Our Journey: Getting on SAS® Grid

David Wilson, Annette M. Green, and Karen Terminiello, RTI International

ABSTRACT

RTI International made the move from PC and server-based SAS® to SAS Grid this past year. The decision to move to the Grid was based on cost over time, scalability - allowing room for growth, centralization of SAS administration, improved performance, and a highly available environment. This paper will focus on how the overall transition occurred from the decision to move to SAS Grid to getting 400+ SAS users successfully transitioned within a 12-month period on both the Federal Information Processing Standard (FIPS) Low (limited adverse effect) and FIPS Moderate (serious adverse effect) environments. The process included getting sponsorship from the business units and IT, identifying an implementation partner, forming stakeholder teams, gathering requirements and designing the system, establish a plan and timeline for communication, implementation, training, and rollout. Along the way, we addressed challenges in our environment: which platform to use, moving from Windows to Linux, FIPS Mod requirements that impacted the architecture of the system, user response to the transition, regional users and data housed at regional offices, as well as legacy code that required modification due to the move to SAS Grid. Some unexpected positive items to come out of the transition included more collaboration between SAS programmers across the business units which continue after the transition was completed and overall knowledge of what SAS programmers throughout the company utilize in their project specific code. As we transition from implementation to operational mode as a company that utilizes SAS Grid, our previous project technical advisory team has become a Grid advisory committee, a cross-functional team that continues to emphasize the business needs of the analytical community as well as improve our relationship with SAS and leverage the latest features SAS offers. We hope sharing our experience and lesson-learned will be valuable to others considering the transition to SAS Grid.

INTRODUCTION

Our journey began as RTI management considered the benefits of moving to the Grid rather than renewing our individual PC SAS® licenses.

The benefits of implementing the Grid at RTI International, which drove the decision to take on this initiative, include:

- Improved processing power

- Scalability

- Better performance for regional offices and remote locations

- Centralized administration, including simpler on-boarding of new users

- Increased knowledge sharing

- Industry alignment

As of the first quarter of 2017, RTI International successfully completed the transition process of migrating more than 400 SAS users from using a mix of hundreds of individual PC SAS installations and a few SAS server installations to using a Linux SAS Grid-based system. The

planning process for this transition began in earnest in 2015 with design and planning continuing into 2016. The construction of the SAS Grid and transition of staff to the Grid occurred in 2016.

The purposes of this paper are to provide an overview of the structural process used to manage the transition to the SAS Grid, provide some detailed discussion on the key components of that process, and to provide recommendations for others who may transition to a SAS Grid environment. As illustrated in Figure 1, our conceptualization of this structural process encompasses five key components: project planning, stakeholder engagement, Grid design and building, user training, and post-rollout support. We discuss project planning and stakeholder engagement within the broader topic of organizational change management, then discuss some specific technical hurdles that required substantial resources to overcome, and penultimately discuss user training with respect to Grid development and staff transition. We conclude by providing a summary of lessons learned and recommendations for those who may transition to a SAS Grid environment.
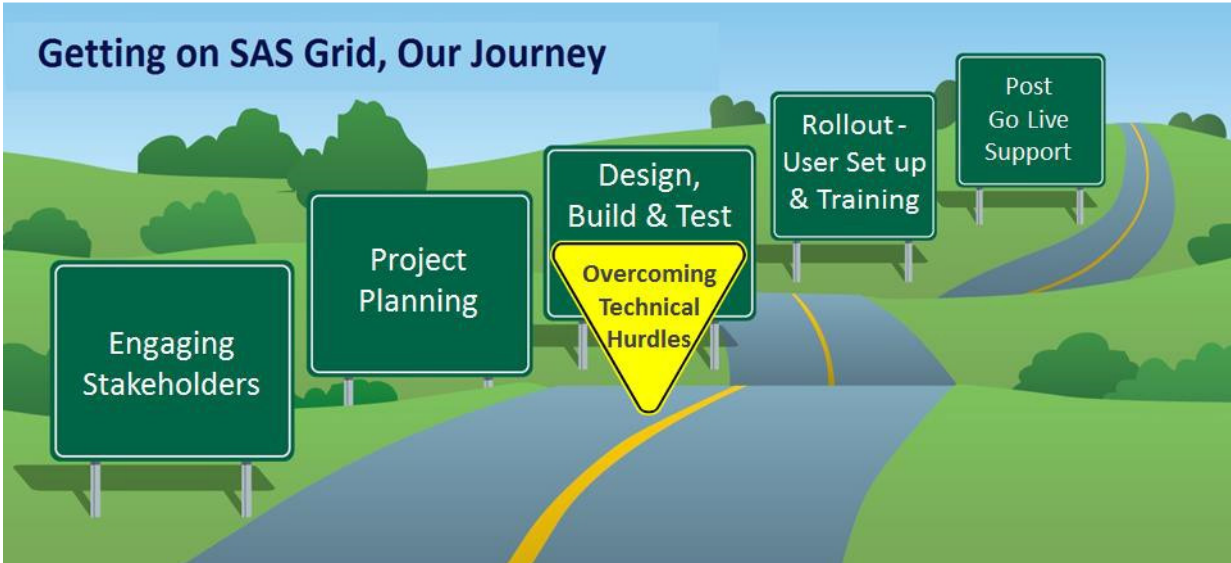
Figure 1. Getting on SAS Grid, Our Journey - Key Components of the SAS Grid Transition

ENGAGING STAKEHOLDERS

As with any project, stakeholder involvement is a key factor in user acceptance and the outcome of the implementation. To successfully change the technology for over four hundred SAS users, we had to be sure to strategically approach the organizational change management aspect of the project. This effort was highly collaborative between the business sponsors, the business users, Information Technology (IT), and a technical implementation partner; with support from executive leadership.

We managed the organizational change with the stakeholders in mind. Various groups were involved throughout our journey to the Grid.

SUPPORT FROM THE TOP

A steering committee was formed to ensure this project had support and guidance from our leadership team. The Vice President of the Research Computing Division filled the role of Project Sponsor and met bi-weekly with the project management team. The Senior Vice President of Survey, Computing, and Statistical Sciences at RTI International, along with the IT Chief Information Officer, provided executive sponsorship. The steering committee had additional representation from the business units as well as finance. The steering committee

met monthly to review progress, and provided necessary guidance and decision making along the way.

BUSINESS UNIT REPRESENTATIVES HELP GUIDE THE WAY

In the early stages of the project, a committee was formed with members of the SAS user community representing each of the business units, and core project team members from the IT department.

Engaging this group of users, meeting on a regular cadence, was crucial. Involvement from this team resulted in comprehensive requirements, well-defined use cases and resources to execute on user acceptance testing (UAT), and to provide guidance to other users during the implementation.

As early adopters and promoters of this technology, this team played an important role in communications, documentation, peer-to-peer collaboration and education – all very helpful in getting the users through the transition to the Grid. This team's involvement was important throughout the entire SAS Grid implementation project, and this committee for the project has turned into an ongoing SAS Advisory Committee. This team continues to collaborate and have conversations with IT to influence the direction of the SAS Grid at RTI International. The plan is for this team to be involved with capacity planning – assessing Grid usage / needs; as well as to leverage the relationship with SAS – providing guidance related to education opportunities, support, and feedback.

WORKING WITH AN IMPLEMENTATION PARTNER

Information Technology (IT) team members and leadership contracted with a third-party implementation partner, Zencos, to define the technology requirements, design the Grid architecture, and ultimately to build out four Grid environments – two production Grids, and two Disaster Recovery Grids – meeting both the FIPS (Federal Information Processing Standards) Low and Moderate security requirements to which our business adheres. The implementation partner brought extensive Grid knowledge and experience.

RTI's IT team had extensive knowledge of the implementation of PC SAS, SAS Servers, and SAS in our FIPS Moderate environment; along with extensive knowledge of Linux, and RTI's networking and storage. Together these teams implemented these Grid environments on a very aggressive timeline.

Both the third-party partner and RTI International had Project Managers involved in the implementation project. While the two worked very closely on all aspects of the project, the partner focused primarily on the technical build and implementation, and RTI International managed the overall implementation and rollout to the users.

WORKING WITH SAS

The project team worked closely with SAS on several aspects: our contract / licensing, architecture, issue escalation, training, and support. The ongoing relationship with SAS includes support, documentation, and learning opportunities.

PROJECT PLANNING

Once there was agreement and sponsorship for this project, RTI International was faced with an aggressive timeline to get the SAS Grid in place, and users migrated (Figure 2). Ultimately, we built four Grids – two in production, and two for disaster recovery.

Project planning included a high level of detail in a Microsoft Project Plan. All technical tasks were detailed, the implementation team met weekly, and eventually daily for the technical team, to review status, action items, and issues to get the Grid implemented.

TASKS AND TIMELINE

The project tasks detailed the work through all the phases of the project, including:

- Initiation – Scope, Identify an Implementation Partner, Statement of Work, Stakeholder identification, Roles and Responsibilities

- Planning and Design – Business Requirements, Technical Requirements, Data Migration Plan, User Migration Plan, Training Plan, Communication and Organizational Change Management Plan

- Build and Test - Procuring Hardware and Software, Installation and Configuration, System Testing, Performance Testing, User Acceptance Testing (UAT), User set-up, Readiness Reviews for Go Live

- Rollout by group - User migration and training; Usage and performance monitoring; Capacity Assessment

- Close Out – Knowledge Transfer for Grid admin functions, Transition to operational support, Project Report and Lessons Learned
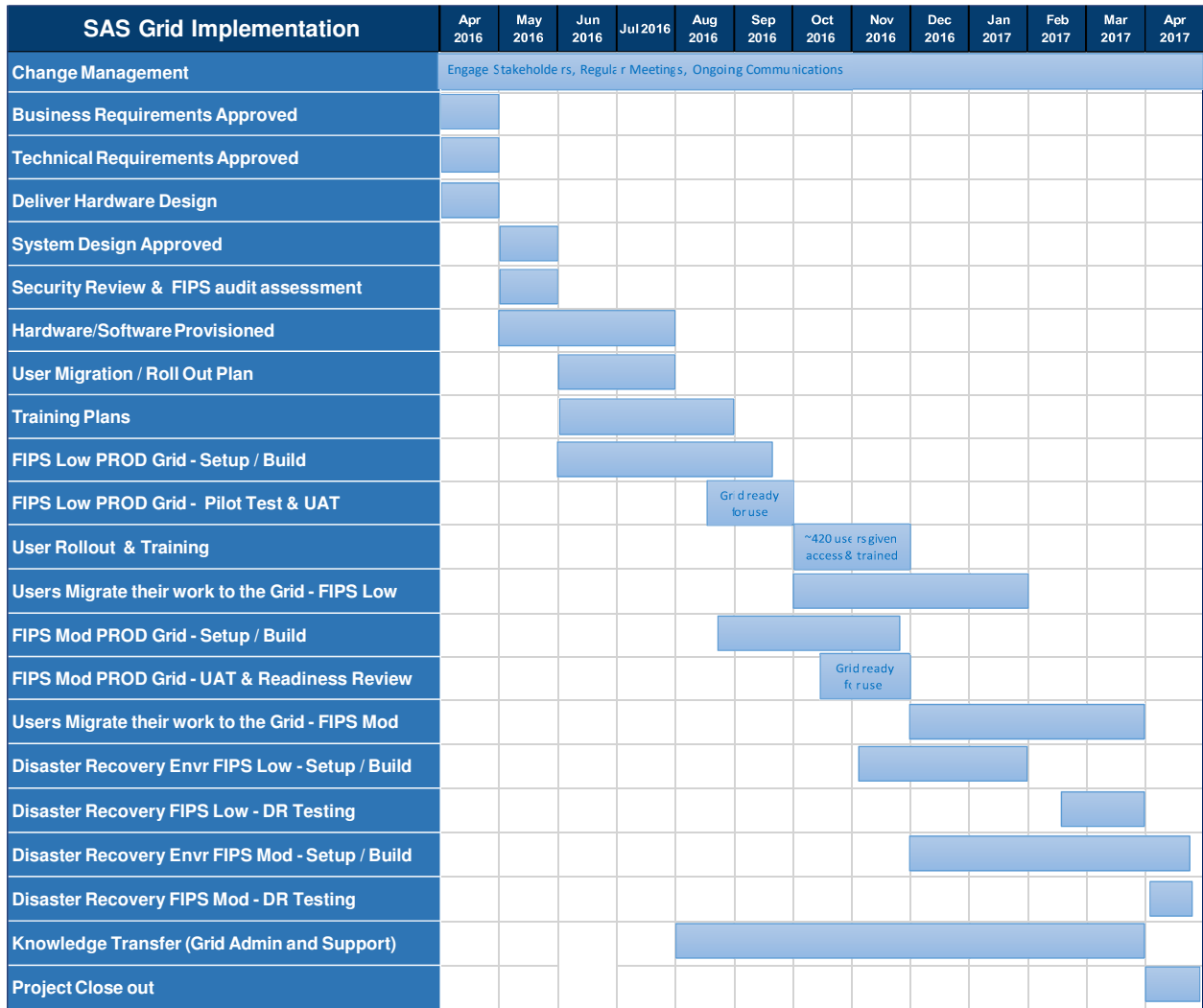
SAS Grid Implementation — High Level Timeline (Apr 2016 – Apr 2017)

Task	Timeline / Notes
Change Management	Apr 2016 – Nov 2016: Engage Stakeholders, Regular Meetings, Ongoing Communications
Business Requirements Approved	Apr 2016
Technical Requirements Approved	Apr 2016
Deliver Hardware Design	Apr 2016
System Design Approved	May 2016
Security Review & FIPS audit assessment	May 2016
Hardware/Software Provisioned	May 2016 – Jul 2016
User Migration / Roll Out Plan	Jun 2016 – Jul 2016
Training Plans	Jun 2016 – Aug 2016
FIPS Low PROD Grid - Setup / Build	Jun 2016 – Sep 2016
FIPS Low PROD Grid - Pilot Test & UAT	Sep 2016 (Grid ready for use)
User Rollout & Training	Oct 2016 (~420 users given access & trained)
Users Migrate their work to the Grid - FIPS Low	Oct 2016 – Dec 2016
FIPS Mod PROD Grid - Setup / Build	Aug 2016 – Oct 2016
FIPS Mod PROD Grid - UAT & Readiness Review	Oct 2016 (Grid ready for use)
Users Migrate their work to the Grid - FIPS Mod	Nov 2016 – Mar 2017
Disaster Recovery Envr FIPS Low - Setup / Build	Oct 2016 – Jan 2017
Disaster Recovery FIPS Low - DR Testing	Feb 2017
Disaster Recovery Envr FIPS Mod - Setup / Build	Nov 2016 – Apr 2017
Disaster Recovery FIPS Mod - DR Testing	Apr 2017
Knowledge Transfer (Grid Admin and Support)	Jul 2016 – Oct 2016
Project Close out	Apr 2017

Figure 2. SAS Grid Implementation – High Level Timeline

STATUS REPORTING

Weekly status reports (Figure 3) were sent to all project team and steering committee members indicating progress on the key tasks and milestones. The weekly reports also highlighted risks and issue status.

SAS Analytic Grid
10/24/2016

STATUS: Overall project is Green.

Status Summary:

Technical: FIPS Mod Grid set up is underway and on track for adjusted Go Live date of Nov. 10; FIPS Mod UAT planned for 10/26-28. Planning for data moves continues (e.g., data from Waltham servers). Planning for SAS Grid DR Environment builds is underway.

Training and Roll out: Roll Out training is underway and will continue through Nov. 17; at that point all users will have access to the Grid. All FIPS Low work is expected to be transitioned to the Grid by Dec. 20th. The period to transition ESN work to the FIPS Mod Grid will run from Nov. 10 through Feb. 15, 2017.

Change management: Planning a Town Hall session for Nov. 9; and planning "SAS Office Hours".

See the September SAS Grid Newsletter, and StaffNet page for additional project information.

CRITICAL MILESTONES/ACTIVITIES:

MILESTONE/ACTIVIITES	TARGET DATE	STATUS NOTES
Change Management	1/15/17	Ongoing (Monthly newsletter to all SAS Grid users; Communications via Bus Unit Reps)
User Roll Out & Training	11/17/2016	Roll Out began Oct 4. User migration and training scheduled through 11/17
FIPS Mod (PROD) Setup complete – Ready for Go Live	11/9/2016	FIPS Mod build activity IN PROGRESS; FIPS Mod Go Live Planned for 11/10
FIPS Mod UAT and Readiness Review	11/9/2016	UAT 10/26,27,28, and a final UAT check 11/9, before go live
Users Migrate FIPS Low work to the Grid	12/20/2016	Plan to have all work on the Grid by Dec. 20; PC SAS licenses expire at EOY

Figure 3. Weekly Status Report

While the project plan included a lot of detail regarding the technical tasks to get the Grid architecture in place, and to get the software installed, configured, and integrated into our environments, there were additional tasks to tackle to ensure existing PC SAS programs could be converted to run on the SAS Grid.

DESIGN, BUILD, AND TEST - TECHNICAL CHALLENGES

For our purposes, we define technical hurdles as issues that, if not addressed, would negatively impact our SAS users. We define negative impacts as events that:

- Require substantial re-write of existing SAS programs

- Result in the loss of existing SAS functionality

- Break in-house developed systems that utilize SAS

The technical challenges discussed here fall into two broad categories: issues arising from the choice of Linux for our SAS Grid and issues arising from moving to SAS on a Grid from local PC SAS installations.

INTEGRATING A LINUX-BASED GRID WITH A WINDOWS-BASED NETWORK

One of the major challenges was to figure out how to translate the Windows file path in a SAS program to the path that the Grid would see. RTI International project data is segregated to individualized folders which are shared at the project level. The number of project shares is in the hundreds and fluid as shares are created and removed as projects begin and end. The administrative overhead of maintaining individualized Network File System (NFS) mount points (directories in a file system where additional information is logically connected from a storage location) for each share and mounting these (making the files accessible to users) to the SAS Grid would be prohibitive. RTI's solution to this issue was to create NFS mount points at the parent-level to the project share folders. This allowed for a reduced number of mount points, as well as automatically compensating for the addition or removal of project folders and shares. These parent level mount points were also made available to Windows machines as traditional file shares, enabling users to use the same pathing across platforms if so desired. We could have required all SAS users to use the parent-level mount points on the Windows side but that would have necessitated changing all references to existing Windows project server names across all projects at RTI; meaning that all existing SAS code would have to be revised to use new server names for the same project share. To minimize the impact on existing SAS programs and associated documentation, users were allowed to continue to use the original existing project-level mount points.

### CREATING, READING, AND EDITING ACCESS DATA FILES AND DATABASES

Some RTI International SAS users needed to be able to read and create Microsoft Access files. We first determined that there was no freeware driver that would support this need in an enterprise setting. We then considered using SAS ACCESS to PC Files, but this did not support the ability to read Microsoft Access files. We next considered using a PC Files Server available from SAS; however, because of file mapping complexity due to the dual NFS mount points described previously and due to some concerns about the scalability of the PC Files server, we determined that an alternative solution was required. We ended up purchasing a license for an SQL driver from EasySoft which did not have the limitation of SAS ACCESS to PC files on Linux and avoided the difficulties and concerns associated with the use of a PC Files Server.

GRID-BASED TECHNICAL HURDLES

There were two features of standalone PC SAS that were lost because of transitioning to a SAS Grid environment: the ability to utilize Dynamic Data Exchange (DDE) to produce Excel tables and the ability to use context menus in Windows Explorer to submit SAS programs in batch mode.

DYNAMIC DATA EXCHANGE (DDE)

Prior to the introduction of the SAS Grid, RTI staff had access to a variety of RTI-developed SAS macros that were created over more than a decade to simplify the construction of complicated Excel files. A survey of RTI's SAS users was conducted as part of a users' needs assessment and approximately half (200) of RTI's SAS users indicated use of DDE or the DDE macros within the past year. Figure 4 illustrates the way RTI users utilized DDE to produce complicated Excel tables prior to SAS Grid:
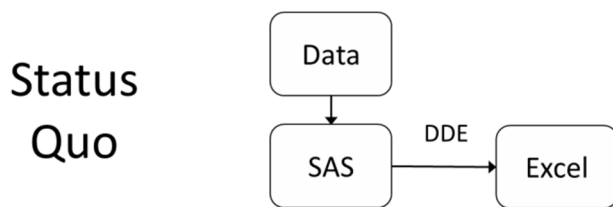
Figure 4. Pre-Grid Excel Table Construction

We considered, and discarded, the SAS recommended model for a Linux-based SAS Grid, as shown in Figure 5, to produce detailed Excel tables using Visual Basic for Applications (VBA) from within Excel to invoke SAS on the Grid and pull SAS results into Excel.
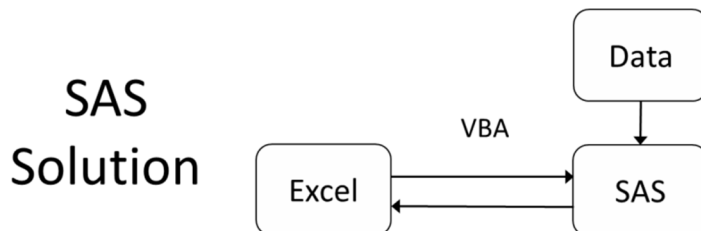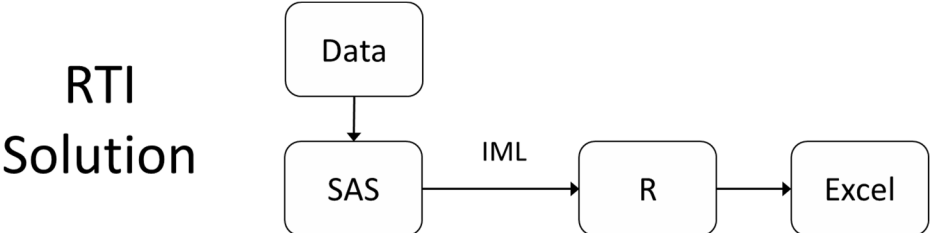

Figure 5. SAS Solution for Detailed Excel Tables on SAS Grid

As illustrated from a comparison of figures 4 and 5, using VBA to create complicated Excel tables would necessitate a paradigmatic shift in how SAS is utilized. In the pre-Grid setting, SAS acts as the driver in that it pulls data, applies manipulation, and pushes data to Excel. In the proposed Grid setting, VBA becomes the driver with SAS producing table elements that are pulled into Excel by VBA. Shifting to a VBA-driven model would have:

1. Required training hundreds of SAS users on VBA,

2. Required revision of hundreds of existing SAS programs to work under the new model; and

3. Would have complicated quality control procedures because our existing SAS logs would not be able to catch errors arising between the VBA pull from SAS to push to Excel.

We settled on an approach that permitted our SAS users to continue to use the DDE macros previously mentioned without requiring changes to their SAS programs. Our SAS users who used DDE directly did have to spend time converting their programs to use the DDE macros. The RTI approach to replace DDE functionality utilized SAS/IML and R as illustrated in Figure 6.


Figure 6. RTI Grid Solution for Detailed Excel Tables

Additional information on our DDE replacement macros may be found in Kinney, et al. (2017).

RIGHT-CLICK CONTEXT MENU SUBMISSION

Another feature of PC SAS supported running SAS programs by selecting an option associated with SAS files from the right-click context menu of Windows Explorer. This option would submit SAS in batch mode and place the resulting log and list files in the same directory as the SAS program. We developed a process to replace this functionality by integrating a C++ program, Windows batch files, and MobaXterm. The process that occurs when a user selects "Submit SAS to Grid" from their Windows Explorer context menu is illustrated in Figure 7.
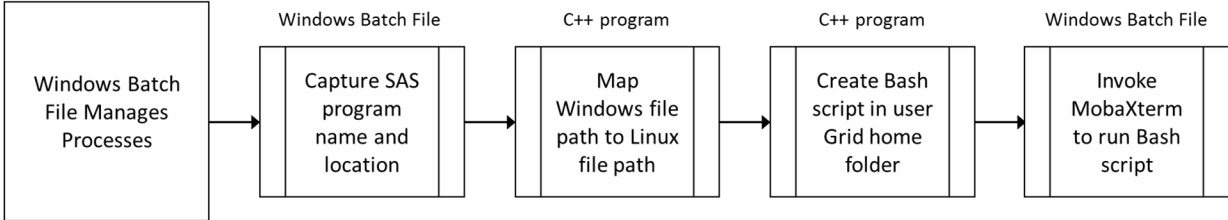
Figure 7. Implementing Right-Click Submit Functionality

UTF-8 ENCODING

While most of the data collected, or processed, at RTI International use Latin1 encoding, some data use UTF-8 encoding. In order to support data encoded with Latin1, the default Grid encoding was   set at Latin1 and, consequently, users of SAS Enterprise Guide and SAS Studio were unable to process UTF-8 data. We considered setting up a second application server context that was UTF-8 enabled but   decided that the additional complexity to support two Grid application servers was unnecessary to support the limited UTF-8 usage. RTI SAS users who wish to process UTF-8 encoded data must log in to the Grid and submit their programs using SASGSUB; after appropriately updating the SAS configuration file to change the encoding to UTF-8. If UTF-8 processing demand grows sufficiently over time, we may consider establishing a second application server context to enable UTF-8 in SAS EG and SAS Studio.

ROLLOUT – USER SETUP AND TRAINING

Our SAS Grid Implementation Project followed a well-defined plan to implement this new architecture from a technical perspective and navigated the technical hurdles along the way. It is important to note that, in addition to the technical planning, there was a lot of focus on how this change would impact the organization – the people who use and support the technology.

Organizational change management began with engaging stakeholders, and continued throughout the project with communication efforts, training, and support.

COMMUNICATION

Our attention to managing the organizational change - communication, implementation, training, documentation, rollout, and support - was significant. In addition to the committee with the Business Unit representatives, there was a lot of collaboration amongst SAS programmers across the company.

Communication is key and it is always challenging. "Technical Excellence + Positive End User Experience = Project Success" …. A technically sound implementation alone would not be successful if users were not well informed, trained, and supported through this transition.

In addition to the regular communication amongst the project team members, there was ongoing communication with the SAS user community at RTI International, including:

- Announcement – The initial announcement of the initiative was accompanied by a presentation and a video in which the project sponsor explained the objectives.

- Project page on our intranet site - Highlighting key project information, like the rollout timeline; and containing links to documentation and training information.

- "SAS Grid" email address – Managed by the project manager and IT project team, this mailbox was used to collect FAQs, to respond to questions, and to send communications from the project team. An email group with all SAS users was also maintained to effectively communicate about the rollout and training.

- Lunch and Learns - Throughout the implementation, there were several peer-sponsored Lunch and Learn information sessions,

- A Yammer group – An active collaboration group where colleagues pose questions and share information about the transition and using SAS on the Grid.

- Business Unit contacts communicated regularly in staff meetings and via email.

- Town Hall meeting – Panel style Q&A

- Email from the Executive sponsor for the final push over the finish line, to get all work transitioned to the Grid.

- Monthly Newsletters – Provided a one-page overview of progress, the SAS Grid user migration timeline, information and links to documentation, Tech Tips, highlights of Q&A, training links, and business unit representative contact information.

Communication was a priority throughout the project. The other key component to managing the change for our SAS users was a phased rollout plan that integrated training.

PILOT TESTING

Pilot testers were chosen to represent each business unit/division. They were seasoned programmers with a variety of skills to test as many components and processes as possible.

Use cases were identified and documented, and a Microsoft Access database was created to serve as a test script to guide users to test various scenarios; and a place to indicate processes that were checked by pilot testers, as well as to gather results and feedback.

Technical team reviews of the pilot testing feedback, as well as debriefs with the testers, allowed the team to implemented fixes to the configuration along the way, and helped identify any gaps in functionality.

PILOT GROUP COMMUNICATION AND TRAINING

Pilot testers communicated within a Slack group and were encouraged to work as a team sharing difficulties they had and help others get past hurtles they faced during the process.

During pilot testing we compiled a list of issues the general user population was likely to face and began writing documentation to cover each topic. By the time users were given access to the Grid to start working on converting previous code and creating new code, a large library of FAQs and Tech Tip documents were available for their use. The downside of this was that there was information overload, so a Quick-start guide was developed to get the users up and running with the minimum amount of information. The focus of this 2-page document was to quickly get on the Grid and start coding using either EG or SAS Studio.

Lunchtime seminars were also provided by members of the pilot testing group to share information to general users, answer questions, and to alleviate some of the anxiety users faced with the transition in general.

As pilot testers and later groups of staff gained access and expertise on using the Grid, they were points of contact for those where were just getting access and had questions about the process or how to adapt

their code to the new setting. It was easy for staff to walk down the hall to talk to someone with experience to answer a quick question.

Fortunately, many staff found the transition to be less painful than originally expected. The primary steps they needed to take to get previous code to run in the new system was to:

- Change the direction of slashes in their pathnames from "\" to "/" to work in the Linux environment.
- They also had to update pathnames since Windows allows nicknames whereas Linux does not. For example,
- A Windows path may be referred to as libname in "\\rtifile02\saisreporting2015\30-ReportsAnalysis " while its counterpart in Linux would be, libname in "/rtpnfil03/rtpnfil03_vol4/SAISReporting2015/30- Reports-Analysis".

Users also have to get used to case sensitivity, not due to the transition to the Grid but due to the change from Windows to Linux.

TRAINING AND SKILL DEVELOPMENT

Training and skill development were important issues facing our organization as we made the move from PC SAS to SAS Grid. In addition to the different SAS platforms, we were also shifting most of our staff from a Windows to Linux based system. Needless-to-say, much planning and collaboration went into the process of getting our staff up-to-speed and comfortable in the new environment.

Several steps were taken prior to moving SAS users to the Grid to get them acclimated:

- A few months before transition began, staff were asked to start using Enterprise Guide (EG) and SAS Studio within PC SAS instead of using the enhanced editor. This allowed

staff to get use to the "feel" of these two primary editors before they lost the use of the enhanced editor. This suggestion uncovered a good number of staff who weren't using the enhanced editor at all. We found many staff were using various text editors so there was concern as to whether they could continue to program in a text editor once we made the transition.

- Staff were directed to review current blogs and video demos about SAS Grid, EG, and SAS Studio. Most found these references helpful and were less anxious about the move once they saw how easy it was to use the newer tools. This exercise made our users aware of some newer features within SAS that they were not familiar with.

- A survey was sent to all SAS users to gather information on the modules used within the organization.   The survey was initially provided to help us better plan for what was needed when we transitioned to the Grid, but it also made us aware of a few obstacles we would have to face. One, was the inability to use in-house dynamic development (DDE) code. The process we had in place for this would not work on a Linux-based Grid system.

- Grid environment. It was first believed that we would just do away with the DDE process, but users were not satisfied with that decision and several staff took it upon themselves to create similar code in the new environment. Readers can refer to, "A SAS macro replacement for Dynamic Data Exchange (DDE) for use with SAS Grid computing" Kinney, et al. (2017) for more information on this topic.

Steps taken once a training plan was in place and underway:

- In-house SAS classes
- In-house third party provided training tailored for RTI International's Grid environment
- Newsletters and FAQ
- Slack and Yammer Groups – See "Intracompany Social Media Support for a SAS Grid Migration", Harper Gordek, SESUG 2017 for more information on this topic

DOCUMENTATION

Several FAQs and "Tech Topics" were posted to our Self-Service Portal Knowledge Base System

Figure 8. Tech Topics List (Partial list) – Documents posted on the RTI International Self-Service Portal

SAS TRAINING

It was decided early in the process that RTI International would work with SAS to hold in-house trainings from a SAS instructor. RTI staff which included the SAS Grid project manager, Grid Training Task Lead,   and Business Partner met with our SAS customer representative and training specialist.

After several meetings, it was determined RTI International would need approximately 30 classes which would either take place on the main campus or through web meetings to provide access to off-site staff.

Each class covered the same material which consisted of a generic version of transition from PC SAS to SAS Grid based upon the "Using SAS Client Applications in a SAS Grid Environment" course. The classes lasted 4 hours and included both lecture and lab exercises.

Staff were scheduled to take this course shortly before they gained access to the Grid. As with most well laid plans, Grid implementation was pushed back at various times which meant some staff took this training weeks before gaining access to the Grid so recall of class material was not as high as it would have been if access was available sooner.

USER MIGRATION TRAINING

Staff were also given in-house training by a third-party vendor who helped with the transition. This training took place once the Grid was up and running. Training was offered at the same time that the user groups were being given access to the Grid – In other words, the training scheduled coincided with the rollout schedule.

In this training staff were shown how to establish a connection to the Grid and access it using both EG and SAS Studio. Staff connected to the Grid while in this training and were then allowed to start their work on the new system. The timeliness of this training, and distribution of the quick start guide, as well as providing awareness of the documentation and contacts for assistance, was an effective way to support the users at the time of their transition.

Additional training, in the form of peer-led lunch and learns, took place throughout and after the migration.

PHASED ROLLOUT

A lot of coordination went into determining the schedule for getting users on the Grid, getting them trained, and getting their work migrated from PC SAS to the SAS Grid.

The general population of SAS users were separated into 7 groups who were given access to the Grid on a staggered schedule. Each group consisted of about 60 members, with pilot testers participating in the general rollout with group 1. Groups were created with consideration to staff who worked on the same projects, project deadline dates, and type of project work. This was done so that those working on the same project could begin migrating and creating their code in the new environment. This also included transforming 32-bit Windows based SAS datasets and format libraries to the 64-bit Linux environment.

Since most staff work on multiple projects, users had to produce some of their project work using the new Linux Grid environment while other project work remained in PC SAS until the transition was complete.

ROLLOUT REPORTING

Once the user migration began, we reported the progress of the migration, along with a report summarizing issues and requests (Figure 9).
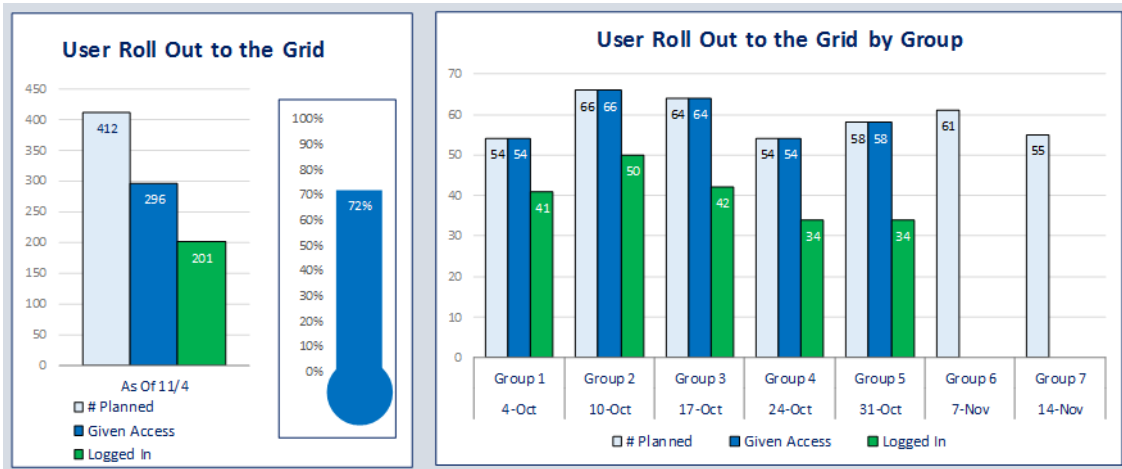
Figure 9. User Rollout Report

POST GO-LIVE SUPPORT

Early live support for the SAS Grid at RTI International relied heavily on the implementation team, with technical expertise from the implementation partner. All tickets were tracked in our Help Desk ticketing system, and daily reports and review of those tickets took place to ensure timely response to users.

Help Desk staff was informed regarding basic troubleshooting, where to direct users for information, and where to triage tickets that required Grid admin expertise, or that required support directly from SAS.

Our documentation on the Self-Service Portal Knowledge Base serves as a valuable resource for our SAS users. Also, a significant amount of peer-to-peer support takes place with the use of the SAS Grid Yammer group.

Now that the transition is complete, new SAS Grid users are sent a welcome email from the Help Desk system when they are granted access to the Grid. This directs them to the Quick Start Guide and other documentation, and it directs them to the Yammer group, as well as the IT Help desk, to support them on the SAS Grid. Each business unit also provides a SAS point-person to walk through accessing SAS Grid since, for many new employees, programming in a Grid or even Linux environment is new to them.

CONCLUSIONS AND RECOMMENDATIONS

RTI International successfully transitioned to a SAS Grid environment for two primary reasons: identification and participation of all relevant stakeholders in all phases of the transition and the use of experienced project managers who shepherded the stakeholders during the process.

We made a concerted effort to put as much information as possible into the requirements gathering phase by getting input from a wide array of SAS users, information technology staff, business unit leaders, and other companies who have gone through the transition to SAS Grid. This phase was given sufficient time for staff to truly consider their project needs throughout the year rather than focusing on tasks currently on the horizon. By allowing staff and other stakeholders time to think through the process,

there were fewer surprises as we proceeded since we had a good idea of what obstacles may lie ahead and planned for them accordingly.

While sufficient time was given to the planning phase of the project, time was an issue in both the aggressive nature of completing the transition in one year as well as timing of staff training in relation to how quickly users gained access to the Grid. As a "lessons learned", the beginning of user rollout was delayed at various times which meant some staff had their initial training weeks before gaining access to the Grid so recall of class material was not as high as it would have been if access was available sooner.

The team mentality not only contributed to the success of the project but paved the way for continued collaboration among our staff. The use of social media provided good communication avenues in which to discuss problems and discoveries, not only due to the transition to a new SAS environment but also as SAS collaborators throughout the company. This success and collaboration can be seen in other papers which have not previously been referenced including, "Migrating from PC-SAS to SAS Grid on Linux", Myers, et al. (2017) which focuses on some of the hurtles we encountered moving from Windows to Linux and how historic code and processes were modernized not only to accommodate the new Grid environment but to provide newer, more efficient code. Prior to the installation of the Grid we did not have access to parallel processing. When staff were provided with this new feature, it was utilized to cut down on program processing time; see "Parallel Processing in a SAS Grid" Rabb, et al. (2017) for more information on this topic.

Though many staff were reluctant to make the move, they did so more smoothly than anticipated. By allowing SAS users to have an active voice in the transition, incorporating expertise for each component of the move to the Grid, and providing sufficient documentation for users as they gained access to the Grid we were successful and look forward to continuing to take advantage of the features SAS Grid has to offer.

REFERENCES

Kinney, Satkartar, David Wilson, Benjamin Carper. 2017. "A SAS macro replacement for Dynamic Data Exchange (DDE) for use with SAS Grid Computing." *Proceedings of the 2017* SESUG *Conference*, Cary, NC.

Gordek, Harper. 2017. "Intracompany Social Media Support for a SAS Grid Migration." *Proceedings of the 2017 SESUG Conference*, Cary, NC.

Myers, Susan, Inga Allred, and M. Rita Thissen. 2017. "Migrating from PC SAS to SAS Grid on Linux."

Proceedings of the 2017 SESUG *Conference*, Cary, NC.

Rabb, Merry and Keith Brown. 2017. "Parallel Processing in a SAS Grid." *Proceedings of the 2017* SESUG *Conference*, Cary, NC.

CONTACT INFORMATION

Your comments and questions are valued and encouraged. Contact the author at:

Annette Green
RTI, International

919-541-8717

agreen@rti.org