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Managing SAS® Technical Support in a Research Organization

Michael A. Raithel, Westat, Rockville, MD, USA

Abstract

Westat utilizes SAS software as a core capability for providing government and private industry clients with analysis and characterizations of their data. Staff programmers, analysts, and statisticians use SAS to manage, store and analyze client data, as well as to produce tabulations, reports, graphs and summary statistics. Because SAS is so widely used at Westat, the organization has built a comprehensive infrastructure to manage SAS technical support issues. This paper provides an overview of Westat's SAS technical support infrastructure, which provides a central resource for handling SAS software issues so that the programming and statistical staff can concentrate on providing clients with cutting edge analysis.

Introduction

Westat is an employee-owned research corporation serving agencies of the U.S. Government, as well as businesses, foundations, and state and local governments. We have used SAS software since the late 1970s, due to its unparalleled power and flexibility and its relevance to our capabilities as a leading statistical survey research organization. Since then, the role of SAS at Westat has grown dramatically and become even more critical, given the increased scope, breadth, and complexity of our projects. So, over the years, we have found it in our best corporate interests to build a strong SAS technical support infrastructure.

Westat's SAS technical support infrastructure is composed of five main elements:

- Managing day-to-day technical support issues
- Keeping SAS software current
- Managing new SAS releases
- Administering SAS servers
- Disseminating SAS information

This infrastructure has proven to be very effective in providing a structured, supportive, professional environment for our SAS professionals. This paper discusses each of the five elements of our SAS technical support infrastructure. Readers should note that though this paper describes Westat's SAS infrastructure, it is not meant to be a statement of the organization's official policies or procedures.

Managing Day-to-Day Technical Support Issues

An organization with over three hundred SAS programmers and dozens of other SAS users needs a strong structure for SAS technical support. Programmers, statisticians, and analysts should not be concerned with the fine details of which version of SAS they are using, what SAS hot fixes have been applied, and whether the versions of SAS are in sync across computer platforms. Nor should they have to worry about occasional SAS system errors and individually contact the SAS Institute's Technical Support staff. Instead, they should concentrate on their jobs of processing data and providing the result to clients.

They should have a dependable, internal group that they can rely on for SAS-related issues, such as version control and technical support.

Years ago, we established the SAS Unit; a small team of SAS-savvy IT professionals who are dedicated to in-house SAS technical support. SAS Unit personnel answer telephone calls and email messages from staff members who have experienced SAS errors or have SAS other system problems or concerns. They research the problems, find a solution where possible, and provide that solution to the original caller.

When troubleshooting a problem, SAS Unit staff work directly with the person who contacted them for support. They usually phone the originator and ask for additional information—sometimes a SAS log, or a clarification on what they were trying to do. In some cases, they may solve the issue right away, based on their extensive knowledge of SAS and their experience with similar issues.

When there appears to be a SAS software issue involved in a problem, SAS Unit staff contacts the original poster, gets more information, and then contacts the SAS Institute's Technical Support staff with a detailed description of the problem. The SAS Unit staff works as the liaison between SAS Technical Support and the person reporting the problem until the issue has been resolved. If such an issue is likely to affect numerous staff, the SAS Unit creates a write-up of the issue and solution and posts it to a SAS Outlook information folder, which is available to all staff as a Microsoft Outlook public folder. The SAS Outlook information folder provides information on SAS upgrades, hot fixes, techniques, and technical issues to SAS users company-wide.

Members of the SAS Unit can be contacted in one of three ways. A special email address for the SAS Unit has been established and published on the corporate intranet. Staff can simply send an email to that address with a description of the issue. Secondly, we have a SAS help hotline number that staff can call to directly contact a member of the SAS Unit. That telephone number is also published in several of the SAS-oriented web pages on the corporate intranet. Finally, staff can simply drop by for an unannounced office visit. SAS programmers who have worked closely with SAS Unit staff on past issues are the most likely to drop in with a question.

An indirect route that some SAS issues take to get to the SAS Unit is via the PC Help Desk. The PC Help desk provides technical support to all Westat users on topics ranging from workstation issues, to Microsoft Office use questions, to software availability and installation issues. Like the SAS Unit, they are reached via telephone or email. When they receive a question that is SAS oriented, they forward it to the SAS Unit by means of email. Thereafter, that particular issue is has been officially transferred to the domain of the SAS Unit for analysis and resolution.

The SAS Unit is composed of one manager and two SAS programming professionals. The manager provides overall direction to the team, meets with other managers on higher-level SAS issues, and ensures that the deployment and support of SAS are in line with corporate best interests. The SAS programming professionals provide the day-to-day SAS technical support to staff programmers, statisticians, and analysts. They address issues ranging from corrupted SAS profile catalogs, to odd SAS system errors, to questions about SAS product availability. The SAS Unit meets weekly to discuss recent and ongoing SAS technical support issues, and to discuss upcoming initiatives that affect will SAS users.

With over three hundred SAS users in the organization to support, we have found that having two full-time SAS support professionals on staff is the optimal number. During busy times, such as when we are migrating to a new release of SAS, all of their time may be dedicated to SAS support. During less busy

times, SAS Unit members perform ad-hoc programming tasks on Westat projects. Their involvement in project work helps them to understand the SAS-related issues important to the general SAS programming staff.

Centralizing SAS technical support to a single team provides a number of benefits to our organization. First, staff know exactly who to contact for SAS questions and for SAS technical support. They do not have to shop complex SAS questions around to their peers or perform extensive online research. Secondly, our seasoned support staff can resolve many SAS technical questions quickly, based on their extensive experience. Though many of the issues may be new to the particular SAS user, our support staff has likely dealt with those issues before. Thirdly, it provides a single point of contact with SAS Technical Support. Our staff has an established working relationship with SAS Technical Support and knows how to submit questions succinctly, with the proper amount of documentation that the SAS staff needs. Consequently, the SAS Unit can expedite the research of questions that require the help of SAS Technical Support. Finally, SAS Unit staff can surface persistent SAS issues to management's attention. Armed with that knowledge, we may decide to make changes to the way that SAS is configured or installed to ameliorate the particular issue at hand.

Keeping SAS Software Current

SAS software is continuously evolving, resulting in cyclical deliveries of maintenance releases and hot fixes. This can present a challenge to an organization that supports a large number of SAS users across three different computing platforms. The SAS Unit must apply maintenance and hot fixes to SAS on Windows workstations, Windows servers running SAS/IntrNet, and Red Hat Enterprise Linux servers. Applying maintenance releases and hot fixes must be transparent to the users, or at least be minimally intrusive, so as to not interrupt their daily project work.

The first thing that the SAS Unit does is to evaluate hot fixes and maintenance releases when they become available. As you know, SAS has a huge array of software products and solutions that organizations can purchase. Many hot fixes and maintenance releases may not pertain to the particular products or platforms that an organization has licensed. So, the SAS Unit peruses the weekly SAS hot fix email to discern which hot fixes relate to the particular SAS products that we have installed.

SAS software maintenance generally falls into two categories:

- **Hot Fixes** – SAS Institute releases hot fixes on a weekly basis. The SAS Unit reviews these hot fixes and determines if any of them are of such importance that they need to be applied before the next SAS maintenance release is available.
 - Critical hot fixes are applied to workstations and servers as soon as is practical
 - Other significant hot fixes are applied to workstations and servers during the monthly maintenance window.
 - The remaining hot fixes are not applied until they appear in the next Maintenance Release.
- **Maintenance Releases** – Maintenance releases, which are issued relatively infrequently, typically bundle a large number of previously-released hot fixes, and may add some additional

features. The SAS Unit keeps SAS software up to date by applying maintenance releases when they become available.

The SAS Institute provides the SAS Installation Qualification Tool (SAS IQ), which validates SAS software installation and maintenance by verifying the integrity of each file in the SAS System. We use SAS IQ to validate both our initial SAS installations and our updates to SAS software.

Pertinent hot fixes are downloaded and staged to be applied to the relevant computing platform: Windows workstations, Windows servers, or Red Hat Linux servers. The SAS Unit posts the list of hot fixes applied to Windows workstations, SAS/IntrNet servers, and SAS Linux servers to the SAS Information Forum. Any anomalies are also noted in the post.

SAS Maintenance on Windows Workstations

On Windows workstations, we need to apply SAS hot fixes and updates to over three hundred users. In our organization, SAS for Windows is deployed as “client installs”, meaning that SAS is installed in the Program Files directory on users’ C-drive. We do not want our SAS for Windows users to have to be concerned with individually installing hot fixes and updates. So, we have a semi-transparent method of deploying the hot fixes. That method consists of the following steps:

1. We copy the executables of selected hot fixes to a Hotfixes directory on our network. The Hotfixes directory also has a WinBatch program that chooses which hot fixes should be applied.
2. Our Windows SAS users have a **hotfixflag2.txt** file in their **C:\Program Files\SAS92\SASFoundation9.2** directory. Within that file is a flag that signals which hotfixes have been applied to SAS on that workstation.
3. Our Windows SAS users also have a DATA _NULL_ step embedded in their autoexec.sas program that looks like this:

```
data _null_;  
call system("\Westat.com\dfs\SASCORP\SASMISC\HOTFIX.exe");  
run;
```

That code runs the WinBatch program whenever SAS is initiated.

4. The WinBatch program does the following:
 - Compares the contents of the workstation’s hotfixflag2.txt file with the hotfix flag file on the network drive.
 - If the comparison shows the workstation is up to the current maintenance level, the WinBatch program ends.
 - If the comparison shows that SAS on the workstation is not up to the current maintenance level, a dialog box pops up to prompt the user to run the hot fix. This happens when they open SAS in Display Manager or attempt to execute SAS in batch

mode. Users may choose to apply the hot fixes right away or to delay applying them to some later time. Declining to apply the hot fixes results in another prompt the next time the user initiates SAS in either interactive or batch mode. When the hotfixes are applied to the workstation, the flag in the hotfixflag2.txt file is updated to show that the current level of hot fixes have been applied.

The time that it takes for hot fixes to apply varies, depending upon individual hot fixes and upon the number being applied. It can be as short as several seconds or as long as several minutes. But, we have not found it to be too disruptive to our SAS professionals. Whatever time it takes, it is certainly faster than each user researching the relevant hot fixes, downloading, and applying them themselves.

SAS Maintenance on Windows Servers

We run SAS/IntrNet applications on dedicated Windows servers. Since SAS is centrally located on those servers, we do not have to employ the same hot fix application strategy as we do for our distributed workstations. Instead, SAS Unit staff stage relevant hot fixes on the Windows server and plan to deploy them at a prearranged time. Maintenance for SAS/IntrNet servers is applied on a Sunday morning between 4:30 a.m. and 7:30 a.m., so as to cause as little disruption as possible.

Updates to SAS server software often call for a reboot of the server. In the case of SAS/IntrNet, the individual SAS application servers must also be stopped for the maintenance to take effect. Our project managers are aware of this and are used to the monthly reboot of the SAS/IntrNet servers. Nonetheless, we send them an email mid-week reminding the managers that the SAS application servers will be taken down, the maintenance applied, and the servers rebooted during the Sunday maintenance window.

SAS Maintenance on Red Hat Enterprise Linux Servers

A number of corporate projects harness the power of Linux servers and SAS software to process data. Some of the projects are run on Linux servers because they analyze very large SAS data sets. They are utilizing the faster I/O transfer rates and larger SAS work library area of the Linux servers. Other projects run on Linux machines because they perform complicated, iterative calculations. They are using the increased memory and the faster processor speed of the Linux servers. Our Linux servers act as mini-mainframes.

SAS Unit staff coordinates with the Linux administrator to schedule SAS maintenance for the Linux servers. The Linux administrator stages relevant hot fixes on the Linux servers and deploys them at a fixed time. Maintenance for SAS Linux servers is applied on a Sunday morning between 4:30 a.m. and 7:30 a.m. As with the SAS/IntrNet servers, Linux maintenance often calls for a reboot of the server. Project managers are sent an email alerting them to upcoming Sunday maintenances and plan accordingly. If a manager alerts the SAS Unit to the fact that a particular project must run SAS programs throughout the weekend and the maintenance window, the reboot is simply deferred to the next Sunday.

Deploying SETINITS

SAS licenses are renewed on an annual basis. Once the bill is paid, the SAS Institute sends a SETINIT file that must be applied to allow the software to run for another year. The SETINIT procedure uses the

file sent by SAS to update the license information stored on individual workstations and on also our SAS servers. We handle the deployment and execution of the SETINIT updates much the same way that we handle hot fixes and maintenance releases.

On Windows workstations, we update the WinBatch program to apply the SETINIT when a SAS session is first initiated. The WinBatch program checks to see if the workstation's license has been updated to reflect the most recent SETINIT. If not, it then runs PROC SETINIT to update the license on that workstation. Otherwise the WinBatch program closes. The application of the SETINIT happens so quickly that it is nearly invisible to users.

On Windows servers, SAS Unit staff apply the SETINIT to the central SAS installation on the individual server. They must stop and restart each SAS/IntrNet application server for the license update to take effect for that particular instance of SAS. Consequently, SETINIT's on SAS/IntrNet servers are applied during the monthly, Sunday maintenance window. It is not necessary to reboot the SAS/IntrNet servers after application of a new SETINIT

On Linux servers, SAS Unit staff apply SETINITs as soon as they are received. Updating the central SAS license is not disruptive to SAS programs that are currently running, and no reboot of the servers is needed for the SETINIT to take effect. Programs submitted after the license has been updated will immediately reflect the fact that the new SETINIT is in place.

Managing New SAS Releases

Perhaps the biggest challenge to an organization with a large, embedded SAS culture is migrating to the next release of SAS. Each new release of SAS produces new features and consolidations of hot fixes and maintenance upgrades. So, they are generally welcomed events. However, getting larger groups of users on project teams to take the time to migrate, and to migrate in tandem, is a challenge. Users may not have the time to migrate due to project deadlines. Some may need to stay with an older version for a while because they must stay in sync with the version a client is using. And, some may just not be aware of the additional features the new release has to offer.

In recent memory, our organization has migrated: from SAS 6.08 to SAS 8.2; from SAS 8.2 to SAS 9.1.3; from SAS 9.1.3 to SAS 9.2. We are now looking at a migration from SAS 9.2 to the latest release: SAS 9.3. Each migration involved its particular challenges as we moved over three hundred SAS professionals to the new version. However, over time, we have developed a methodology that facilitates the upgrade and works reasonably well for all involved. We take a phased approach that incorporates early adopters and alpha testers, a general rollout, monitoring of the migration, nudging, and then making the older version of the software unavailable. Here is our approach:

1. Download the new release of SAS for all Westat SAS platforms – Windows workstations, SAS/IntrNet servers, SAS Linux servers
2. Install the new release of SAS on the workstations in the computer lab
 - Make the computer lab available for early adopters
3. Install the new release of SAS on a Linux server
4. Install the new release of SAS on a SAS/IntrNet server
5. Perform limited testing on the new release

- Run suite of test programs on computer lab workstations
 - Run suite of test programs on a Linux server
 - Create and run an application server on a SAS/IntrNet server
 - Test SAS/Connect of workstation to Linux server
 - Ensure compatibility with the previous release of SAS
 - Test Westat SAS Autocall macros
 - Test Westat SAS Statistical Macros
6. Allow small group of early adopters to install the new release of SAS on workstations
- Put the new release's Software Depot on a generally accessible server
 - Let early adopters know that that they may have to reinstall if we find significant issues or a maintenance upgrade of the new release is issued
7. Create a corporate-wide migration schedule
- Announce the availability of the new release to staff via email
 - Allow anybody to install, but the new release of SAS is not the company default
 - Users may install it via a link on our Regular Use software page on the corporate intranet
 - Hold a "What's New in SAS x.x" one-to-two-hour lecture presentation, at which senior staff describe the most salient features of the new release
 - The new release of SAS becomes the Westat default
 - The link used to install the old release is removed from the Regular Use Software page on the corporate intranet.
 - An email is sent to staff alerting them of the cut-off date when the old release expires
 - The SETINIT for the old release is allowed to expire

During the entire process, the SAS Unit monitors who has migrated to the new release. This is done using the RTRACE facility—See Raithel paper in References. We determine who is still using the old version. Once the new release becomes the Westat default, we work with the various project managers to get them to nudge their staff to migrate to the new release at their earliest convenience. We continually monitor our "hold-outs" and work with their managers to have them install the new version.

Sometimes staff members have good reasons to stay on the older release of SAS after the rest of the company had migrated to the new version. Perhaps other software they use can only work with the previous version of SAS, or maybe they must stay in sync with a client's version. Sometimes a project is in the middle of a deliverable and doesn't have the time to coordinate a group-wide migration. In those rare cases, we do provide the old SETINIT to staff so that they can run that release. Our experience is that such staff members often install the new release and use it for project work that does not require the old SAS software. So, they have two versions of SAS installed on their workstations. They then use the new release of SAS for all of their work when it is no longer necessary to use the old version for the "hold-out" projects.

Administering SAS Servers

Westat licenses SAS for two server platforms: Windows servers and Linux servers. On Windows servers, we run SAS/IntrNet software that supports intelligent web applications. On Linux servers, staff run batch programs that take advantage of the faster processors, large memory, and large SAS work library disk space. The SAS Unit is involved in SAS administration on both of these computing platforms. A previous section of this paper explained how SAS Unit staff apply patches and hot fixes, and how they apply SETNINTs to the SAS/IntrNet and SAS Linux servers. This section describes other Administering SAS servers activities.

SAS/IntrNet Administration

SAS/IntrNet software is designed to allow a front-end web application to dynamically execute SAS programs on a back-end server. This allows the SAS/IntrNet web applications to harness the power of SAS to access and process data, and to create dynamic reports that are streamed back to the end user's web browser. Our projects use SAS/IntrNet software in two different environments:

- **Intranet** – Projects where in-house analysts and researchers need interactive access to data
- **Internet** – Projects where off-campus analysts and researchers need interactive access to data via the World Wide Web

When a corporate project decides to create a new SAS/IntrNet web application, the IT manager contacts the SAS/Unit's SAS/IntrNet Administrator for assistance. We ask project staff to take the following considerations into account when deciding whether or not to select SAS/IntrNet software for a particular project.

- An interactive application is required
- A web-based application is required
- The data reside in SAS data sets or other files that can be loaded to the SAS/IntrNet server; or the data resides in a RDBMS that they have access to
- Staff have the relevant programming skills:
 - Intermediate SAS programming skills are required
 - Basic SAS macro language skills are required
 - Basic HTML programming, ASP programming or .NET programming skills are required
- SAS statistical procedures are needed to characterize the data
- SAS/Graph software is needed to create graphs

After considering the aforementioned points, a project may determine that SAS/IntrNet is the right software tool for their project. The project's IT manager supplies the SAS/IntrNet Administrator with the following information:

- The name of the project and the project charge number
- Whether the project will be an Intranet or Internet project
- The estimated amount of disk space needed for project data
- The development timeframe
- The production timeframe
- The SAS software components that will be used if there are any other than Base SAS

When contacted, the SAS/IntrNet Administrator performs the following functions to enable the project's use of the SAS/IntrNet server:

- Create the new application's directories on the SAS/IntrNet server
- Provide access to the new directories to designated project staff
- Create new SAS/IntrNet application server
- Modify the SAS Application Broker configuration file to include the new application server
- Run the new SAS/IntrNet application server
- Advise the project contact that the new SAS/IntrNet programming environment is ready
 - Provide the contact with the name of the new directory on the SAS/IntrNet server
 - Provide the contact with the name of the new SAS/IntrNet application server

SAS/IntrNet applications are implemented in two stages:

- **Development** – All SAS/IntrNet applications are developed on the Development server
 - This server resides on the Westat Intranet
 - Applications are developed and tested on this server
 - Applications may be accessed via the Westat Intranet, but not over the WWW
- **Production** – SAS/IntrNet production applications for the Internet are deployed on the Production server
 - This server is on the Westat Internet zone
 - Applications may be accessed via the WWW

If a project is developing an Intranet application, then project staff only use the Development server. That is; the project programs are developed and implemented on the Development server. If a project is developing an Internet application, then it is developed and tested on the Development server, and then deployed to the Production server. All SAS programming, web programming, and data issues are handled by the project's applications programmers.

As project staff work on their SAS/IntrNet applications, they may need technical support from the SAS/IntrNet Administrator from time to time. The SAS/IntrNet Administrator helps staff address SAS/IntrNet structural and systems issues. The administrator responds to occasional matters such as researching system errors, restarting hung-up application servers, and providing application program response and usage statistics. The SAS/IntrNet Administrator also works with projects that need to have batch programs scheduled on the SAS/IntrNet servers. Such programs typically perform nightly data extracts to build SAS data sets needed by the SAS/IntrNet applications. In these cases, the administrator uses the Windows Scheduler to schedule the designated project .bat programs for execution.

SAS Linux Server Administration

Westat uses SAS Linux servers to facilitate running SAS programs that consume large amounts of computing resources. Staff employ SAS/Connect software to connect their workstations to the Linux servers and upload/download data and programs. They can submit programs to run remotely on the Linux server and get the log and result sets back on their workstations. Users can also log directly into the Linux server and perform tasks using native Linux commands. They can traverse directories, look at files, schedule programs to run via the CRON facility, and directly run SAS programs in batch.

SAS Linux server administration is a partnership between Westat's Systems staff and SAS Unit staff. The Systems Linux administrator takes care of tasks such as upgrading the Linux operating system, creating user accounts for project staff, and ensuring that nightly and weekly backups are taken. The Linux administrator also applies the relevant SAS hot fixes and maintenance upgrades. SAS Unit staff interact directly with the SAS users. They provide users with information on who to contact to obtain a Linux user account, how to use SAS/Access software, how to submit batch programs, and how to schedule batch programs to run. They help users with systems errors and with questions about how SAS interacts with the Linux operating system.

The protocol for SAS users obtaining a Linux account is:

- Project staff contact the SAS Unit to request a Linux SAS server account
- The SAS Unit discusses the need with the project staff to help determine if Linux is the best platform for the proposed processing
- The SAS Unit forwards the project staff's information—list of user id's, estimate of disk space needed, etc. to the Linux Administrator

- The Linux Administrator creates the user accounts and root directory structure and sends that information to the project staff
- The SAS Unit helps the project staff get oriented to the Linux environment, both through SAS/Access and through the direct login.
- Users are referred to the document: **Exploiting the SAS System on Linux Servers with SAS Connect Software**, which is posted on the corporate intranet.

SAS Unit staff provide the Linux administrator with relevant information about SAS hot fixes and maintenance releases. They also supply the administrator with the latest SETINIT file. SAS Unit staff work closely with the Linux administrator—and with project staff—when it is time to upgrade to a new version of Linux. Such upgrades require significant planning and coordination, and are beyond the scope of this paper.

Disseminating SAS Information

An important facet of SAS technical support is providing SAS users with the information they need to successfully use SAS in the corporate environment. Providing relevant information about SAS is a proactive way of heading off technical support issues. Informed, educated SAS users are better consumers of corporate SAS resources and less likely to contact the technical support staff unless they have a significant issue. We have a number of facilities for disseminating information about our corporate SAS infrastructure and support.

It is important for programmers to have a central source that they can easily access to get information about SAS, both at the corporate level and at the more global, world-of-SAS-programming level. We provide a home page for such information on our corporate intranet. Our SAS home page is named *SAS Software, Documentation, and Resources*, and is one mouse-click away from the main corporate intranet home page. See Figure 1, below.

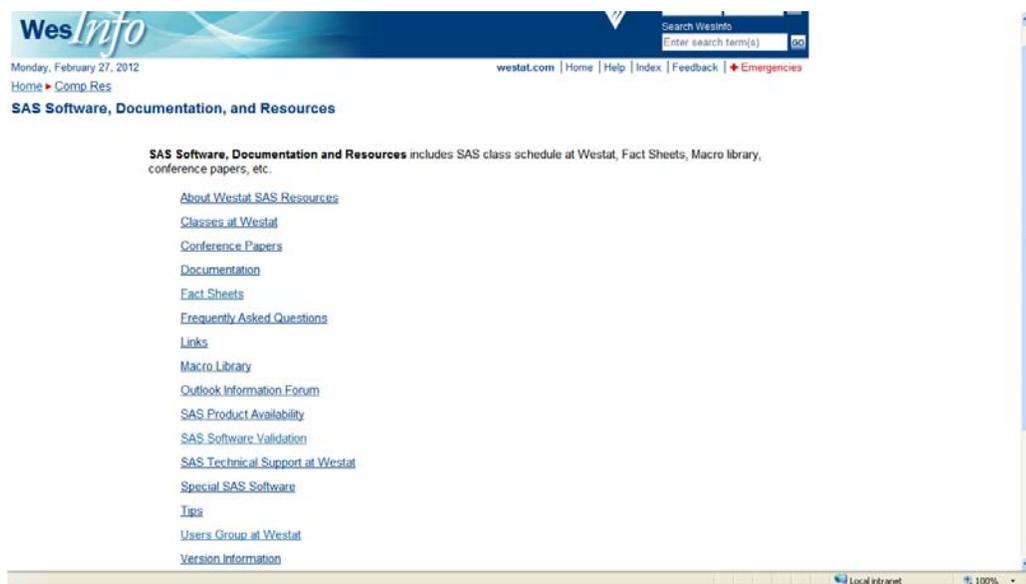


Figure 1 – The Westat SAS Resources home page.

The *SAS Resources* home page has links to sub-pages that cover everything from upcoming SAS classes, to SAS Frequently Asked Questions (FAQ), to the SAS products available on corporate servers, to links to SAS web sites on the Internet, to SAS tips. Programmers can stay attuned to upcoming events such as SAS classes and user group presentations, and they have a plethora of SAS information at their fingertips.

There are fifteen links available to corporate staff on the *SAS Resources* web page. The links take them to the following pages:

- **Classes at Westat** – This page provides a list of upcoming in-house SAS classes. It includes dates, times, how to sign up for a class, class prerequisites, and class descriptions.
- **Conference Papers** – This page lists all of the organization's SAS conference papers. Staff can choose a particular conference and view a list of all of the papers presented at that conference by fellow staff members. They may click on a paper title to read a particular paper online, or to print it for later reading.
- **Documentation** – This is a page where programmers can link to online documentation of SAS for each version of SAS that Westat currently supports. Having SAS documentation online gives programmers easy access to it whenever they need it to research a particular aspect of the SAS programming language. There are also instructions on this page on how to order copies of SAS-related books.
- **Fact Sheets** – From time to time, corporate staff author in-house papers concerning various SAS topics and techniques. Papers range from how to use SAS/Connect to link to corporate Linux servers, to how to send emails via SAS, to how to migrate from SAS/Access to ODBC to SAS/Access to OLEDB. These papers are accessible from this web page.
- **Frequently Asked Questions** – Programmers can find the answers to commonly posed questions regarding the installation and use of SAS software on this web page. The FAQ is updated as needed by members of the SAS Unit with new questions and answers.
- **Links** – A number of universities, organizations, SAS user groups, and individuals have web sites that provide useful information on SAS programming. This web page contains links to over a dozen such web sites, as well as to the SAS Institute web site.
- **Macro Library** – Over the years, Westat programmers have created scores of SAS macros that solve common programming problems. These macros have been placed into the corporate SAS autocall library. Staff can review the macros on this web page. The entire SAS macro, including a detailed explanation of the macro's purpose, inputs and outputs, is available. Currently there are fifty SAS macros in the corporate SAS autocall library.
- **Outlook Information Forum** – This page describes how staff can use the SAS Outlook Information Forum, which is an internal public folder in Microsoft Outlook dedicated to discussing SAS issues.
- **Product Availability** – This page lists all of the corporate SAS platforms (Windows, Linux, and VAX) and the SAS software products that are installed on each of them. In the case of Linux and SAS/IntrNet servers, each server is listed separately, along with its list of SAS products. Programmers can use this list to determine if the SAS products they are interested in using are on the corporate server they are interested in using.
- **SAS Software Update Schedule** – This page provides staff with the schedule of when SAS hot fixes are implemented on our SAS servers.
- **SAS 9 Software Validation** – This page describes the formal procedures the SAS Unit goes through to validate that SAS software has been successfully installed on corporate servers. There are validation procedures for installing new versions of SAS and for implementing SAS hot fixes.
- **SAS Technical Support at Westat** – Users access this page to read about how to obtain corporate SAS technical support. The write-up tells them about the SAS Outlook Information Forum, the SAS FAQ, and the SAS Tips links. It also supplies the email address and extension for obtaining in-house SAS Support.

- **Tips** – Over the years, senior staff programmers have compiled a number of tips that make SAS programming easier. These simple one-or-two paragraph tips are available on this page.
- **Users Group at Westat** – This page provides a general overview of the Westat SAS Users Group and a schedule of upcoming WesSUG presentations.
- **Version Information** – This web page has information about the versions of SAS software that the organization currently supports.

In addition to the informative links on our corporate intranet, we also host a listserv-like facility that staff can use to ask technique-oriented SAS questions. The SAS Outlook Information Forum is an in-house public folder in Microsoft Outlook used to discuss SAS programming issues. Programmers post SAS-oriented programming questions or problems to the folder and wait for a response. Senior SAS programmers and SAS Unit staff normally monitor the folder, watching for new questions. When appropriate, staff members respond to the questions, providing specific answers or possible solutions that the original poster may consider. This is usually enough for most posters to be able to resolve their SAS programming issues. On those occasions when it is not, SAS Unit staff contact the original posters and work with them to get the question fully fleshed out and submitted to SAS Technical Support.

Conclusion

In an organization with a large number of SAS users, it is necessary to have a solid SAS technical support infrastructure. Westat has developed a strong SAS technical support infrastructure with five main elements that facilitate support to its over three-hundred programmers, statisticians and analysts. Those elements are:

- Managing day-to-day technical support issues
- Keeping SAS software current
- Managing new SAS releases
- Administering SAS servers
- Disseminating SAS information

These support elements have enabled us to successfully provide SAS technical support in a research environment. Every enterprise is somewhat different; but hopefully the central ideas in this paper are ones that readers can use in their own organizations.

Disclaimer

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Contact Information

Please feel free to contact me if you have any questions or comments about this paper. You may reach me at: michaelraithel@westat.com