

## Migrating Your SAS® Applications to SAS 9.1.3 and Beyond

Margaret Crevar, SAS Institute Inc., Cary, NC

Diane Hatcher, SAS Institute Inc., Cary, NC

### ABSTRACT

You have heard about the new features of SAS®9, but you have several mission critical SAS 8 applications written with products that are no longer being talked about (i.e., SAS/IntrNet and SAS/AF software). You would like to be able to move these applications forward to SAS 9 so that they can work with the full-featured Business Intelligence, Data Integration, and a multitude of analytical solutions that are part of the SAS 9.1.3 Intelligence Platform. This paper describes the steps to do this migration along with some tips and tricks to ensure that your SAS 8 application behaves nicely in SAS 9.

We will also touch base briefly on how to migrate directly to SAS 9.2 from SAS 8. And for the SAS 9.1.3 users, we will briefly talk about the overall process of migrating an entire SAS Intelligence Platform configuration from SAS 9.1.3 to SAS 9.2.

### INTRODUCTION AND DEFINITIONS

The purpose of this paper is to assure you that your existing SAS 8 applications will work well in SAS 9 (either SAS 9.1.3 or SAS 9.2) with minimal changes to the application. This paper is a collection of information from the SAS Migration Community Web pages, support documents from the SAS Technical Support Division, and previously published SUGI/SAS Global Forum papers. Since SAS 9.2 will begin shipping in 2008, we wanted to encourage everyone to migrate all existing SAS 8.2 applications to SAS 9, and to let you know you can go directly to SAS 9.2, bypassing SAS 9.1.3 if you prefer.

Let's start off with what we mean by the term *migrate*. The computer industry provides many definitions. For the purpose of this paper we mean this: When you migrate a SAS application, you upgrade the SAS software release, and begin using your existing applications with the new SAS software release. For reference purposes in the remainder of this paper, the existing installation will be referred to as the *source*, and the new, upgraded installation as the *target*. You might also upgrade the computer platform (primarily because the target installation might require a different version of an operating system) as part of the migration. The discussion of software upgrades is beyond the focus of this paper.

Taking the time to carefully establish a plan for what needs to be migrated is essential. SAS has constructed a Migration Planning Worksheet that you can use as a checklist of the steps that need to be reviewed prior to starting the migration process. A link to this worksheet is in the REFERENCE section at the end of the paper, and using it is highly recommended.

Before you begin your migration activities, you must determine if you plan to run SAS 8 and SAS 9 on the same computer (i.e., same instance of the operating system on this computer). The Peaceful Coexistence paper ("Peaceful Coexistence: SAS®9 and SAS 8.2") referenced at the end of this document discusses several known issues for coexistence of two different versions of SAS on the same computer. The primary issues involve cross-release compatibility on UNIX-based systems, different operating system requirements, and TCP/IP port number conflicts between the versions of SAS. This referenced paper goes into more details on these topics.

This paper concentrates on details regarding the migration of SAS 8 applications to SAS 9. There will be a brief discussion of the migration of a SAS 9.1.3 application to SAS 9.2. Discussions concerning the migration of SAS applications from DEV/TEST environments to PRODUCTION environments within the same release of SAS are beyond the scope of this paper.

### GETTING STARTED

A primary focus of this discussion is files—specifically, the various SAS files that make up your SAS 8 application (SAS files – data sets, indexes, catalogs, MDDBs, views, etc.; and SAS source code). Once you have determined what types of SAS files you are employing, how you handle them depends on the operating system your SAS applications run on. PLEASE NOTE: It is not advisable for you to have SAS 8 and SAS 9 files in the same data path location.

For several operating systems, the SAS data file structure remains constant between SAS 8 and SAS 9. These operating systems include Windows (32-bit), Linux (32-bit), OpenVMS and z/OS. You can simply copy all the files from one data path location to another data path location using either operating system commands or SAS procedures (COPY or MIGRATE (preferred method) or the combination of CPORT and CIMPORT).

If your SAS 8 application is running on a 32-bit version of SAS under UNIX (Solaris, AIX, HP-UX) and if you are going to SAS 9 on the same platform, then the migration is a bit more complicated because SAS 9 executes in a 64-bit environment as a 64-bit application. You will need to migrate all of your SAS files to the new SAS 9 version if you need to update (edit) them or if you need to use indexes. The preferred migration tool is the MIGRATE procedure.

**\*\*PLEASE NOTE** that for a simple function test, you can copy the existing SAS 8 files to a target location over and use the SAS cross-environment data access feature (CEDA), thus allowing the SAS application to run via emulation. This mode allows the application to run, but there are some things you need to be aware of. When using this mode, there is a heavy performance penalty, indexes are not available for use, and you can't update any the files (they have to remain Read only mode to remain SAS 8 compatible files). Also, if you access the SAS 8 file in Write mode with SAS 9, the file will automatically be converted to the new SAS 9 64-bit format and it will no longer be accessible via SAS 8!! For more information about CEDA, including its limitations, see the SAS OnLineDoc 9.1.3 or the SUGI 31 paper "CEDA: The Invisible Hand" by Bruce F. Gilson.

Note also that the CEDA access method supports only SAS data sets via emulation. This is important for two reasons. The first is emulation causes additional processing to be done to be able to access the file and this will be reflected in poor performance. The second is SAS 8 applications that employ user-defined formats since these formats are stored in SAS catalogs. For these applications, you have to migrate all of the SAS files to SAS 9 before you can test the SAS application with your SAS 9 release.

The preferred method for migrating SAS files from SAS 8 to SAS 9 is PROC MIGRATE. The syntax is very straightforward, very similar to PROC COPY. There are also some macros that can be run after you have migrated your SAS files that will validate that all the SAS 8 files have moved completely and correctly to SAS 9. For details about how to migrate SAS files, see the SUGI 28 paper "PROC MIGRATE: How to Migrate Your Data and Know You've Done It Right!"

Information regarding what operating systems are supported by SAS 9.2 can be found in the SGF 2008 paper "Improving Your SAS Investment from the Ground Up: SAS 9.2 Enhancements That Help You Leverage Your Operating Environment" by Clarke Thacher.

## **OTHER THINGS TO CONSIDER WHEN MIGRATING FROM SAS 8 TO SAS 9**

Now that we have the basics covered, let's talk about things to consider for some of the more common SAS 8 applications.

### **BATCH SAS JOBS**

SAS 8 batch jobs run very well with SAS 9 (both 9.1.3 and 9.2). Initial runs that can access the data via CEDA should work without having to make any changes. However, when migrating your data from SAS 8 to SAS 9, you will need to update the LIBNAME and FILENAME statements to point to the new SAS 9 file locations. If you use operating system commands in these SAS jobs (e.g., 'X' commands) and you have to upgrade your operating system to support SAS 9, you need to verify that the operating system command is applicable in the new operating system version.

If you use SAS macros, you need to be aware that the IN (#) operator is supported in SAS 9 macro expressions. Because IN and # now have meaning to the SAS 9 expression evaluator, any time these values appear in an expression context and are not meant as the IN operator, you must quote the values.

The format of HTML generated by the Output Delivery System (ODS) changed from 3.2 to 4.0 when you issue the ODS HTML statement. This can be important when you use the NOTOP argument. Some formatting specifications have been moved to the cascading style sheet (CSS). Therefore, if your code includes NOTOP, then you do not get the CDD formatting unless you specify the HTML 3.2 standards. For more differences in ODS between SAS 8 and SAS 9, see the paper "A Soft Landing to ODS 9.1" and the Migrating ODS Templates Web site listed under References.

### **SAS/AF APPLICATIONS**

As you know, SAS/AF software was the first way to create GUI-based applications with SAS starting with SAS Version 6. SAS Institute has used SAS/AF software to create the VIEWTABLE windows as well as other SAS

products – SAS/ASSIST, SAS/EIS, SAS/LAB, and SAS Money Laundering Detection. SAS Consulting and several SAS Alliance Partners have used SAS/AF software to create thousands of SAS applications specific to customer needs. We just wanted to let you know that existing SAS/AF applications (after migration where applicable) run well with SAS 9 (both 9.1.3 and 9.2).

The SAS Component Language (SCL) programs used to drive these SAS/AF applications will need to be recompiled if any of the SAS code within the SCL program is changed in the future. To recompile an SCL program, you will need Edit access to the SAS catalog in which the program is stored. As mentioned before, you might need to migrate the catalog with the PROC CPORT and PROC CIMPORT or with PROC MIGRATE.

There have been numerous enhancements to SAS/AF software in the SAS 9.2 release. For more information about these enhancements, see the SUGI 31 paper, “SAS/AF Software Rises Again – Enhancements in SAS 9.2.” A second paper, “Branching Out with the Tree View Control in SAS/AF Software” will be presented at SGF 2008.

If you would like to use the SCL code that you have already created with these SAS/AF applications in Web-based applications, see the SUGI 29 paper “A Recipe for Success: Migrating SAS/AF Applications to the Web Using SAS, HTML and JavaScript.”

### **SAS/INTRNET APPLICATIONS**

For SAS 8 customers who use SAS/IntrNet software to create Web-based SAS applications, please note that these applications will all execute in SAS 9 by simply migrating your SAS files as mentioned in the section above.

### **SAS OLAP APPLICATIONS**

In SAS 8, OLAP applications stored the data in a file format called MDDB. With SAS 9, OLAP applications store the data in Scalable Performance Data Engine tables. This makes migration between releases a little more work.

You can continue to run your existing SAS 8 OLAP application using the MDDB file format in SAS 9. PROC MIGRATE will move your existing data forward or you can recreate the data your existing OLAP ETL process.

Whereas there is no direct process to take your SAS 8 MDDB code and convert it to SAS 9 OLAP code, a discussion of this process is included in a SUGI 29 paper, “Taking your SAS/MDDB Server Applications to the Next Level.”

### **SAS SOLUTIONS**

Within SAS 8, SAS introduced the concept of SAS solutions. A solution is a compilation of many SAS steps to perform a particular task. This compilation was driven by a nice graphical user interface (GUI) that enabled programmers who are not familiar with SAS to answer a few questions to help determine what SAS steps and data would be used and then perform the particular task. The first SAS solutions offered by SAS Institute were SAS Enterprise Miner and SAS/Warehouse Administrator software.

For SAS Enterprise Miner, migration is very easy. One simply migrates the SAS files, as described in the section above, for your particular operating environment.

For SAS/Warehouse Administrator software, migration works the same. However, note that there will be no enhancements to SAS/Warehouse Administrator software after SAS 8. The replacement solution for creating and managing ETL processing in SAS 9 is the SAS Data Integration Studio. There is not a way to convert metadata from your SAS/Warehouse Administrator software to SAS Data Integration Studio. For more information regarding the suggested methodology for converting from SAS/Warehouse Administrator software to SAS Data Integration Studio, see the compatibility Web site listed in the References.

We have listed many of the most common products that your SAS 8 applications might have issues with during the migration process. More information can be found in the product-specific compatibility Web site listed in the References.

### **MIGRATION PLANNING**

Now that we have presented the types of things requiring conversion during the migration process versus what can just be copied, let's review what other things should be planned for. SAS has put together a comprehensive Web site (<http://support.sas.com/rnd/migration/planning/index.html>) that lists numerous questions that should be

addressed before the migration process begins. The questions are grouped into four main categories: Hardware, Files, Scheduling, and Validation.

Before we discuss what is covered in these groups, let's talk about creating a timeline for the migration of the SAS applications. Establishing a timeline is best done via a team approach with team members from all the areas that will be affected by the migration – SAS users, IT administrators, and others. You need to decide if you will migrate all the SAS files at once or in stages, how to minimize downtime for existing SAS users, if a roll-back plan is necessary in case there are issues with the migration, and what type of training on the new version of SAS will be needed to support the existing SAS users.

#### **HARDWARE**

Ensuring that the hardware you plan to use for your SAS 9 application meets the hardware and software requirements for SAS 9.1.3SP4 or SAS 9.2 is very important. The baseline operating system required for SAS 9 is much higher than what was required for SAS 8. If you are running a current instance of the operating system, then you might not have any issues, but we advise that you verify this – especially if you are planning to go from SAS 8.2 directly to SAS 9.2.

#### **FILES**

Understanding what files need to be moved is the next step in the migration process. In some cases where you have only a single SAS 8 application running on your existing computer, then you will migrate all of the SAS files within your SAS library or libraries. However, the exercise becomes more complex when you have multiple SAS 8 applications on a computer and you are planning to move the SAS 8 applications to SAS 9, one at a time (e.g., not through a wholesale migration). In this situation, you must identify which SAS files will need to be moved. This can be done by parsing the SAS 8 application code for various SAS data file names.

Before you move to the next step, you need to determine if any of the SAS files you intend to migrate to the new version of SAS are used by other SAS users or SAS applications besides the initial ones you are planning to migrate. This can happen for SAS files used by the application designed for non-programmers as well as by power SAS users who need the same files for ad hoc analytics and reports. This information is needed for the next step in the migration process.

#### **SCHEDULING**

After you have verified that the hardware can support the new release of SAS and the SAS files that should be migrated, then you can determine a timeline for the migration. You need to come up with a policy if any of the SAS files you are migrating are shared between SAS applications. How will you keep them synchronized? What happens if there are issues during the migration and you need to roll back to the older SAS version of the application? Do you have a complete backup of the existing SAS application from before the migration that you can use?

#### **VALIDATION**

Validating that the SAS 9 version of your SAS 8 application runs the same way as it did before is the last step in the migration process. Don't let the fact that it is the last step diminish the importance of allowing enough time to properly test the new version of the application before you release it to your SAS users. This should help with any technical or performance issues that you encountered with running the SAS 8 application under SAS 9.

**BEST PRACTICE:** Set a review session to occur at the end of the planning phase. Review all decisions, not just the time table and personnel budget, but also hardware, software, etc. This is advisable because many planning decisions are interdependent; that is, one decision can affect multiple areas of planning.

#### **BRIEF DISCUSSION OF MIGRATING FROM SAS 9.1.3 TO SAS 9.2**

Your batch SAS jobs, SAS/AF, SAS/IntrNet, and any other SAS applications that were originally written with SAS 8 will migrate from SAS 9.1.3 to SAS 9.2 without any issues. You do not have to migrate your SAS files from SAS 9.1.3 to SAS 9.2.

If you are currently using SAS 9.1.3 Business Intelligence solutions, then migration is something you need to plan for. The metadata architecture in SAS 9.2 has changed, so that you must also update your metadata content as part of the migration process.

SAS will provide two key tools to help support migration of these SAS 9.1.3 Business Intelligence solutions to SAS 9.2. The first tool is the SAS Migration Utility. This command line utility provides two key functions:

- **ANALYZE mode:** In ANALYZE mode, the Migration Utility will document the contents and configuration of your SAS 9.1.3 environment. It will also validate that your environment meets the minimum system requirements required for the SAS tool to perform the migration.

- o EXECUTE mode: In EXECUTE mode, the Migration Utility will copy the metadata content (and associated files) in your SAS 9.1.3 environment and create a SAS package file (essentially an archive file). This package file can then be imported into your target SAS 9.2 environment via the migration process. This package works similarly to the partial promotion capabilities provided in SAS 9.1.3 in the BI Manager plug-in for SAS Management Console.

The second tool is the SAS Deployment wizard. This application handles the actual installation and configuration of the SAS 9.2 environment. The SAS Deployment wizard has integrated the ability to migrate your SAS 9.1.3 content as part of the configuration process. The SAS Deployment wizard guides you through the configuration questions, then runs silently through the installation. The answers to the configuration questions can be saved to a file, so the deployment can be run again with the same settings, or set up to run in a batch process.

The goals of the migration process for SAS 9.2 are to migrate all your SAS 9.1.3 content at one time and create a mirror image of your SAS 9.1.3 deployment in your SAS 9.2 environment, while leaving your SAS 9.1.3 environment untouched. In this manner, you can run SAS 9.1.3 and SAS 9.2 side-by-side for validation testing before rolling SAS 9.2 into production.

## CONCLUSION

We hope that after reading through this paper you have an understanding of what is involved in the migration of a SAS 8 application to SAS 9. As you can see by the amount of information on the SAS Migration community Web site, migration of existing SAS applications to the next production version of SAS is very important to us. We are doing everything we can to make this migration as painless as possible.

## REFERENCES

From the SAS Technical Support Web site –

- o Knowledge Based/Focus Area – Migration: <http://support.sas.com/rnd/migration/>
- o Getting Started: <http://support.sas.com/rnd/migration/roadmap.html>
- o Compatibility Calculator: <http://support.sas.com/rnd/migration/planning/files/calculator/>
- o Migration Planning Worksheet: <http://support.sas.com/rnd/migration/planning/plan.html>
- o Peaceful Coexistence: SAS@9 and SAS 8.2: <http://support.sas.com/rnd/migration/papers/peaceful.html>
- o Updating SAS Code: <http://support.sas.com/rnd/migration/planning/files/programs.html>
- o Product-Specific Compatibility: <http://support.sas.com/rnd/migration/planning/files/products.html>
- o Migrating ODS Templates:  
[http://support.sas.com/rnd/migration/execution/migrate/special\\_odstemplates.html](http://support.sas.com/rnd/migration/execution/migrate/special_odstemplates.html)
- o Converting from SAS/Warehouse Administrator to SAS Data Integration Studio:  
<http://support.sas.com/rnd/migration/planning/files/etlstatement.html>
- o Top Ten Questions to Ask Before Your Data Migration paper:  
<http://support.sas.com/rnd/migration/papers/SUGI30.pdf>

From previous SUGI/SGF conferences:

- o From SUGI 28 “PROC MIGRATE: How to Migrate Your Data and Know You’ve Done it Right!”  
<http://www2.sas.com/proceedings/sugi28/288-28.pdf>
- o From SUGI 29 “A Recipe for Success: Migrating SAS/AF Applications to the Web Using SAS, HTML, and JavaScript” <http://www2.sas.com/proceedings/sugi29/025-29.pdf>
- o From SUGI 29 “Taking your SAS/MDDB Server Applications to the Next Level”  
<http://www.sas.com/psd/GBIDI/GBIDI Docs/Converting%20MDDB%20to%20OLAP%20Presentation.pdf>
- o From SUGI 31 “CEDA: The Invisible Hand” <http://www2.sas.com/proceedings/sugi31/225-31.pdf>
- o From SUGI 31 “SAS/AF Software Rises Again – Enhancements in SAS 9.2”  
<http://www2.sas.com/proceedings/sugi31/008-31.pdf>
- o From SUGI 31 “Web-Enable your SAS Applications” <http://www2.sas.com/proceedings/sugi31/023-31.pdf>

From SAS online documentation:

- o Overview of CEDA: <http://support.sas.com/onlinedoc/913/getDoc/en/lrcon.hlp/a002200731.htm>
- o “A Soft Landing to ODS 9.1”:  
<http://support.sas.com/rnd/base/ods/templateFAQ/ODS91.pdf#pagemode=bookmarks>
- o Available documentation and instructional resources for SAS/AF software:  
<http://support.sas.com/kb/24/440.html>

## **ACKNOWLEDGMENTS**

Many SAS Institute staff have assisted us put preparation this paper. We would like to thank the following reviewers: Tony Brown, Lynn Curley, Diane Olson, Meg Pounds, Ann Rockett, and Mike Whitcher.

## **CONTACT INFORMATION**

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

Margaret Crevar  
SAS Institute Inc.  
500 SAS Campus Drive, Room R-2427  
Cary, NC 27513  
Work Phone: 919-531-7095  
E-mail: Margaret.Crevar@sas.com  
Web: [www.sas.com](http://www.sas.com)

Diane Hatcher  
SAS Institute Inc.  
500 SAS Campus Drive, Room R-4460  
Cary, NC 27513  
Work Phone: 919-531-0503  
E-mail: Margaret.Crevar@sas.com  
Web: [www.sas.com](http://www.sas.com)

SAS and all other SAS Institute Inc. product or service names are registered trademarks or trademarks of SAS Institute Inc. in the USA and other countries. ® indicates USA registration.  
Other brand and product names are trademarks of their respective companies.