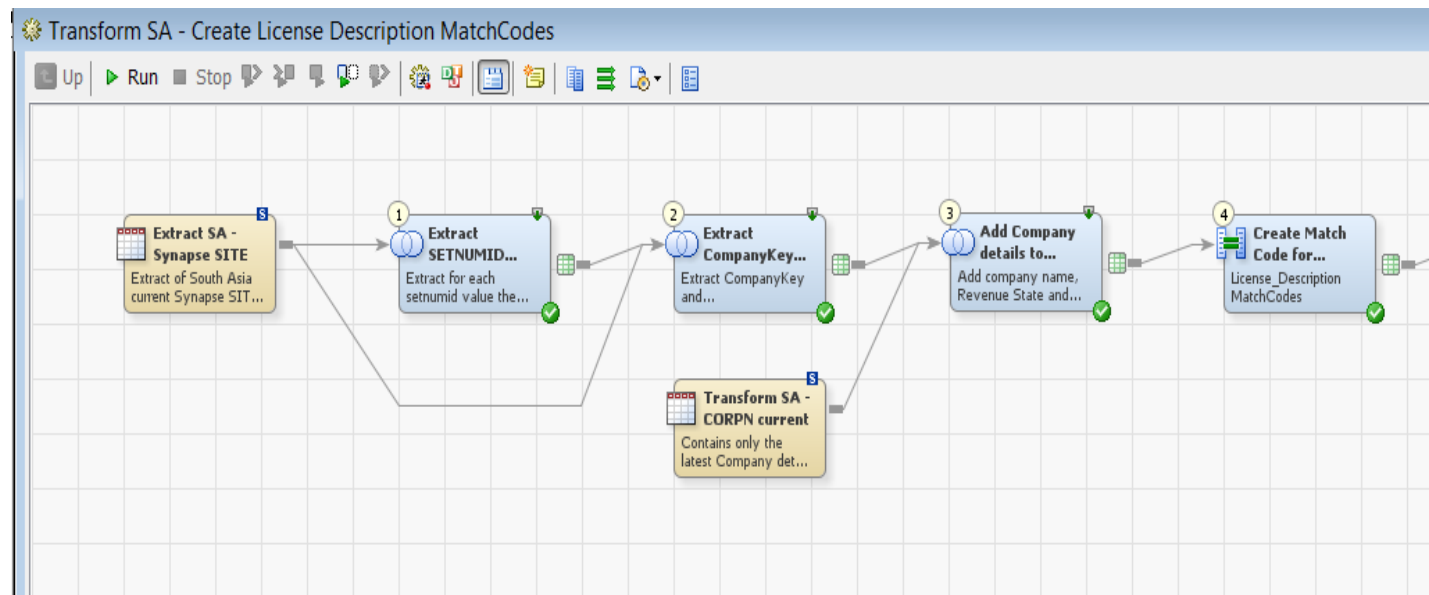
Display 2. SAS Job in SAS Data Integration Studio to Generate Match Codes

The matching rules are specified in the Create Match Code transformation, which is shown below in Display 3. The **Locale**, **Match Definition**, and **Sensitivity** values are used to generate the match codes.


Display 3. Matching Rules Specified in the Create Match Code Transformation

SCHEDULING THE ETL FLOWS

To schedule ETL flows, ANZ Technical Support opted to use the integrated scheduling capabilities that are available in SAS® software. The IBM Platform LSF job scheduler for SAS provides an effective way to manage and schedule flows and SAS jobs. This tool is fully integrated with SAS Data Integration Studio, providing an easy method for deploying and updating SAS jobs. The flow and job definitions are stored in the metadata, which enables you to centrally control SAS jobs through the Server Manager plug-in that is available in SAS® Management Console.

Display 4 shows the scheduled ETL flow **SA_WD_ALL_0700_2300_x10_x25_x40_x55** that delivers data to the command center. This flow consists of four subflows to perform the data-extraction, transformation, and data-load processes. The subflow **SA_WD_E_0700_2300_x10_x25_x40_x55** has been expanded to show the five SAS jobs that perform the data extraction.
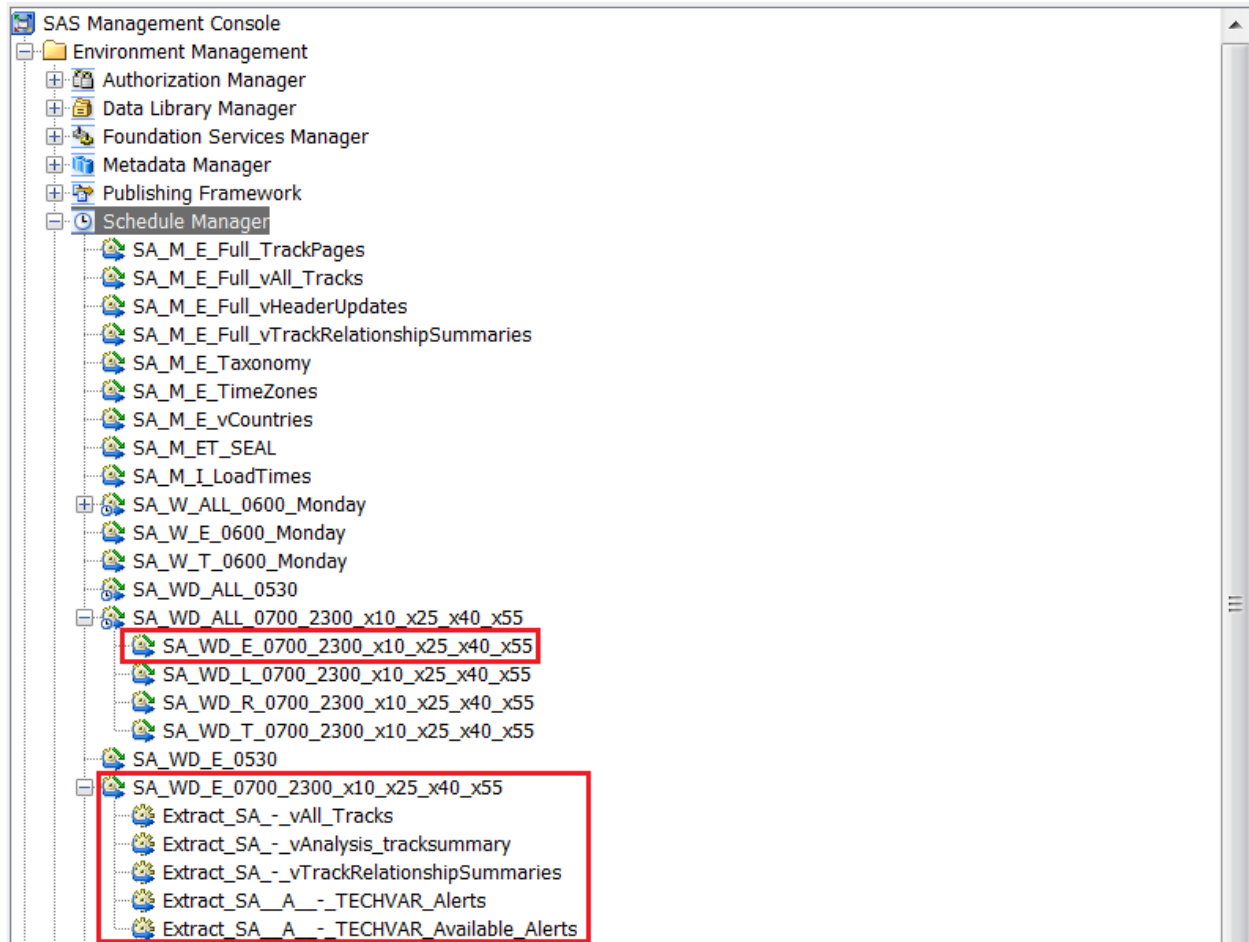
Display 4. The Scheduled Flows in SAS Management Console

IMPLEMENTING VISUAL ANALYTICS SECURITY

In the metadata, the `Technical Support Monitors` folder shown in Display 5, below, contains the metadata objects for SAS Visual Analytics reports and LASR tables for the command center. The intention is to enable all SAS employees to view SAS Visual Analytics reports but not necessarily modify the reports or data. It is essential to have some restrictions on who can or cannot modify reports and data. This security was achieved by granting **ReadMetadata** and **Read** permissions to the **SASUSERS** group and by granting full access only to users who are SAS Administrators.
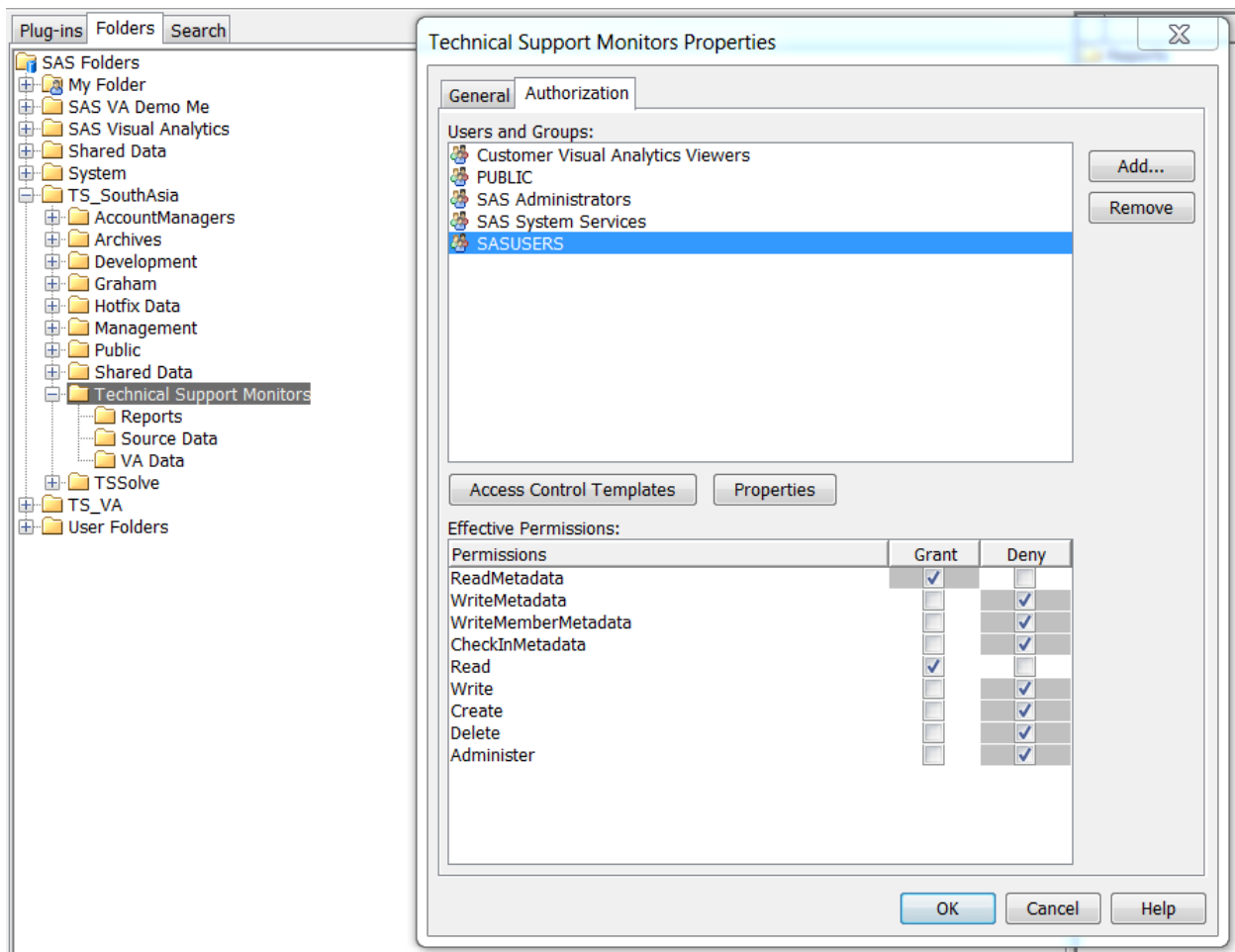
Display 5. SAS Management Console Metadata Tree on SAS Visual Analytics Server

Display 6, below, shows a new SAS LASR Analytic Server instance (**South Asia LASR Analytic Server**) that the team created to accommodate only LASR tables used in SAS Visual Analytics reports for the command center. This approach provides a way to set memory limits at the LASR-instance level. Having multiple SAS LASR Analytic Servers also provides flexibility in situations where a LASR instance has to restart without impacting all of the LASR tables.

Server	Status	Tables Memory (MB)	Tables Limit (MB)	Port	Started By
LASR Analytic Server - techvar	●	421.70		10011	lasradm
Public LASR Analytic Server - techvar	■			10031	
South Asia LASR Analytics Server	●	1,925.93		10037	lasradm

Display 6. Visual Analytics Administrator Listing Defining LASR Analytic Servers

AUTOMATICALLY REFRESHING SAS® VISUAL ANALYTICS REPORTS

As a requirement for the command center, SAS Visual Analytics reports need to provide up-to-date business metrics. While a report is being viewed, the data is static. That data is not refreshed until it is manually reloaded. For SAS Visual Analytics reports that are developed in the classic-mode interface for Adobe Flash, there is no feature available that enables reports to be refreshed automatically. This lack of automatic refreshing proved to be a major obstacle. Using the ANZ Technical Support team's knowledge of Java, they built new JSP files for the sas.visualanalyticsviewer.war file that is deployed on the SAS® 9.4 Web Application Server. The Java code forces any report that is accessed through SAS® Visual Analytics Viewer to refresh the web browser after a defined period of time. For instructions about how to use Java to force automatic refreshing, see Appendix 2.

As part of future development plans, ANZ Technical Support aims to migrate its reports to an HTML5 format. SAS uses the modern mode for the HTML5 interface, which was added in SAS Visual Analytics 7.2. Starting with SAS Visual Analytics 7.3, the modern interface shown in Display 7, below, supports automatic refreshing, and it provides an easy-to-use feature that enables you to refresh your reports automatically.
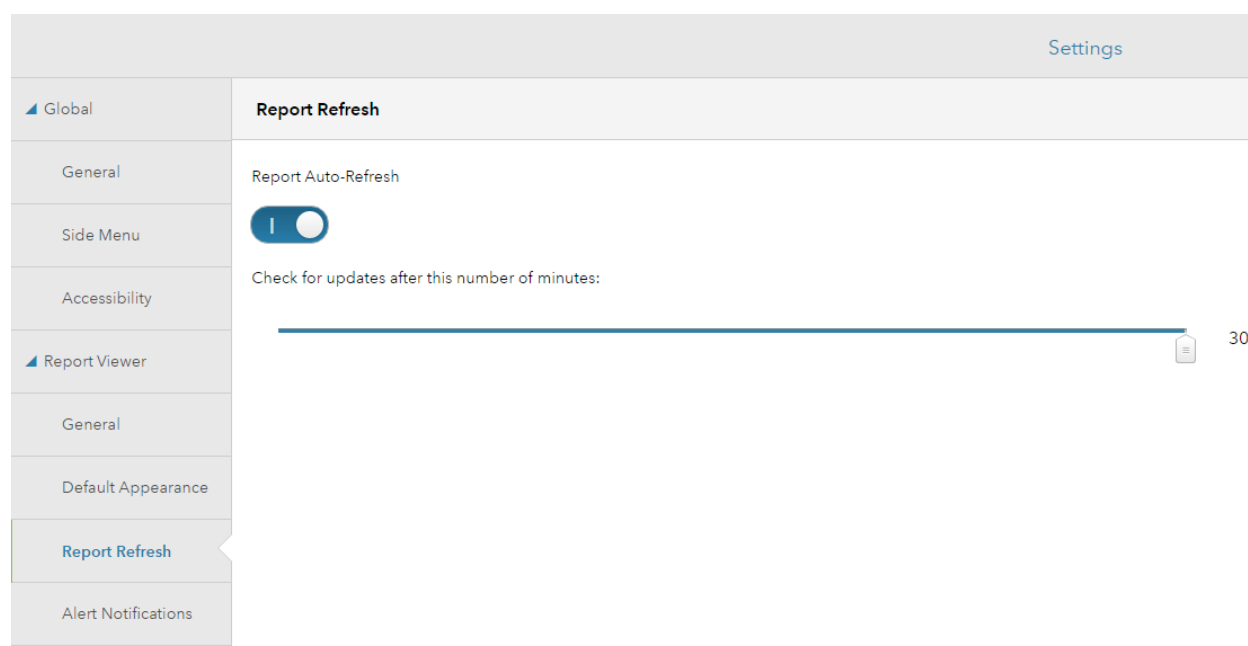
Display 7. The Report Auto-Refresh Feature Available in SAS Visual Analytics 7.3 and Later Releases

## TRANSFORMING ANZ TECHNICAL SUPPORT INTO A LEARNING ORGANIZATION

ANZ Technical Support set a goal of transforming their department into an innovative learning organization. (See References.) The concept is based on scientific research that shows that you can create a positive environment in which a group of people can work collectively, enhance individual and team learning, and create outcomes that an organization truly cares about. The concept of the learning organization helped provide a framework for the development of the SAS Visual Analytics reports and the creation of the command center.

CREATING A SHARED VISION

One of the disciplines of a learning organization is to build a shared vision that connects people through a common aspiration. ANZ Technical Support experimented with using the command center to broadcast an image of the department's shared vision that people can relate to. The idea was simple, but it had profound results.

Note: The metrics displayed in the following SAS Visual Analytics reports were created for demonstration purposes and are not a reflection of reality.

The **Current Open Tracks** report shown in Display 8 is the focal point in the command center that gives Technical Support managers and engineers a common understanding of what the department is experiencing at that moment in time.
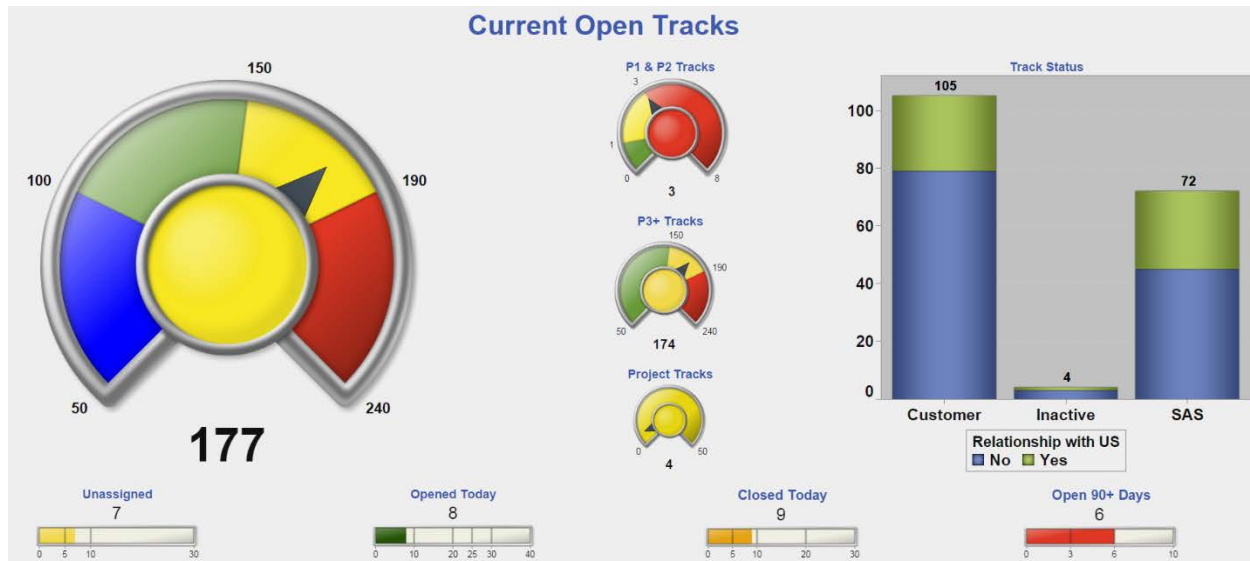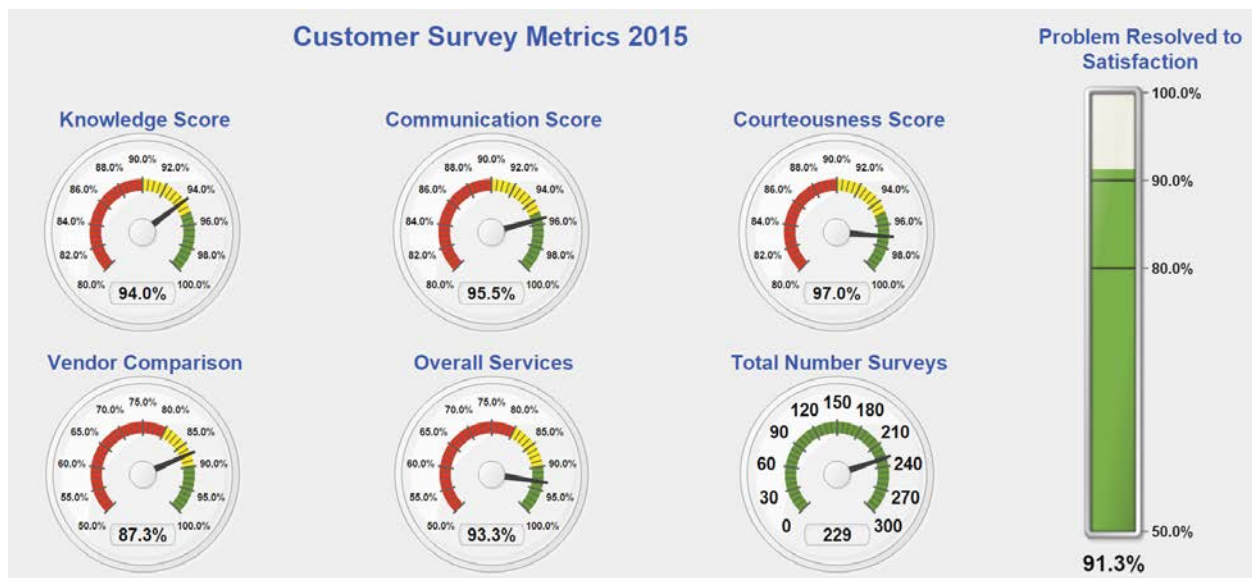

Display 8. SAS Visual Analytics Report Displaying Metrics on Current Open Tracks

The large dial on the left shows the total number of open tracks. The red section indicates that Technical Support is under a high-track load, and the blue section indicates that Technical Support is under a low-track load. Once the dial breaches 150 open tracks, it becomes an area of concern for the team, because it becomes more difficult to manage the track backlog. Most interestingly, the threshold value started at 250 open tracks and, over a period of time, was gradually lowered. One of the reasons for this change in behavior is that the team took responsibility and worked effectively together when everyone saw the threshold breach. The same behavior was seen with the **P1 & P2 Tracks** dial that displays the number of open Priority 1 and Priority 2 tracks. Management and engineers all work together to help bring high-priority tracks to a swift resolution.

UNDERSTANDING CUSTOMERS BETTER BY USING SAS® VISUAL ANALYTICS REPORTS

A customer who opens a track is asked to respond to a survey once the track has been resolved. This survey produces one of the most important sets of metrics that is continuously monitored throughout the year by ANZ Technical Support. (See Display 9, below.) The data provides insight into the customers' view of how well ANZ Technical Support has performed, helping the team to identify areas in which they need to improve in order to meet customer needs and expectations.

Display 9. SAS Visual Analytics Report Displaying Customer Survey Metrics

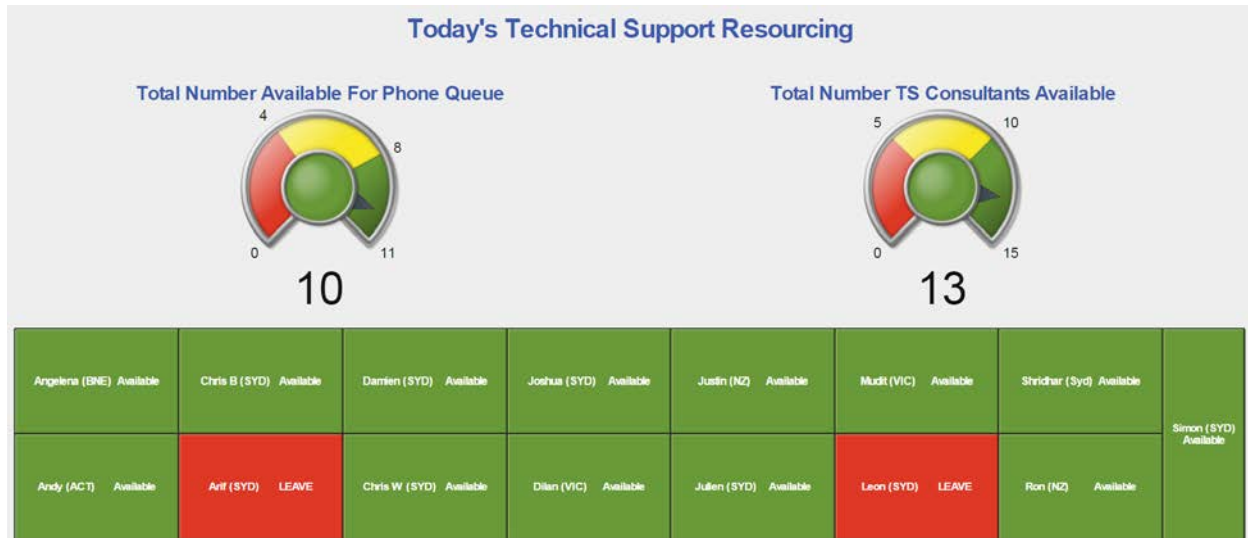Having SAS Visual Analytics reports simultaneously shown in the command center provides a multi-dimensional view of customers at that moment in time. For example, Display 10, below, helps the team to learn more about customers and quickly identify any relationships or patterns that might require further investigation. In the past, these reports have helped to identify customers that are in need of guidance before a situation becomes critical.
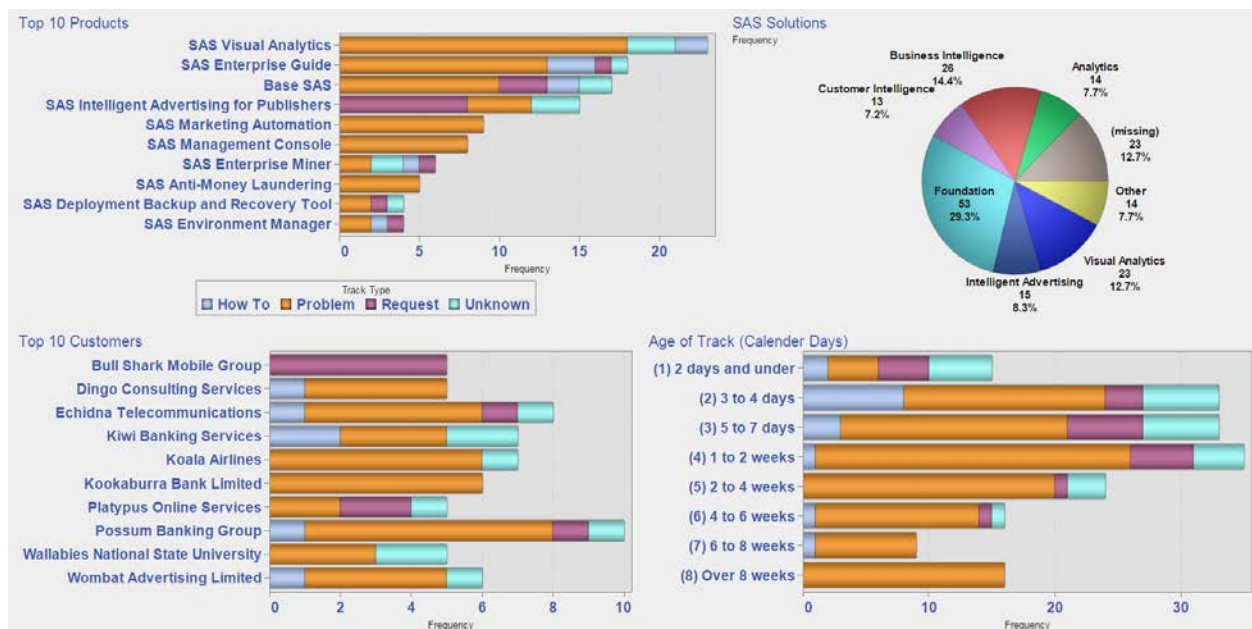
Display 10. SAS Visual Analytics Report Displaying Metrics on Open Tracks

The knowledge gained from the command center enables ANZ Technical Support to link resourcing to customer needs as shown in Display 11, below. These reports help ANZ Technical Support be agile and better placed to respond to high-priority situations.

Today's Technical Support Resourcing

Total Number Available For Phone Queue

10

Total Number TS Consultants Available

13

Angelena (BNE) Available	Chris B (SYD) Available	Damien (SYD) Available	Joshua (SYD) Available	Justin (NZ) Available	Mudit (VIC) Available	Shridhar (Syd) Available	Simon (SYD) Available
Andy (ACT) Available	Arif (SYD) LEAVE	Chris W (SYD) Available	Dilan (VIC) Available	Julien (SYD) Available	Leon (SYD) LEAVE	Ron (NZ) Available	

Display 11. SAS Visual Analytics Report Displaying Resourcing Metrics Using Dials and a Tree Map

One of the intentions of using the metrics provided in the SAS Visual Analytics reports is to help the team easily monitor and accurately measure the backlog of SAS tracks, which is directly influenced by customer demand. With this knowledge, ANZ Technical Support can continuously make improvements throughout the year where needed.

Unfortunately, there is not one particular measurement that can be used to provide this information, because changes in technology are fast-paced and the landscape is continuously changing. For example, ANZ Technical Support is faced with the challenges of new customers adopting SAS software, increases in the complexity of SAS technologies, releases of new SAS solutions, new product versions and SAS maintenance updates being released throughout the year, SAS project implementations that require support, and the added demand of the track count increasing yearly. The only measurement that can be used over a long period of time is Customer Satisfaction, which shows whether ANZ Technical Support is serving their customers well.

One report that is used to help measure the track load is the track load per month (shown in Display 12, below). The bottom bar chart provides insight into the number of tracks raised on a daily basis and gives an indication of the past and current demand placed on ANZ Technical Support. For example, you can see that the department was under the highest demand in May 2015, with 581 tracks raised. For the majority of days in that month, 26 or more tracks were raised, which is highlighted in the red portion of the bar.

The top bar chart in Display 12 shows the types of tracks that are raised by customers. Tracks are categorized as How-To, Problem, Request, or Unknown. And because a track raised to address a customer problem is harder to resolve than a track in which a customer is requesting information, the chart gives an indication of the level of complexity in resolving the tracks for a given month.

14
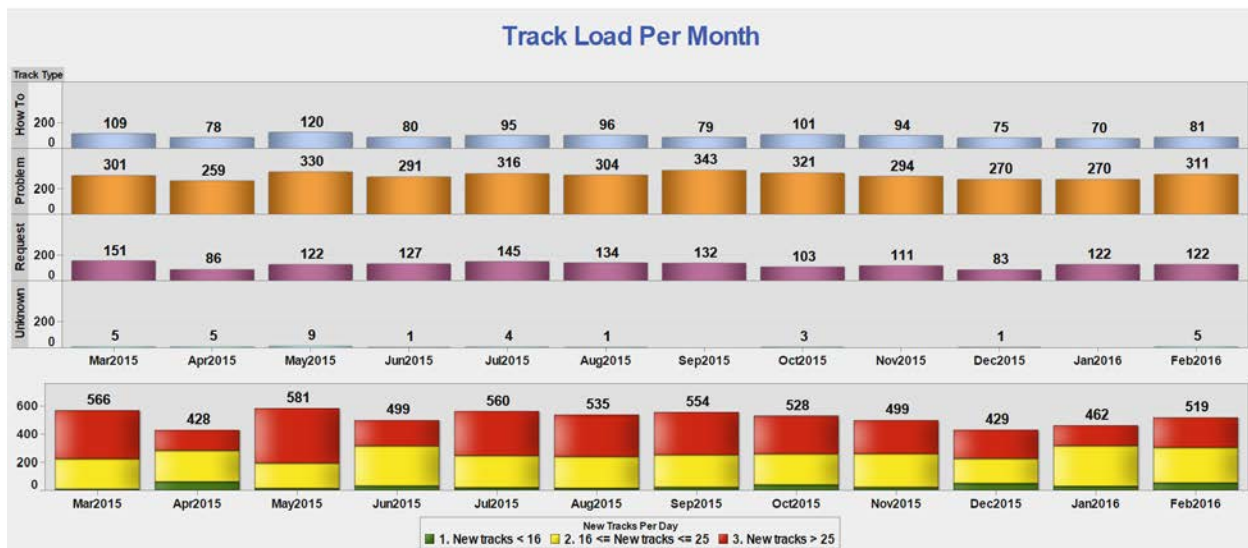
Display 12. SAS Visual Analytics Report Displaying Metrics on Track Load

The track data measures the success of customer uptake of new SAS technologies or of customers upgrading to the current release. Display 13 shows the number of tracks raised about SAS Visual Analytics by release over a period of three years.
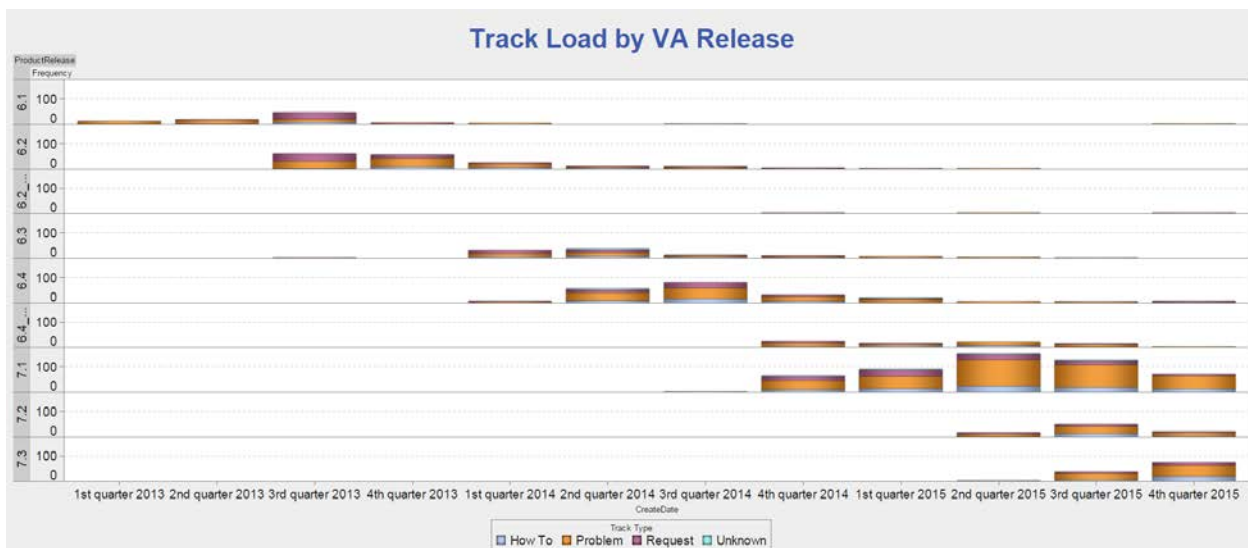
Display 13. SAS Visual Analytics Report Displaying Metrics on Tracks by SAS Visual Analytics Release

SPARKING INNOVATION AND CHANGE

The success of the command center led to its deployment being extended to the Technical Support operations for the South Asia region in Mumbai, Kuala Lumpur, and Singapore. The openness of sharing data through the command center has helped to stimulate new questions, to challenge deeply held views, and to develop new ways of thinking that have formed part of the learning organization. For example, the SAS Visual Analytics reports highlighted differences in how tracks were documented and handled across the South Asia region. As a result, business processes were improved, which enabled SAS Technical Support to operate more consistently across the region and help provide better service for customers.

CONCLUSION

SAS has leveraged a breadth of SAS technologies to better understand the needs of its customers, to improve efficiencies, and to ultimately drive customer satisfaction through SAS Visual Analytics reports in the command center. The ideas and techniques described in this paper provide a blueprint for developing and building a command center.

ACKNOWLEDGMENTS

A project of this size and complexity would not have been possible without the innovation and contribution from my colleagues in SAS Technical Support: Julien Heijster, Ron Barton, Simon Dawson, and Guillaume Curat.

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RECOMMENDED READING

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Kirk, Brandon. 2015. "Bust Open That ETL Black Box and Apply Proven Techniques to Successfully Modernize Data Integration." *Proceedings of the SAS Global Forum 2015 Conference.* Cary, NC: SAS Institute Inc. Available at support.sas.com/resources/papers/proceedings15/SAS1824-2015.pdf

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Command Center Architecture Overview

Data Sources

Excel files

HotFix Database

Cary Data Warehouse

LAN

WAN

ETL Server

Operating System: Windows Server 2012R2 (VM)
Memory RAM: 32GB
Processors: 2.8GHz Intel Zeon, 4 Cores

Visual Analytics Server

Operating System: Windows Server 2012R2 (VM)
Memory RAM: 32GB
Processors: 2.8GHz Intel Zeon, 4 Cores

Dell Server

Machine: DELL T3610
Operating System: Windows 7 64-bit
Memory RAM: 4GB
Processors: 3.1GHz Intel Zeon, 4 Cores
Web Browser: FireFox

Dell Server

Machine: DELL T3610
Operating System: Windows 7 64-bit
Memory RAM: 4GB
Processors: 3.1GHz Intel Zeon, 4 Cores
Web Browser: FireFox

Graphics Card: NVIDIA NVS 510

Graphics Card: NVIDIA NVS 510

Graphics Card: NVIDIA NVS 510

Graphics Card: NVIDIA NVS 510

Dell Monitors

Dell Monitors

Dell Monitors

Dell Monitors

APPENDIX 2: STEPS TO IMPLEMENT AUTOMATIC REFRESH OF SAS® VISUAL ANALYTIC REPORTS

To implement an automatic refresh of reports in a SAS Visual Analytics 7.3 environment, use the following steps. **Note:** Earlier versions of SAS Visual Analytics have a different file structure, so these steps might not be applicable to those versions.

1. Download the VisualAnalyticsViewerRefresh.jsp and ViewerFlashRefresh.jsp files.

2. Save the VisualAnalyticsViewerRefresh.jsp file to `SAS-configuration-directory\Lev1\Web\WebAppServer\SASServer12_1\sas_webapps\sas.visualanalyticsviewer.war`.

3. Save the ViewerFlashRefresh.jsp file to `SAS-configuration-directory\Lev1\Web\WebAppServer\SASServer12_1\sas_webapps\sas.visualanalyticsviewer.war\WEB-INF\jsps`.

4. Determine the metadata identity for each SAS Visual Analytics report. In SAS Visual Analytics Server, launch SAS® 9.4 Foundation. From the toolbar, select **Solutions ► Accessories ► Metadata Browser**:
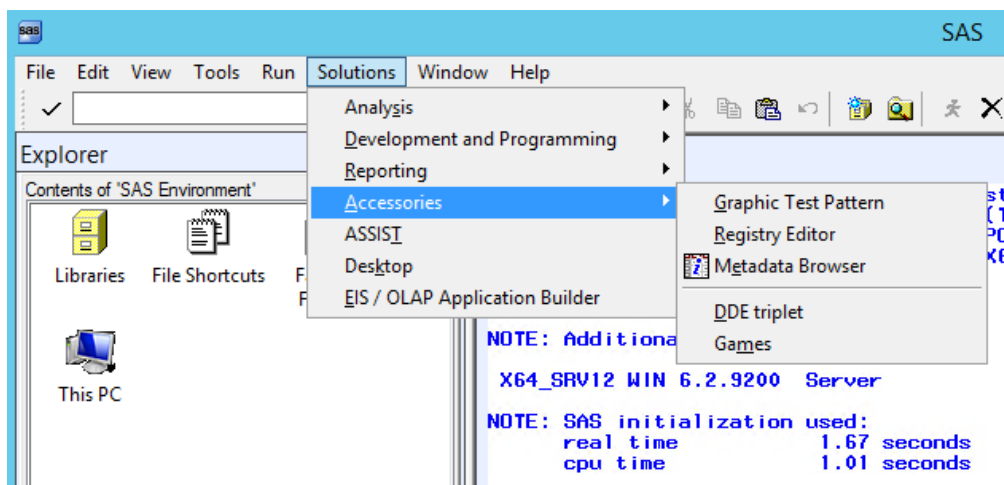
5. In the Metadata Browser tree, navigate to **Foundation ► Transformation**. The window that opens provides a list of all the SAS Visual Analytics reports with their unique metadata identity.

   Note: You can use other methods to obtain the same information.
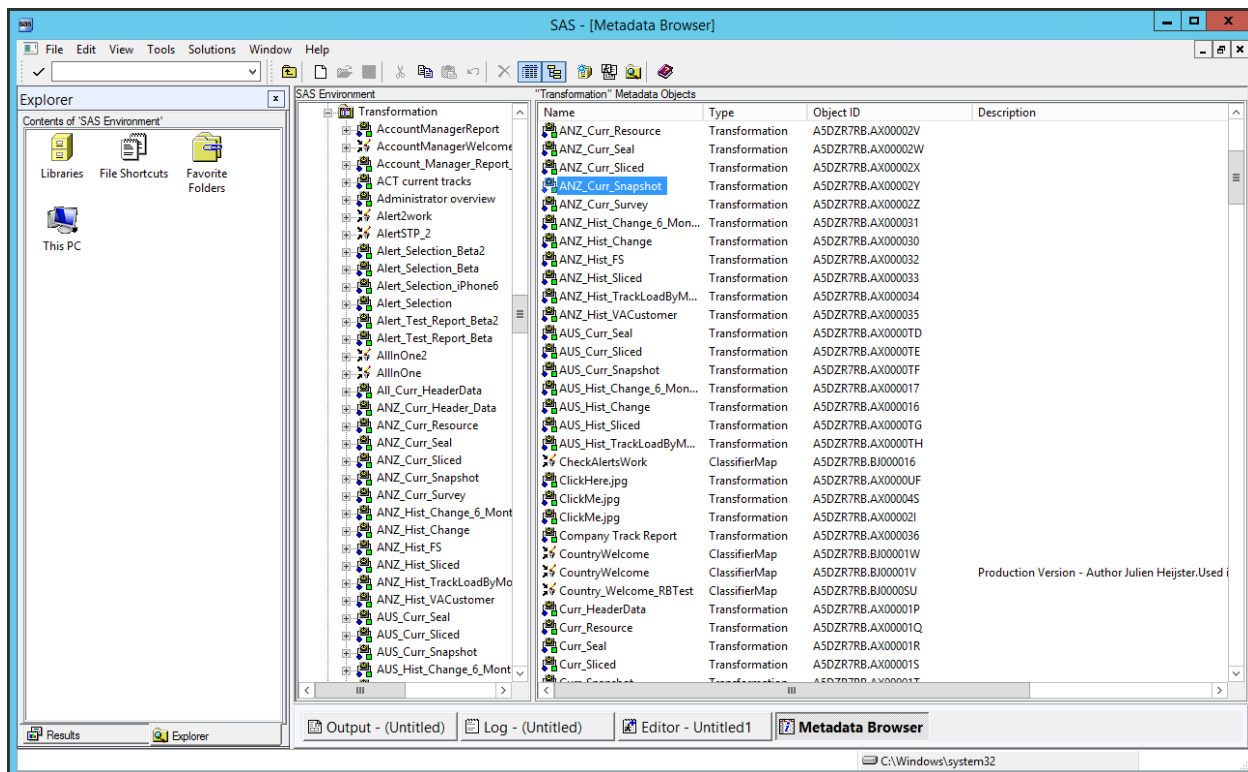
6. In the web browser, enter the URL for each SAS Visual Analytics report that is displayed in the command center. Use the following format:

`https://``server-name`**`/SASVisualAnalyticsViewer/VisualAnalyticsViewerRefresh.jsp?`**

`saspfs_request_entitykey=``metadata-identity`**`%2FTransformation`**

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