

Paper PA-03

The Many Hats of a SAS Administrator: An Insider's Guide to Becoming an Indispensable Asset in Your Organization

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ABSTRACT

SAS systems are typically deployed to interactive network environments which interface with other network environments, systems, and users. Because of the extensive interoperability required for successful deployments, it is advantageous for SAS Administrators to develop competency in as many adjacent skill sets and technologies as possible. This paper is addressed to SAS Administrators working on Windows or UNIX Operating System (OS) based servers and details the core SAS administration competencies as well as these adjacent skill sets and technologies, providing insight into their relevancy and a breakdown of their components.

INTRODUCTION

Division of labor into specialized skill sets is common in the computer services industry. With so many subspecialties, it is impossible to be an expert across all technical areas and efficiency is maximized when labor is distributed. However we must not lean too far in the direction of isolated skill sets lest our specialization narrow to the point that we are unable to competently address network or system component interoperability issues. Additionally, cross training technical team members ensures deployment projects are primed for continued success in the event any one individual is no longer available.

While there are innumerable skill sets which might enhance the SAS Administrator's utility, there are ten key areas of competency that are directly tied to SAS administration that should be given priority attention. These areas include core server functionality and administration, core client functionality and administration, programming, database technologies and access, network design and deployment, technical writing, customer service, technical sales consulting, training, and project management.

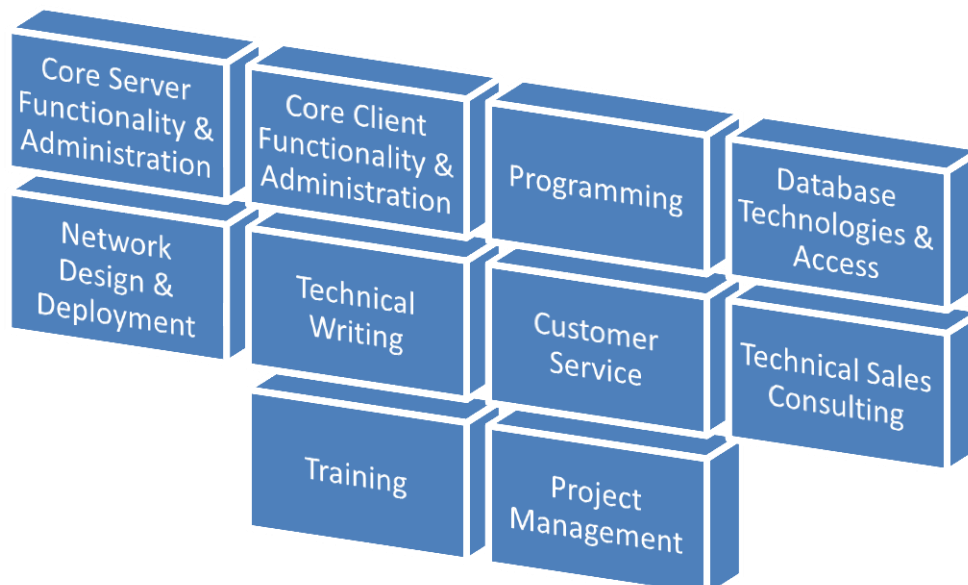


Figure 1: SAS Administration Competency Areas & Adjacent Skill Sets (Overview)

CORE SERVER FUNCTIONALITY AND ADMINISTRATION

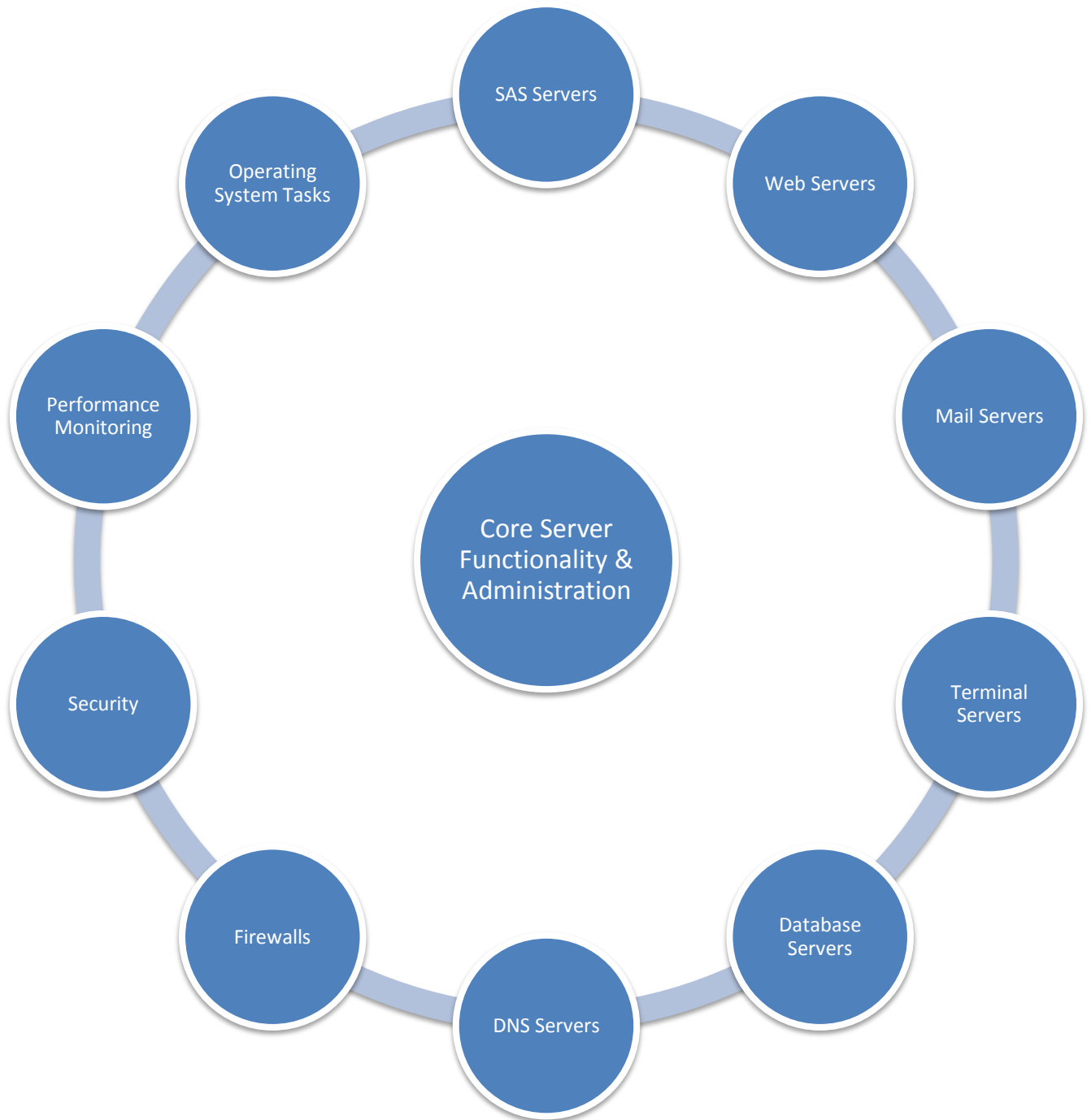


Figure 2: Core Server Functionality & Administration

For proper operation and full functionality, SAS Server components must successfully integrate with many other third party server components. In order to adequately diagnose and resolve interoperability issues with these components it is necessary to hold at least a basic understanding of how they operate. Additionally, it is important for SAS Administrators to understand the relationships and dependencies between SAS Server components and these third party server components in order to ensure compliance with organization security policies.

SAS SERVERS

Every SAS Administrator's central responsibility is SAS Server administration. At the basic level this includes Enterprise Business Intelligence (EBI) or Enterprise Data Integration (EDI) Server components and at the advance level may include SAS Specialized Solution Servers such as Fraud Framework. At minimum, every SAS Administrator should understand how to install, configure, and administer SAS Server components such as the SAS OLAP Server, Stored Process Server, and Workspace Server following a SAS Deployment Plan.

WEB SERVERS

SAS supports a variety of web servers including Apache, Internet Information Server (IIS), Tomcat, and JavaBeans Open Source Software (JBOSS). Because different deployment projects may specify any of these web servers, SAS Administrators should aim to become adept at configuring as many of these as possible. Each web server is configured through different methods, but the basic tasks that should be mastered for each web server studied include:

- configuring sites including subdomains, Uniform Resource Locator (URL) redirection, authentication, Internet Protocol (IP) assignment, and installing Secure Socket Layer (SSL) certificates
- deploying and retiring web applications to a web site

MAIL SERVERS

SAS Administrators can take advantage of automated email notifications in conjunction with monitoring SAS Server processes. Additionally, end users such as SAS Programmers and Analysts may also wish to utilize email notifications in association with report distribution or Extract, Transform, and Load (ETL) batch jobs. While simply inputting the mail server's fully qualified domain name and port are the minimum tasks required to enable email notifications through SAS, understanding mail server configuration, error codes, and how to connect to external or local mail servers to test functionality can aid tremendously in troubleshooting, particularly when it comes to SAS batch jobs that aim to generate and distribute a large volume of email. Some of the common mail servers include Microsoft Exchange, IBM Domino, Ipswitch Imail, Novell Groupwise, and MailEnable.

TERMINAL SERVERS

Competency in utilizing and troubleshooting terminal servers such as Microsoft Terminal Server or CITRIX is essential for remotely administering Windows based SAS environments. Correspondingly, familiarity with X Servers is required for remotely administering UNIX based SAS environments. Additionally, surfacing SAS client applications to remote users through CITRIX is often required as a workaround for slow Virtual Private Network (VPN) networks and SAS Administrators tasked to such deployments must understand the ins and outs of configuring CITRIX applications and diagnosing client connectivity errors or latency.

DATABASE SERVERS

Database server platforms on the market are numerous and a prime selling point of SAS Software is the ease in which SAS Servers connect to a variety of proprietary database servers including Microsoft SQL Server, ORACLE, MySQL, PostgreSQL, and Sybase. Each of these servers is installed, configured, and maintained with different methods and understanding how each handles indexing, storing relations, query optimization and transaction processing can assist the SAS Administrator in diagnosing query processing errors or latency and with configuring the connectivity at both the SAS Metadata Server level as well as the server OS level which SAS relies on.

DOMAIN NAME SYSTEM (DNS) SERVERS

Understanding domain name to IP translation; DNS record listings such as Address (A or AAAA for IPv6), Canonical Name (CNAME), Mail Exchanger (MX); DNS cache configuration; and DNS round robin configurations can prove critical in diagnosing connectivity issues between SAS Metadata or Application Servers and external data sources, domain controllers, or web servers.

SERVER FIREWALLS

Because the typical SAS Server environment relies heavily on connections among distributed SAS Server components as well as connections between these components and third party servers or clients, misconfigured firewall applications running on the OS that the SAS Servers or SAS clients are installed on can cripple the functionality of the environment as a whole. Fortunately the basics of firewall application configuration including port blocking and rules are fairly easy to learn, allowing the SAS Administrator to configure firewall applications directly or verify configurations performed by OS Administrators.

SERVER SECURITY

SAS Administrators share in the responsibility for the security of SAS Server environments. Familiarization with operating system and application level security components, features, and auditing is mandatory for SAS Administrators. This includes:

- file system directory and file permissions including inheritance
- domain structure and security including Active Directory object security (for Windows OS)
- group and user security
- group policy (for Windows OS)
- security logging and audit trails for server access and privilege execution
- SAS Metadata object security
- implementation of least privilege across all server components– the security principle of giving a users or groups of users only those privileges which are required to complete the tasks that have been assigned to them

PERFORMANCE MONITORING

Tracing the performance of SAS Stored Processes, SAS ETL Batch jobs, and other SAS Server executions can be beneficial for measuring performance of these components and overall system performance (Central Processing Unit (CPU) and memory utilization) again industry benchmarks as well as diagnosing performance hiccups after system changes are applied (such as SAS hotfixes, upgrades, or updated versions of end user SAS code). Windows and UNIX Servers support a variety of performance monitoring applications and the latest versions of SAS Software feature integrated performance monitoring as well.

OPERATING SYSTEM TASKS

Learning how to run basic Server OS tasks such as running executable programs from the command shell, utilizing Universal Naming Convention (UNC) paths, configuring scheduled tasks, stopping and starting services (on Windows Servers) should not be overlooked by the SAS Administrator. Understanding the how, when, and why aspects of completing these tasks will afford the SAS Administrator the ability to:

- better diagnose errors in end user SAS programs that call these tasks programmatically
- provide educated input to the OS administrator on possible resolution to SAS Server errors in environments where the SAS Administrator and OS Administrator roles are held separately
- resolve SAS Server errors in environments where the SAS Administrator is also the de facto OS Administrator

CORE CLIENT FUNCTIONALITY AND ADMINISTRATION



Figure 3: Core Client Functionality & Administration

SAS CLIENTS

In many organizations, the SAS Administrator is tasked with successfully configuring and securing SAS client software as well as diagnosing and resolving SAS Client/Server communication problems. A thorough understanding of the basic functionality of the most common SAS clients (such as Data Integration Studio and Enterprise Guide), their role in creating content, how they are authorized by and interact with the SAS Metadata Server and other SAS Servers, and common SAS Client configuration and runtime errors is crucial for providing SAS desktop client support.

MICROSOFT OFFICE

SAS offers integration technologies for Microsoft Office (MO) that hold the prerequisite of competency in Microsoft Office Applications in order to fully utilize or support as a SAS Administrator.

INTERNET BROWSERS

The SAS Web Applications are accessed via standard internet browsers such as Chrome, Internet Explorer, or Mozilla, and therefore SAS Administrators must be familiar with Browser configuration including proxy configuration, Active X enablement, cookie tracking, and security zones.

WEBDAV CLIENTS

SAS Servers include the SAS Content Server (replaced the Xythos WEBDAV Server) for storing static documents and graphics for surfacing in the SAS Web Portal. Adding to or editing content on the WEBDAV server requires a WEBDAV client and knowledge of how to use it.

FTP/SFTP CLIENTS

In many organizations third party application components may not be downloaded directly to SAS Server environments via the internet due to restrictive security policies. In these environments, such applications must be downloaded to a desktop in the organization and then transferred to the SAS Server environment across the organization's internal network via FTP or SFTP.

ADOBE ACROBAT

Extensive documentation on SAS and third party adjacent applications (such as JBOSS) is published in Adobe Acrobat (.pdf) format, necessitating a basic familiarity with Adobe Acrobat Reader. Additionally, supporting SAS Server programmers who wish to output to.pdf documents requires Adobe Acrobat Pro to be installed on the machine hosting the SAS Server.

ADOBE FLASH

SAS BI Dashboards and SAS Visual Analytics rely on Adobe Flash for rendering. Troubleshooting errors in these SAS Applications requires familiarity with the operation of Adobe Flash.

PROGRAMMING



Figure 4: Programming

A SAS environment that fully integrates SAS functionality into the rest of the server programming components is able to not only successfully run SAS programs but also call SAS programs from other programs and call other programs and objects from SAS.

SAS

Many times it will be necessary for the SAS Administrator to diagnose and resolve SAS Server or SAS scheduled batch job errors for which a rudimentary grasp of SAS programming at minimum is necessary. In some environments the SAS Administrator is also tasked as a part time SAS programmer and a more advanced understanding of the language is required.

OTHER HIGH LEVEL LANGUAGES

Familiarity with other high level languages such as JAVA (including JAVA Runtime Environment (JRE) and JAVA Developer Kit (JDK) installation and troubleshooting), languages supported by .NET such Visual Basic (VB).NET and C#.NET (including the.NET install and troubleshooting), and Python will provide the SAS Administrator with robust exposure to the most common third party languages one is likely to encounter in SAS Server environments. As the majority of SAS applications and configuration scripts rely on java, knowing how to read JAVA code greatly assists the SAS Administrator in troubleshooting and customizing SAS configuration files and extending SAS Applications.

OPERATING SYSTEM SCRIPTING

Many SAS Administration tasks can be efficiently automated with OS scripting. For Windows this means learning VBScript, the default scripting language available with Microsoft Windows that runs in the Windows Script Host. For UNIX this typically means learning bash or Perl. SAS programmers executing SAS programs in a Windows Server environment may also rely on OS scripting to pull data from Active Directory (AD) using the AD Service Interfaces (ADSI).

WEB SERVER SCRIPTING AND FRAMEWORKS

Just as we can extend our SAS programming functionality by enabling interoperability with other high level languages, it is preferable to enable our SAS Web applications to integrate with other web applications whenever it is practical to so, such as when retrofitting the SAS Portal into an existing intranet site. Such existing sites might be running Common Gateway Interface (.cgi) scripts written with Perl; Active Server Pages (.asp), written with VBScript or JavaScript; Hypertext Preprocessor (.php) scripts; ASP.NET (typically written in VB.NET or C#.NET) framework; JAVA Server Pages (.jsp) written with JAVA; or ordinary HyperText Markup Language (HTML) and Extensible Markup Language (XML) pages. Understanding how to read, write, and troubleshoot these web scripting technologies, languages, and frameworks provides another tool for the SAS Administrator in managing the SAS Server environment and supporting users in making full use of SAS interoperability. XML is of particular importance for SAS Administrators to master as SAS Metadata is exposed and exported in XML format, many SAS configuration files are written in this format, and SAS programmers have the ability to stream program output to XML format and may call on the SAS Administrator for diagnosing XML file errors.

SERVER OBJECTS

Component Object Model (COM), ActiveX, COM+, and other server objects are installed in SAS Server environments at the OS level and programming languages can use the application programming interface (API; an API is an interface between two software programs for automatic communication without interactive user input required) of an object to interact with it (instantiate, call its methods, or destroy the object). The server object's methods exposed through the API can complete a wide variety of programmatic tasks on behalf of the calling application (examples include the ASPEmail component that can send mail, the Authorize .NET component that can complete credit card processing transactions and the Microsoft File System Object that can create, open, and write to files in the file system).

DATABASE ACCESS AND METHODS

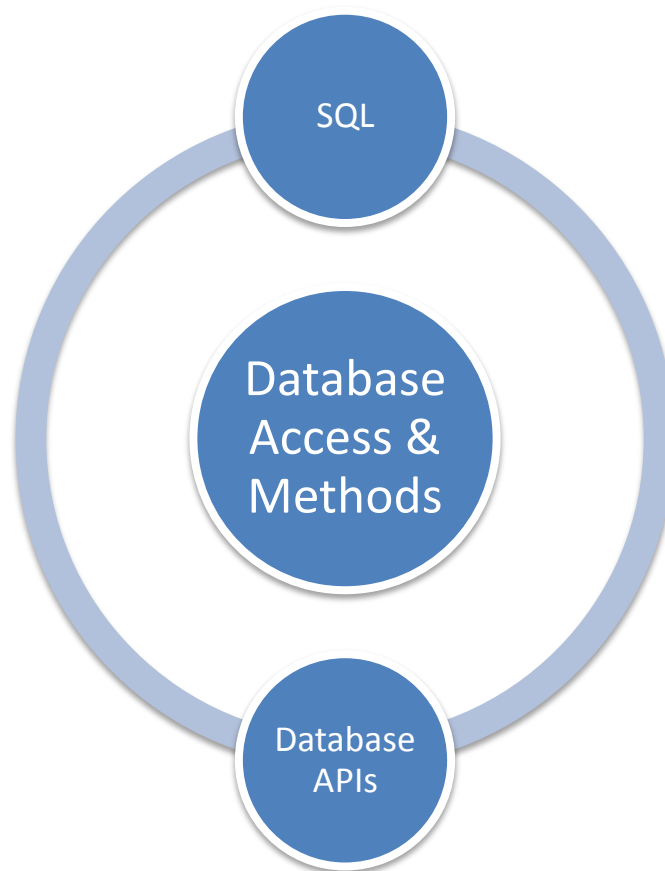


Figure 5: Database Access & Methods

In order to configure SAS external libraries, diagnose database connection problems including latency and buffer overrun issues, or assist SAS programmers and end users in successfully connecting to a database server from or through a SAS Server to send or receive data, SAS administrators must be comfortable with database APIs and reviewing database queries.

SQL IMPLEMENTATION

Every database server noted in the Core Server Functionality section of this document implements its own modified version of the American National Standards Institute (ANSI) Structured Query Language (SQL). Transact-SQL (T-SQL) is the implementation used by Microsoft SQL Server and Sybase, Procedural Language/Structured Query Language (PL/SQL) is implemented by PostgreSQL and ORACLE, and MySQL's implementation is very close to the ANSI standard. These SQL implementations can be called from all of the programming languages, scripts, and frameworks listed in the programming section, including SAS.

DATABASE APPLICATION PROGRAMMING INTERFACES

Database APIs allow programs such as SAS programs to hook into the database server to open and close connections and pass through SQL commands. Common database APIs include Open DataBase Connectivity (ODBC), Object Linking and Embedding Database (OLE DB), Oracle Data Provider for .NET (ODP.NET), JAVA DataBase Connectivity (JDBC), and ORACLE Data Integrator (ODI). SAS produces SAS/ACCESS clients for many of these database APIs that allow SAS programs to connect through these APIs. Typically to facilitate such access in a

SAS Metadata environment, the underlying API must be installed on the machine where the SAS Metadata Server is running, SAS/ACCESS for the API must also be installed, the connection details for the database server must be configured in the API, additional connection parameters such as which API to use must be configured in the SAS Metadata server definition for the database server, and an external library pointing to the server must also be defined in Metadata. Every configuration item in this chain represents a potential point of failure in data handling, so having a firm understanding of database application programming interfaces and their interoperability with SAS is essential for all SAS Administrators, but particularly those assigned to projects with ETL tasks.

NETWORK DESIGN AND DEPLOYMENT

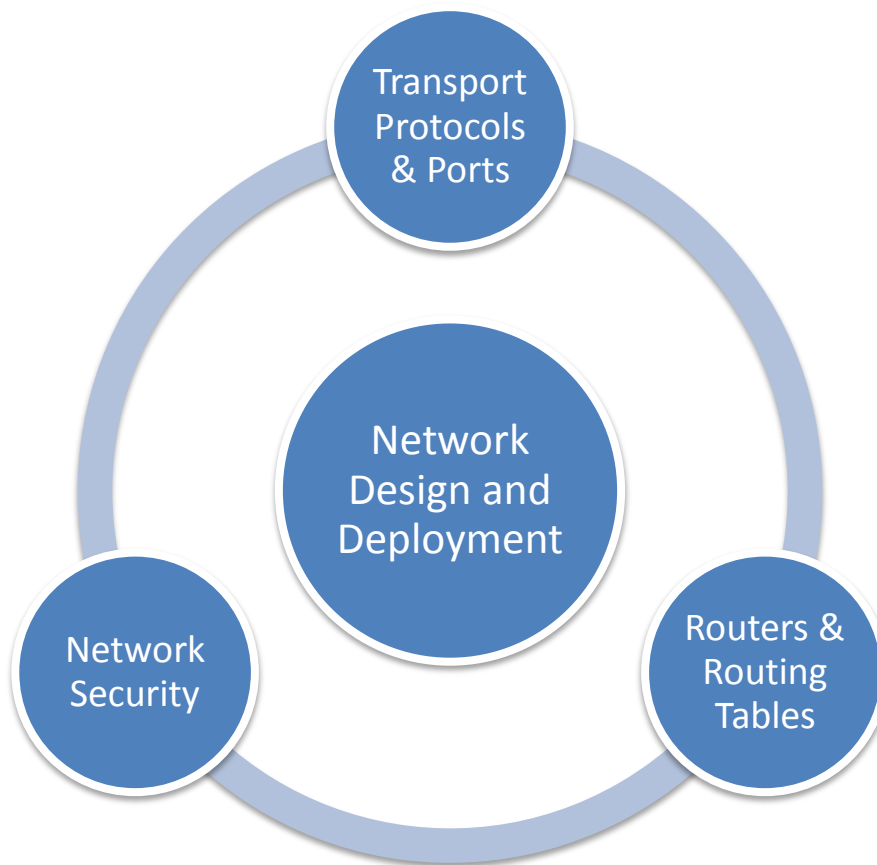


Figure 6: Network Design and Deployment

In a typical SAS environment, the SAS Server Components are distributed across multiple machines as shown in Figure 7 and interact with other network components such as routers, firewalls, proxy servers, other third party servers, and client machines. In order to diagnose network problems that may be interfering with communication among SAS Server components or between SAS Servers and other network components it is necessary for SAS Administrators to have a rudimentary understanding of network design and deployment fundamentals.

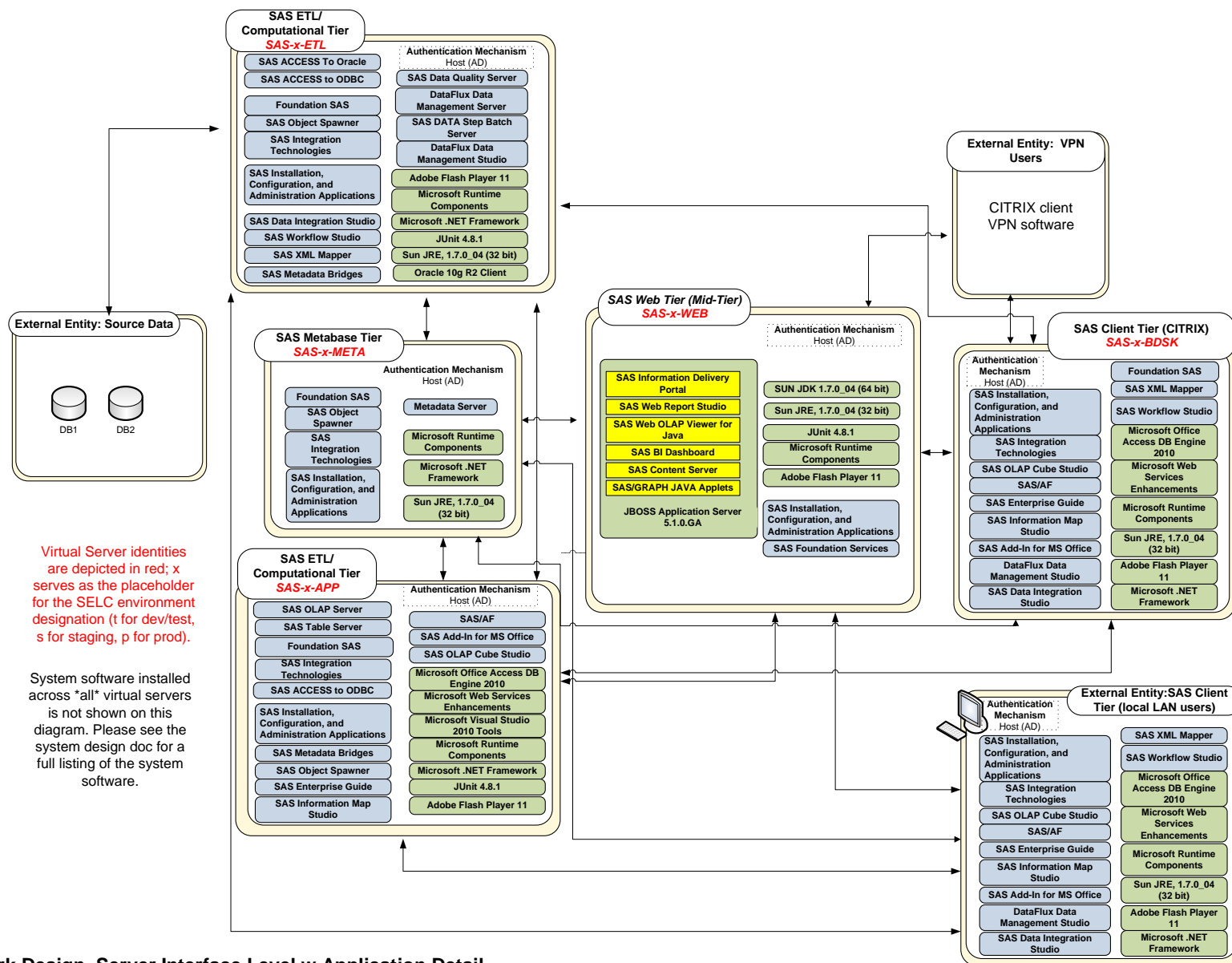


Figure 7: Network Design, Server Interface Level w Application Detail

TRANSPORT PROTOCOLS AND PORTS

Remote Desktop Protocol (RDP), Secure Mail Transport Protocol (SMTP), HyperText Transport Protocol (HTTP), HyperText Transport Protocol Secure (HTTPS), Transmission Control Protocol (TCP), Internet Protocol (IP), User Datagram Protocol (UDP), Secure Shell (SSH), File Transfer Protocol (FTP), Telnet, and Web Distributed Authoring and Versioning (**WebDAV**) are all communication protocols (i.e. rules or methods) used during communication among SAS Servers or between SAS Servers and external third party servers or clients. SAS Administrators should be well-versed in these protocols.

ROUTERS AND ROUTING TABLES

Routers typically sit on the network between SAS Server environments and external third party servers or clients. In some highly restrictive network settings, routers may also be placed between some of the machines that host the distributed SAS Server components (most commonly serving to isolate the machine hosting the SAS Web Applications). Understanding elementary router commands and routing table structures can aid the SAS Administrator in diagnosis connectivity issues due to router failure, traffic collision, or router misconfiguration.

NETWORK SECURITY

Just as firewall applications running alongside SAS Server components on a host machine can impact communication among SAS Server components and between SAS Servers and external interfaces, so too can firewall appliances installed directly on the network. While SAS Administrators rarely have direct administrative access to such devices, understanding how to ping the network firewall and being able to describe the network firewall security exceptions required for SAS Server component communication will enable the SAS Administrator to submit informed change requests to the network firewall team as required.

Understanding your organization's security policies and industry best practices with regard to SAS Server and third party server distribution across the network (taking into account the demilitarized zone [DMZ] and proxy servers if applicable) ensures that your SAS Server environment designs hold up under scrutiny during a security audit.

TECHNICAL WRITING

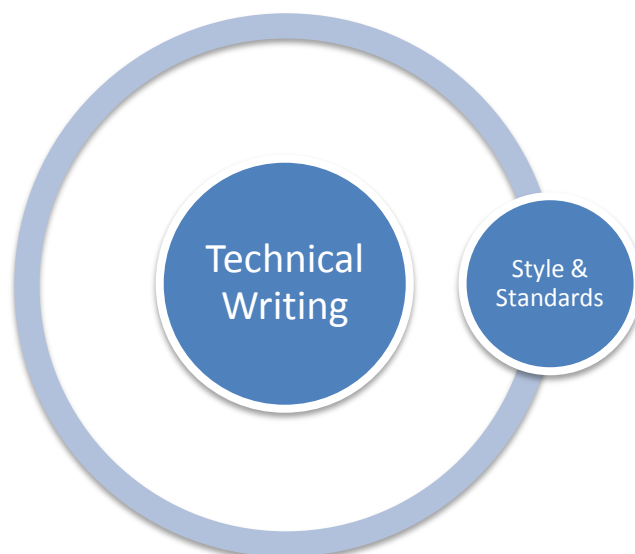


Figure 8: Technical Writing

STYLE & STANDARDS

A well designed SAS Server environment is one that is properly documented. Whether you are tasked directly with documenting the environment for fellow SAS Administrators, producing end user reference manuals, or simply writing summary notes for your organization's technical writing team to further detail, developing your own writing style while carefully adhering to your organization's document standards is a high-reward, high-visibility activity. When you are able to convey ideas and technical concepts to others in well written documentation or white papers you quickly become recognized as a SAS Subject Matter Expert (SME) across your organization and beyond. There will certainly be others in your organization or industry that know as much or more as you about do about SAS but any reluctance on their part to produce quality publications that would otherwise highlight their expertise will leave them in your shadow.

CUSTOMER SERVICE



Figure 9: Customer Service

Developing excellent customer service skills is an important part of a SAS Administrator's job. Whether supporting internal or external users (SAS Programmers, Analysts, Data Scientists, lower tier customer support staff, etc), your ability to productively and professionally work well with others as a problem solver boosts your credibility and visibility across your organization as a SAS SME. And it's not all about glory; ugly server side errors and misconfigurations often quietly come to the attention of the end user community long before they cause catastrophic failure and are caught by server side monitoring so having a good rapport with your end users can assist you in diagnosing and resolving small server side problems before they become big ones.

TICKETING SYSTEMS

In most organizations, a key aspect of providing excellent customer support is understanding the basics of working with the common ticketing systems on the market such as Remedy. In any ticketing system, creating and assigning incident tickets, updating tickets with a journal of troubleshooting completed, and closing out tickets are the main methods for documenting resolution of customer reported errors or handling SAS administration tasks requested by others. Additionally, ticketing systems can also be used as a personal SAS Administration error log, wherein the SAS Administrator creates incident tickets to document the diagnosis and resolution of errors he or she directly discovers in the course of daily administration.

SERVICE LEVEL AGREEMENTS

Part of providing excellent customer service is understanding the expectations your end users and your management have agreed to with regard to SAS Server environment availability, reliability, and integrity. Such expectations are usually spelled out in a Service Level Agreement (SLA) and depending on your organization and industry sector, the SLA may be a formal legal document or a simple oral agreement. What are the presumed or guaranteed hours of system operation? What are the hours for support? What are the penalties if the SAS Administrator is unable to manage the environment to ensure compliance? Understanding SLAs and working diligently to comply with their terms is important for every SAS Administrator.

TIERED SUPPORT

At most large organizations and at some smaller ones as well, customer support is structured in a tiered system. In this way, end users report errors or make requests directly to Tier 1 support staff that triage the report or request to the appropriate Tier 2 staff for handling. Once assigned a report or request, Tier 2 support staff may reach out to the end users to work with them directly or may communicate indirectly with the end users through the Tier 1 staff. Tier 3 support staff may also be designated, and in such cases these staff members typically handle advanced troubleshooting and rarely are customer facing. SAS Administrators should familiarize themselves with their organization's support structure including any tiered support offerings.

RESPECT

Displaying respect, care, and empathy goes hand in hand with promptly resolving errors and completing requests. Our role as IT professionals is to help others to leverage technology to achieve success in their operations. Sometimes our expertise with technology tempts us to feel impatient with others whose IT skills may not be as advanced. Do not fall into this trap. We must never forget that those we work with and work for comprise a diverse body of individuals with many different talents that reach well beyond the IT industry.

TECHNICAL SALES CONSULTING

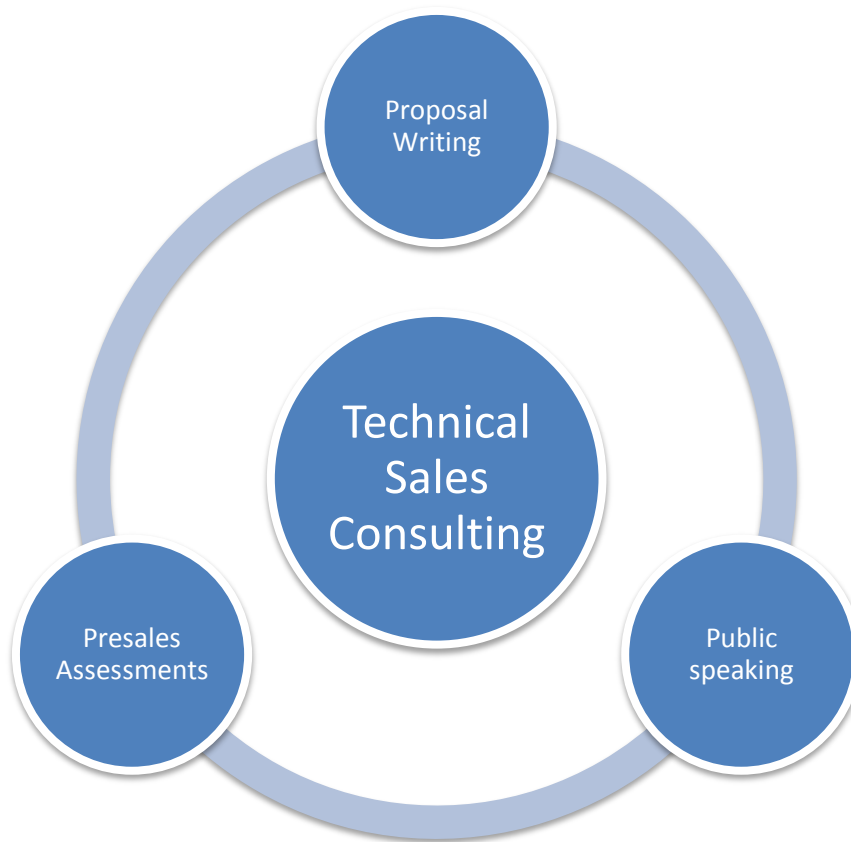


Figure 10: Technical Sales Consulting

Technical sales consulting rests on the foundation of all the other SAS Administrator competency areas covered in previous sections of this paper. Once a SAS Administrator becomes highly visible and respected in their organization due to their expertise in handling server and client issues, programming, and other SAS Administrator skill sets, they are likely to be called upon to provide assistance during the presales or sales process. Therefore it is wise for those in this role to familiarize themselves with the key components of technical sales consulting.

PROPOSAL WRITING

A large portion of technical sales consulting revolves around writing proposals (or grant applications in the case of non-profits) for potential customers or investors. This skill builds heavily on technical writing and core server administration. In this role you will document the structure and validity of the proposed SAS Server environment, addressing any customer or investor originated proposal requirements if applicable. Associating yourself **directly** with incoming revenue gains for your organization as a business driver is always a winning idea. Multimillion dollar contract awards are won or lost based on the strength of the written proposal and there is no better way to evidence your invaluable contribution to your organization and its leadership than to lend your talents to proposal writing.

PUBLIC SPEAKING

Given your expertise in administration you may be called upon to present a speech for potential clients or investors and so attention must be given to your public speaking skills. If you're not yet comfortable with public speaking, practice, practice, practice. One of the best ways to do this is to join a Toastmasters club, which typically meets weekly or biweekly and offers you the chance to get up before others in a low pressure environment to practice your skills as an orator. And of course, submitting whitepapers you have written for presentation at conferences like SESUG or SAS Global Forum can also provide you with the practice you need to polish your public speaking skills.

PRESALES ASSESSMENTS

In contrast to presentations made before large groups of potential customers or investors, you may also be asked to participate in small group or 1-on-1 presales assessments. For these assessments you are often asked to tease out requirements for a new SAS Server environment and provide a rough design sketch. Having a firm understanding of the common SAS Server environment configurations, familiarity with user and functional requirement gathering methods, and a keen sense of lessons learned from your previous deployments will allow you to work efficiently at this task. It's quite rewarding to pitch your own designs and then oversee their successful implementation post-sale.

TRAINING

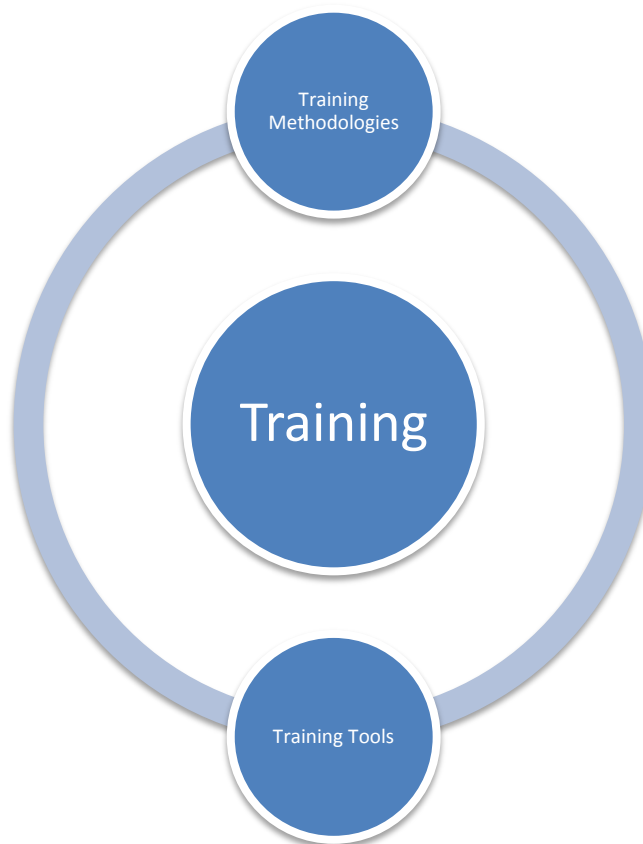


Figure 11: Training

As with sales, success in training others to use SAS requires expertise in the rest of the SAS Administrator competency areas covered thus far. Whereas with technical sales consulting you are tasked with evangelizing SAS before **potential** customers or investors, as a trainer you are tasked with demonstrating for your **existing** internal or external customer base the power of SAS and how it can be used to meet their business objectives. As a participant in your organization's skill building you help ensure that there is sufficient SAS talent to manage your SAS Server environments in the event of your absence, providing continuity of operations.

TRAINING METHODOLOGIES

Every organization creates their own training methodologies based on their budget and requirements and as a SAS Administrator who is tasked with training others, you will be responsible for learning and adhering to these methodologies.

TRAINING TOOLS

There are a variety of open source and commercial training tools available to assist you in creating quality instruction materials. Adobe Captivate is a very popular application that is used for recording video and audio trainings that can be played back on demand for your audience. SAS Administrators should practice using this tool until they are comfortable creating and manipulating videos.

PROJECT MANAGEMENT

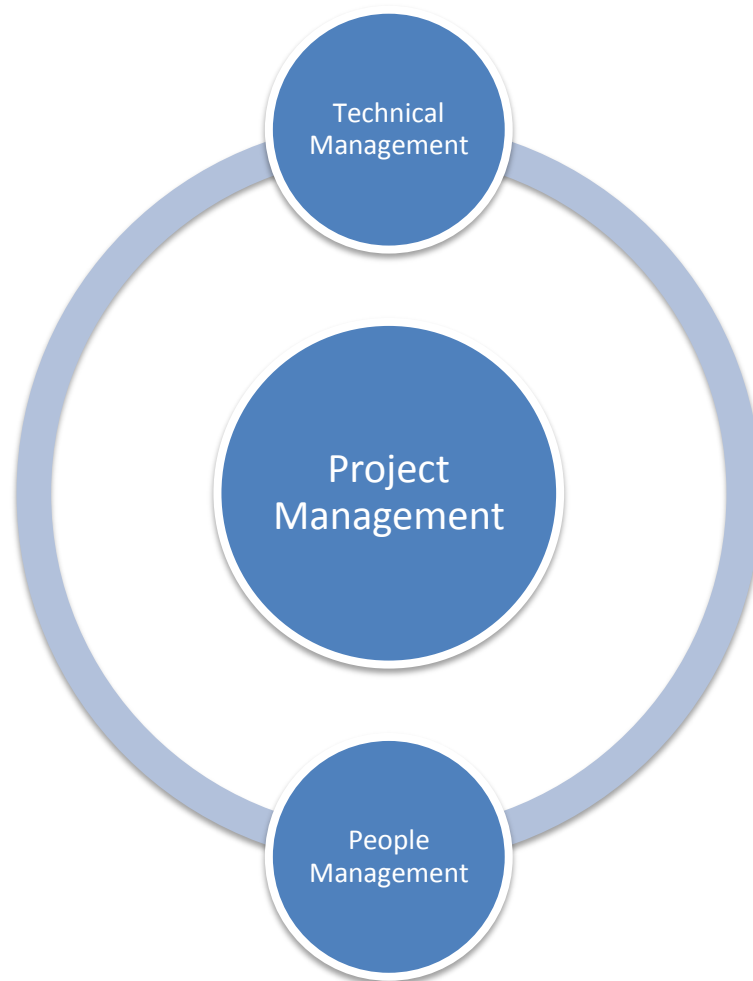


Figure 12: Project Management

SAS Administrators who have proved their skill and value may be asked to assist with project management duties. Holding the skills needed perform these duties will drive the project to its successful conclusion. As with sales and training, lending your advanced SAS expertise to your company's project management initiatives increases your visibility and earning potential. It also provides you the opportunity to get out of the "weeds" temporarily, easing burn out and allowing you to glimpse the bigger picture of how SAS fits into the organization.

TECHNICAL MANAGEMENT

A necessary portion of successful project management is mastering technical aspects such as creating tasks and the Work Breakdown Structure (WBS); scheduling tasks, milestones, and resources; addressing risk; budgeting and Earned Value Management (EVM); learning the ins and outs of project lifecycles (waterfall, agile, etc.); and adhering

to process methodologies such as Capability Maturity Model Integration (CMMI). Even if you are never directly tasked with project management duties, learning these technical aspects of project management will help you to place your SAS Administrator tasks in the proper context of the whole project and its role in your organization.

PEOPLE MANAGEMENT

While success in the technical aspects of project management is necessary, it is not sufficient to ensure successful projects. Project managers must also be adept at managing people with leadership and compassion.

CONCLUSION

SAS Administration is not a narrow skill set. To be a successful SAS Administrator it is necessary to build skills across many different competency areas beyond the core SAS Server administration functionality. SAS Administrators who broaden their skill sets in this way increase their visibility within their organization, improve their earning potential, strengthen their organization's value in the marketplace, and afford themselves the opportunity to parley their SAS Administration skills into a new full time career in technical sales consulting, training, or project management if so desired.

ACKNOWLEDGMENTS

I started out in the IT industry with no commercial IT experience (my BA degree was in psychology) and have diligently worked to expand my competency areas just as described in this paper. I don't just preach breadth of skills as a means to success, I practice it. I am thankful to Rick Sierra who hired me on an entry level tier 1 technical support representative at Activehost Inc. and guided me as I improved my customer service competency and broadened my skill set to include Windows Server Administration and database technologies. In my role as an IT Director in the US House of Representatives, my vendor support team from Lockheed Martin supported and assisted me in strengthening my skills in network design and security. The team at Orizon Inc. gave me the opportunity to polish my technical writing, introduced me to proposal writing, and sent me off for training with Christine Vitron of SAS who provided those first introductory lessons on SAS administration which serve as the foundation for all of my SAS knowledge. Maria Nicholson of Zencos and I worked side by side on a SAS project over four years during which time she allowed me to absorb as much of her SAS wisdom as I was able. Robert Matthews of CSC has been a steady mentor on the federal project management life cycle since I began my tenure with CSC. Finally I want to thank my fellow SAS users in the community, including those on the SAS Institute R&D, product management, and sales teams who are always at the ready to answer my questions via email, phone, or Twitter.

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