

Tips for Effective SAS® Platform and User Administration

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ABSTRACT

Effective administration and support of a SAS® Enterprise BI environment is difficult due to the many and varied type of users and SAS products. Presented here will be some tips and techniques of supporting your environment and users. Some topics to be discussed are how to organize the folder structure on the platform, monitoring the environment, training users, and providing them with support, standards, and resources for self-help. To keep things running smoothly certainly involves tuning of the environment but it is essential to optimize user programs as well. Enclosed within are some ideas to gently turn your users into SAS rock stars. When the SAS environment is running efficiently and programs are delivering timely and accurate results to the users you don't have to worry and you can be happy.

INTRODUCTION

This paper will present some guidelines for the efficient operation of a SAS environment. Some of these suggestions are not traditionally born by the 'SAS Admin' but they can certainly and should be advocated. It has been written to give a holistic approach for managing resources for the building and maintenance of the environments. Not all of these recommendations will be viable for every environment but certainly worth consideration. The paper is divided into several main sections: Build, Organize, Educate, Optimize, Standardize, and Monitor. I encourage you to modify these strategies to better suit your environment. Please keep in mind that I do not present here any hard and fast rules or absolute best practices but rather suggestions that I have found to be helpful and effective.

BUILD

The first step in creating a stable, maintainable SAS environment is to build it properly.

Ideally any large SAS installation should have multiple environments such as Development, Test, and Production. Often it is seen that these environments are not built identically and it becomes very difficult to navigate and promote through the environments. If at all possible these environments should be built out identically on separate machines (either virtual or physical). Traditionally we use the development environment to develop and unit test our programs, however in the SAS world I have seen this work a bit differently. Usually business users need real data to develop and test their code so they do their development in the production environment. This is fine as long as production is organized properly and you keep programs being developed and tested in a different area from the production code. So if users are developing code, analyses, reports in production why do we need other environments? Well the answer is that we, as administrators, need an environment to test the installation, configuration, and modification of the SAS system itself. As you know hot fixes and new releases pop up from time to time and a development environment is a great place to configure, install, and test impact. In my experience a fully functional test environment is not always necessary for the SAS Administrator. Test is of much more use to insure data integrity rather than system configuration or change impact. The development and/or test environments should have a directory structure identical to the prod environment. With the availability of virtual machines it is easier to set up multiple separate environments that have the same directory structure. Ideally it should be set up so that the only thing that differs between DEV, Test and Prod is the machine name and/or IP address. So the configuration files can all be virtually unchanged between environments. Of course, it is often necessary to have different access rules/permissions within the multiple environments. It is nice to have test databases as well but not always possible. The various methods and cost benefit analyses for building and cloning the environments are beyond the scope of this paper but the point is that the effort and expense to build and maintain multiple environments is usually worth it.

ORGANIZE

Organization of the environments and file structure is essential in building and keeping a system running properly. Obviously advanced planning is necessary to determine your company's requirements and it is a good idea to determine where data and programs will live during the planning phase of a SAS installation project. Best practices dictate that information and programs should be stored in a central location that has controlled access, rather than on a particular user's laptop or thumb drive, but you will see stuff stored in all over the place and it is your job to direct them to the proper location. Things to be considered are how departments interact within your organization. For instance the marketing department is likely to interact with the sales department. The drug development department is likely to interact with clinical trials. This is important because you may have objects that need to be and should be shared between departments like formats, templates, and styles. More importantly Libname statements and database access connections.

Items under consideration are as follows: Macros, Formats, Stored Processes, and ODS Templates. By default SAS creates some default locations for these objects under the configuration directory (\SAS\Config\Lev1) but I think it is more effective to create another common area where users can store and modify their own. You will need to set up search paths properly so that a program will first search a user area then the system area. Ideally data and programs should be stored in two separate areas whether they be servers, drives, or just directories on the same drive. When it comes to metadata organization it would be great to create similar structure. I have described techniques for organizing metadata in another paper listed in the reference section.

Create repositories for code, formats, macros, and libnames. There should be several types of libraries for macros, file descriptors, report headers, ODS template, utilities, passwords, sample code etc. Consider whether to use include statements for macros or autorecall libraries. You may find a need for departmental libraries and system wide libraries for certain types of elements. These techniques and standards will make the programmers' job easier and more productive.

Consideration of the location of the code, data, and libraries should be addressed and saved within the detail design documents along with descriptions, designs and flowcharts. This will promote a more organized system as well as assisting in the development of similar systems.

One example I like to follow is to have each department have its own shared area subdivided into code, formats and macros. Have one area similarly subdivided for the entire enterprise. And finally let each user have their own separate areas subdivided as they wish. Programs would be developed and unit tested in the user area then moved to the departmental or enterprise area as they become productionalized. My idea here is not to advocate a particular way of organizing but the ask you to think about, design, and maintain a structure that will work for you.

STANDARDIZE

Design and coding standards have long been a part of traditional centralized information systems. However as CPU clock speeds and amount of memory increase exponentially the standards for coding and efficiency tend to deteriorate. SAS lends itself to developing quick adhoc solutions to common data problems. These so-called adhoc programs have a way of becoming mainstream production modules that run on a regular basis. The idea I would like to present in this section is that coding standards should be applied to all programs and systems in a shop, especially SAS systems. It is easier in the long run to assess, design, and build standardized documented systems than build adhoc systems and wrestle with the maintenance or redesign later. Design and coding standards will increase programmer as well as program efficiency. A standardized design will provide for simpler and controlled maintenance if there is personnel turnover. Novice SAS programmers or those new to your shop will get up to speed quicker if standards are in place and they attend a few short design and standards classes given by your more experienced staff.

Keep the style of programs similar. Begin each program with a standard comment section describing at least the purpose, input, output and modification date of each program. Supply a standard template in a common library for all to use. Emphasize simple top-down design of programs where the files are described and identified in the beginning of the program and results are produced at the end. Very long

programs should be broken up into simpler pieces with well-defined purposes. These types of standards are excellent content for in house classes and discussion groups. Create a set of standards documents internal web site or SharePoint location for easy reference. While these standards seem to be in the realm of programmers I am advocating that you as an administrator advocate for and assist in the development of these standardizations.

OPTIMIZE

When it comes to optimization I am a strong believer that most programs can be optimized. Even great programmers sometimes take shortcuts which could lead excessive memory or storage usage. The best way to attack is identify longest running programs or those that use the most memory. Various logging procedures within SAS will enable you to monitor programs for excessive use of resources.

How can this be fixed and prevented? You may be looking for a magic hack that automatically optimizes each program and causes it to run with minimum of resources. Well keep looking I have not found it yet.

Generally in our world if a program runs in 10 or 30 seconds it is fine. We are not building on-line gaming systems. But any program that is running more than 30 min would be a good candidate to examine and optimize. Begin by examining errant code and optimizing programs one by one looking at the worst offenders first. Fullstimer will assist in this effort. The “*Analyse Program*” tab on EG 7 does offer some assistance in describing and organizing the program but it does not really do any optimization. You can also use this to assist in the preparation of a large job for Grid submission. Once the program is analyzed you can start to determine where savings can be effected then can start with the standard methods of efficiency like reducing the length and breadth of your datasets as soon as possible. Many papers have been written on efficiency techniques and I urge you to seek out www.lexjansen.com where all past SAS User Group papers have been compiled.

Our next topic of discussion will explore ways in which we build efficient code.

EDUCATE

The long term solution is education of the user base. I sure at your site you have heard the complaint that “*Hey it was handed down to me, I just run it*”. My solution to this would be tear that thing apart and rebuild it correctly. Obviously this is not always possible but you can go a long way to solving this problem by providing avenues of education for your SAS users. This can be accomplished in many ways such as:

- Attending User Conferences.

- Reading papers on optimization and efficiency.

- Lunch and Learn sessions where user’s share problems and solutions.

- Ask your users to present one of their favorite programs and invite the group to dissect and improve.

- Promote a collegial, non-threatening environment for users to help each other.

- (Comments like “Hey that program is neat but I have an idea that might improve it a bit” rather than “Your program sucks and is wasting my resources”.)

- Webinars with presentations by SESUG presenters.

- (I am sure many are eager to present to a willing audience.)

- Require users to attend a course before being given access to a resource.

- Set up SAS Center of Excellence in which participants can contribute and discuss improvements

I have found that programmers desire and are willing to improve with a bit of encouragement. A successful training and support plan should utilize a multi-faceted design with two desired outcomes:

- Keeping management and business users informed about what SAS can do.

- Keeping the programmers informed about how to do it.

While all strategies are not feasible for every one you should consider each one for their own merits before determining how best to implement at your organization.

USER GROUPS

SAS user groups are a valuable source of information about SAS products, SAS solutions, and tricks and techniques to implement these solutions. Novice SAS users can benefit from the beginning tutorials, managers can benefit from management tracks, and even the most accomplished SAS programmer can learn a new technique or better way of utilizing resources. The energy, excitement, and knowledge taken home from a conference are a benefit to all. Attendance at conferences should be a part of your training plan. If it is too costly to send everyone in your organization then set up a rotation schedule between local and national events.

SAS INSTITUTE TRAINING

Training courses given at a SAS Institute facility or at your own site provide technical hands-on learning for all SAS products. The courses are designed well and provide a structured environment in which to learn. Employees generally like to take courses and see it as a fringe benefit, but the benefit to the organization far outweighs the cost. Users will learn the best way to do something rather than just a way to make it work. Some sort of formal training should be a part of your training plan for novice and experienced personnel. All training options are listed on the website: <http://support.sas.com/training/>

CERTIFICATION

SAS Institute has developed the SAS® Global Certification Program. While certification is not universally accepted or required it may turn be a helpful way to evaluate prospective candidates and keep your current staff up to date. Look into the Training and certification website at: https://www.sas.com/en_us/certification.html.

SAS INSTITUTE WEBSITE

The SAS Institute web site www.sas.com is very extensive and contains much information on products, solutions, and techniques. Obviously it has a lot of marketing material on software products and solutions but of note here are three key areas Learning, Publications and Support. These pages overlap somewhat but are easy to follow.

Learning

The learning page has variety of venues for learning SAS from free tutorials to paid courses and interactive sessions. It has links to training, certification, books and documentation. While most of their education options like classroom, on-site, and live web classroom are fee based there are quite a few that are free like on-line tutorial and e-learning sessions. Your training plan should encourage users to visit this site often for valuable information: https://www.sas.com/en_us/learn.html. One interesting link on the learning page provides live webinars on various topics. Previously recorded sessions are also available. This is a great way for a novice to dive into the SAS world. Remember there many options for free training so take advantage of it.

Publications

Just about all of the traditional SAS manuals and guides are available in PDF and HTML format, and many are available in ePub format. You can reach this area through the documentation link on the Learning page or <http://support.sas.com/documentation>. You should encourage your users to explore these documents and look there first rather than creating a support ticket. Of course, all of the documents are searchable but my experience has found that Google search engine does a better job than the engine on the publications website. There is also an area for Books by UsersSM, and white papers on special topics.

Support

The support area contains the Knowledge base, Support by Product and various other resources. These documents contain solutions to various problems and bugs as well as usage notes. There are specific installation and configuration manuals for every product as well as a host of data step and graphic samples. Here is where you can find hot fixes for various products as well as sample downloads and a free download of the Learning Edition. This area is better suited to an experienced SAS user rather than a novice

IN HOUSE STRATEGIES

I would encourage you to develop in house classes to train novice users. This is a good way to get novice users or non-SAS programmers up to speed with techniques and standards. Classes can be developed for novice by experienced users for specific problems or concerns in your institution. Course material should emphasize standards such as naming conventions for libraries and projects and straightforward program design. Programs written to some sort of standard will be much easier to maintain. A good starting class might contain information about your specific platform or operating environment. Topics for the first class might include:

- Logon Procedure
- Location of files, macros, formats, programs
- Database logons and Libname statements
- Organizational design of programs
- Internal documentation

Another avenue of approach that can be done in house is to set up an in house users group. Ideally it should consist of all the SAS users who join in periodically for discussion of problems or new techniques. Experienced programmers can offer their advice to the more novice people. It can be as formal as inviting a local speaker or paper presenter or as informal as a brown bag lunch roundtable discussion. Generally experienced programmers are happy to show off their skills and assist others, while beginners are eager to learn advanced techniques. Some typical topics for discussion would be:

- How to handle large datasets efficiently.
- What is the best way to merge several files (Merge vs. SQL).
- How to interpret error message.
- Problems with a particular type of data used by your organization.

Whatever works best for your organization is fine but it should be in a collegial, learning atmosphere that will promote interaction between novice and experienced users.

MONITOR

Monitoring the health and performance of a SAS system is the role of the SAS Administrator. Various tools for monitoring the system are provided in the operating system and by SAS. For grid operations there is the SAS Grid manager (<http://support.sas.com/software/products/gridmgr/index.html>) and Platform LSF (<http://support.sas.com/rnd/scalability/platform/>). For non-grid installation there is the SAS Environmental Manager (<http://support.sas.com/software/products/sev/index.html>) and of course the traditional Management console and its associated logs.

The environmental manager will enable you to monitor disk and memory usage as well as the number of spawned sessions, workspace and other Servers operating.

You can set up alerts to notify you when jobs are running beyond given thresholds. It is beyond the scope of this paper to describe fully the functionality available. However I do want to emphasize that there are tools currently available for you to set up a monitoring system.

Systems can be effectively monitored with batch jobs that run each night and scan the logs. This can be part of your backup and maintenance strategy. I will leave the details for monitoring and backup strategies for another paper.

CONCLUSION

Keeping a SAS system running efficiently encompasses a lot more than allocating more disk space and memory. Code needs to be efficient and well documented. Users need to be trained. Information consumers need to be aware of processes required to keep the information timely and accurate. I hope that these few tips will inspire you to create bigger and better SAS information systems.

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