

## Getting from SAS® 9.1.3 to SAS® 9.2: Practicalities of the Automated Tools

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### ABSTRACT

As a follow-up to last year's paper, "Migration from SAS® 9.1.3 to SAS® 9.2 – An Overview", this paper looks specifically at the automated tools to support your migration of the platform for SAS® Business Analytics from SAS 9.1.3 and SAS 9.2. We will take a closer look at the SAS® Migration Utility and how it's used with the SAS® Deployment Wizard. By understanding the roles, capabilities, and limitations of these tools, you can plan for a smooth migration initiative that will get your SAS 9.2 environment up and running in the shortest amount of time.

### INTRODUCTION

"Upgrade" and "migration" are both understood to refer to the process of creating a more current software deployment based on an existing deployment. This is no different for SAS and the process to move from SAS® 9.1.3 to SAS® 9.2. Upgrading (or migration) to SAS 9.2 is:

*The process of populating a new deployment of SAS software with content, data, or metadata (or a combination of these) from an existing deployment. Migration might include steps to upgrade to a new software release, convert data or metadata, or make changes to ensure compatibility.*

There are two main methods for upgrading to SAS 9.2. The first is to create a "complete" SAS 9.2 deployment, which contains the content from your 9.1.3 deployment, by using SAS migration tools. The second approach involves creating a new SAS deployment with SAS 9.2 software "out of the box" (OOTB), and then recreating user content by using SAS promotion tools and rebuilding content from scratch.

This paper focuses on the first method, creating a "complete" SAS 9.2 deployment containing content from your 9.1.3 environment using SAS migration tools. Using these tools requires that you are currently running the most current release of SAS 9.1.3, which is SAS 9.1.3 Service Pack 4. If you are using an earlier version of SAS®9, you must upgrade to SAS 9.1.3 Service Pack 4 before using these tools. You should also have the most current hot fixes applied.

Keep in mind that using the tools is not the only action required. This is just one part of the overall upgrade process. However, we will not be discussing the complete upgrade process in detail in this paper. Please refer to resources listed under "Recommended Reading," at the bottom of the paper, for more details.

### AUTOMATED MIGRATION TOOLS

Migration tools support automated upgrade of a SAS 9.1.3 system to SAS 9.2, providing a way for you to preserve your current investment in SAS while upgrading to the latest version. The automated tools support migration of the environment, which includes upgrading server-based content, including metadata. There are three key characteristics of automated migration:

- "All at once" – The migration tools migrate software configurations and metadata content and deploy software at one time. Therefore, you should not attempt to migrate until all installed SAS 9.1.3 products are available to be deployed with SAS 9.2.
- "Like for like" – The migration tools deploy the SAS 9.2 environment in the same manner as the SAS 9.1.3 environment. This means that the software is deployed in the same configuration and assumes that the hardware and operating system (OS) configurations are essentially the same. By similar hardware, we mean that the software should be deployed across the same number of machines and in the same manner as your current 9.1.3 environment. For example, if you have deployed SAS 9.1.3 across three machines, with metadata, application servers, and Web application server on their own machines, that is the same configuration assumed for your 9.2 environment. For operating systems, the requirement is to remain in the same OS class — i.e., Windows to Windows, UNIX to UNIX. Moving from 32-bit to 64-bit (or vice versa) is not an issue. In addition, Web application server settings are not migrated, so you are able to configure a different Web application server for SAS 9.2.
- "Do no harm" – The migration process does not modify the SAS 9.1.3 environment. The SAS 9.1.3 configuration files and metadata remain intact, and the new SAS 9.2 files are written to a different file system directory.

The migration tools consist of the SAS® Migration Utility and the SAS® Deployment Wizard.

- The **SAS Migration Utility** is a command-line executable that runs on each physical server in your SAS 9.1.3 environment. The utility reads and copies configuration and metadata into a single directory that will be read in when you configure your SAS 9.2 environment.
- The **SAS Deployment Wizard** is the same application that is used to install and deploy SAS 9.2 OOTB. It also has support for conducting an upgrade using a migration package built into the interface. If you indicate that you want to deploy SAS using a migration package, the deployment wizard reads the migration package created by the migration utility. It configures products based on settings from the SAS 9.1.3 environment and converts the content as part of the software configuration process. Only content contained in the migration package will be upgraded in this fashion

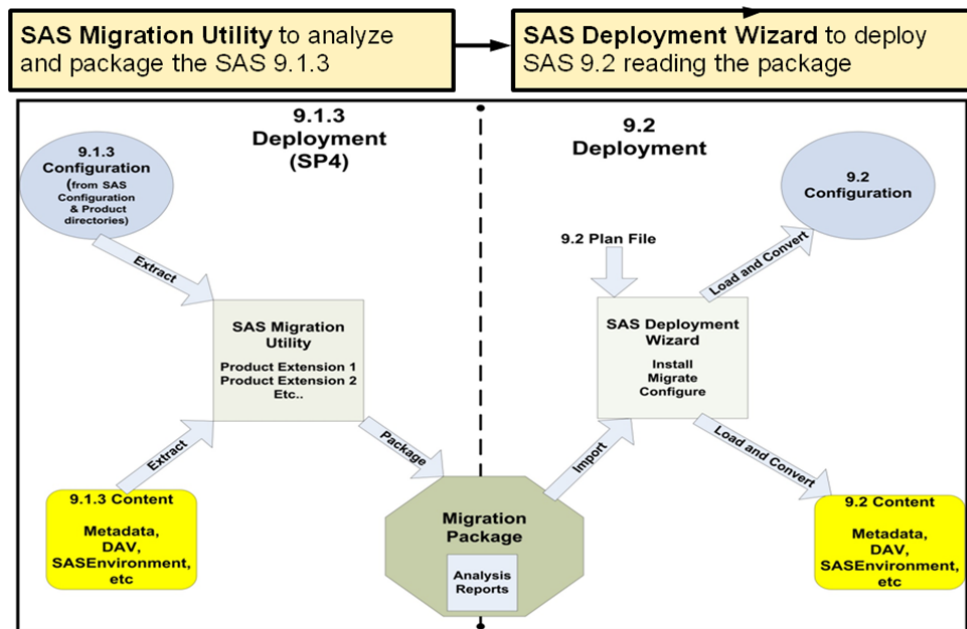


Figure 1. Overall Flow of Automated Migration

## PRE-MIGRATION TASKS

Before you perform a migration, there are some steps you should follow to prepare.

1. Back up your 9.1.3 environment, including metadata, configuration files, source code, and the Web Distributed Authoring and Versioning (WebDAV) repository. Even though the migration process does not overwrite any 9.1.3 files, it is a good practice to make sure you have a good backup.
2. Verify that your software is at the appropriate version to support the migration tools.

Your 9.1.3 environment must be running with SP4 and current hotfixes. If you are unsure whether your environment is up-to-date, you can run the migration utility in analyze mode to analyze your environment. When you do this, you get a Migration Analysis report documenting what software you have deployed, what version it is, and whether it is supported by the migration tools. If the version is not current, the report will also indicate what is required to bring it up to the baseline, such as listing the hotfixes required.

- a. The migration utility is located in your SAS 9.2 software depot: `<software-depot>\utilities\smu`. If you have not yet created a software depot, you can download the migration utility from this location: <http://www.sas.com/apps/demos/downloads/setupintro.jsp>.
- b. Create another directory to store the output of the migration utility (e.g., `<file-system\SASMigrationUtility`) in a location that is accessible and writable from the machine you would like to inventory. Copy the `smu.properties.template` file from `<software-depot>\utilities\smu` (or the directory where you downloaded the utility) to this new directory. Rename the file to `smu.properties` and edit it to match your environment. You should use the

unrestricted user credentials in the properties file. More details on what the properties mean can be found in the *SAS 9.2 Intelligence Platform: 9.1.3 to 9.2 Migration Guide*.

- c. Make sure the SAS 9.1.3 Metadata Server and WebDAV server are running and that you are using Java Runtime Environment (JRE) 1.4.2 Update 9 or higher. At a command line or operating system prompt, change to the migration utility directory and type:

- Windows:

```
smu -s -a -analyze -properties "<file-system>\SASMigrationUtility\smu.properties" -replace
```

- UNIX:

```
./smu.sh -- -analyze -properties "<file-system>\SASMigrationUtility\smu.properties" -replace
```

The analysis report can be found in the folder `<package-dir>\<machine-name>\AnalysisReport\`. Figure 2 shows the types of messages that you could receive in the report. If a product is marked with an **X**, then there should be an indication of what steps are required to support that product with the migration tools.

Status	Action
✓	No action required
●	An item failed to migrate. Review comments. Manual migration of the item may be required.
✗	A product failed to migrate. If the product is being deployed at 9.2, remediation and re-migration is required.

**Figure 2. Sample Migration Analysis Report Output**

More details about messages in the analysis report are available online at: <http://support.sas.com/rnd/migration/utility/index.html>.

- d. Run this report on each server machine in your 9.1.3 deployment.
3. Configure your 9.2 environment to support settings from your 9.1.3 environment. This includes setting up any host accounts that may be required and installing third-party software dependencies, such as Java versions and Web application servers.
4. If you haven't already done so, create your SAS 9.2 software depot. If you downloaded the migration utility to run the steps above, you may need to run the analysis reports again with the migration utility version that's in your software depot. Compare the modified dates on the `smu.exe` files — if they are different, you should re-run the reports prior to continuing.
5. If you have physical data stored in your SAS configuration directory, such as `<sas-config-dir>\Lev1\SASMain\SASEnvironment\Data`, you should move it out of the configuration directory before you create your migration package (detailed below). The migration utility will package up all content in the configuration directory, which would include physical tables if they exist. Having the physical data present could significantly increase the size of the migration package, which impacts overall performance of the migration. It is more efficient to move the physical tables outside of the migration tools.

Once you have completed creating the migration package, don't forget to move your physical data files back to their original location.

## ABOUT THE SAS MIGRATION UTILITY

The migration utility focuses primarily on content in the SAS 9.1.3 configuration directory and WebDAV. The SAS configuration directory is typically `<SAS-Config-dir>\Lev1` directory (or any other `Lev` directory). The type of content that the migration utility migrates includes:

- SAS® Metadata repositories and their content (except for service deployment files)

- SASMain\SASEnvironment folder, including Data, SASCode, SASFormats, and SASMacro content
- Web application configuration files (in the .war files under . . \Lev1\web\webapps)
- WebDAV content, using either Apache DAV or Xythos, is included as an option in the migration package.

There are several exceptions that you should be aware of:

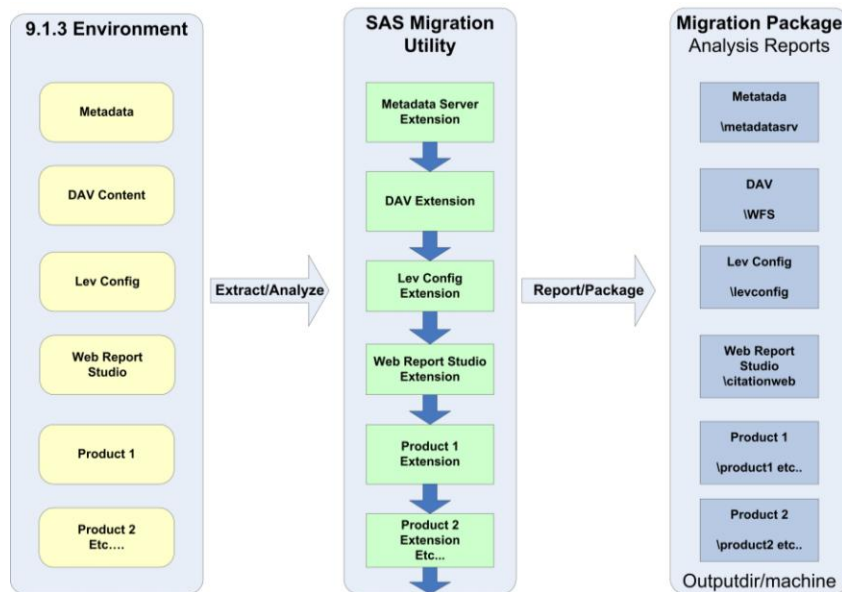
- Service deployment files (found under the Foundation Services Manager in SAS® Management Console) are not included in the migration process. New service deployment files will be loaded when the Web applications are configured.
- Server configuration files and autoexec files are not migrated. New files will be created OOTB in SAS 9.2, and any customizations you had coded in SAS 9.1.3 must be manually added to your SAS 9.2 environment.

Any content that is stored outside the configuration directory (with the exception of WebDAV content) will *not* be copied by the migration tools. These files must be handled separately, if they need to be moved. For example, these could include:

- SAS® Stored Processes code files
- SAS® Data Integration Studio external code files
- physical data sources
- Web application server configuration files
- physical OLAP structures (must be rebuilt after upgrading)

The migration utility provides the framework in which product extensions run. The processing for a single migration utility execution (figure 3) is:

1. The migration utility framework starts and validates that the 9.1.3 metadata server is running.
2. The migration utility iterates through each available product extension.
3. Each product extension runs against the 9.1.3 environment. Configuration and content is written to a directory in the migration package.
4. On completion of the last extension the framework closes.



**Figure 3. SAS Migration Utility Process Flow**

## CREATE THE SAS MIGRATION PACKAGE

To create the SAS migration package, you must run the migration utility on each logical machine in your 9.1.3 environment. A logical machine corresponds to a single SAS configuration directory (e.g., <code>sas-config-dir\Lev1</code>). You must have a plan for running the migration utility because the utility creates a single package containing all 9.1.3 configuration information.

- ✓ You should pick a time to run the migration utility when the system is not being written to by users. It is critical to keep all content in synch when creating the package to ensure completeness of the information.
- ✓ As a best practice, you should write the package to a shared file system location that is accessible and writable by all physical machines in your 9.1.3 environment. If you do not have a shared location, you must move or copy the results from one machine to the next, so that you have a complete package once you've run the migration utility on the last machine. If you need to FTP the migration package across machines, make sure you specify the file transfer type as binary.

You should allocate plenty of disk space for this exercise. The rule of thumb is three times (3x) the size of the metadata server plus WebDAV content.

- ✓ You should only run the utility on machine at a time. Do not attempt to run the utility on multiple machines simultaneously, which can create update conflicts.
- ✓ Make sure your SAS 9.1.3 metadata server and WebDAV server are running.

Follow these steps to create the migration package.

1. Run the migration utility on the metadata server machine first. You can re-use the same `smu.properties` files that you used for the analysis report created in the pre-migration section. At a command line or operating system prompt, change to the migration utility directory and type:

- Windows:

```
smu -s -a -properties "<file-system\SASMigrationUtility\smu.properties"
-replace -tier metadata
```

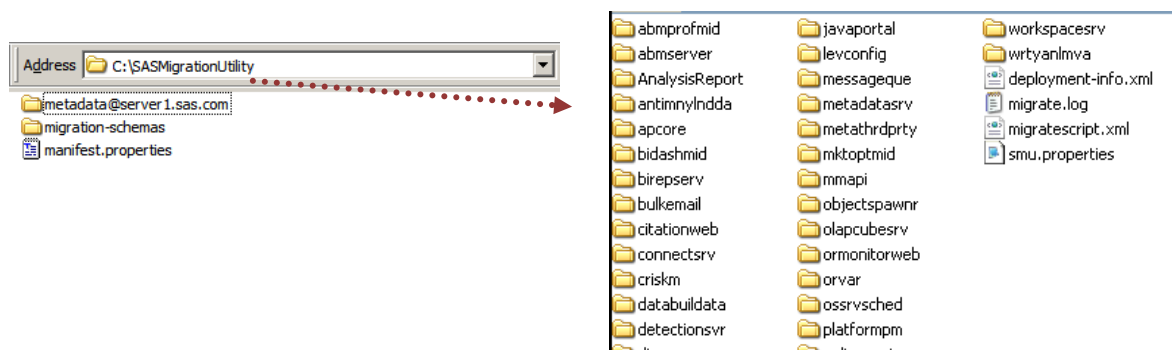
- UNIX:

```
/smu.sh -- -properties "<file-system>\SASMigrationUtility\smu.properties"
-replace -tier metadata
```

- z/OS:

```
./smu.zos -- -properties "<file-system>\SASMigrationUtility\smu.properties" -replace -tier metadata
```

2. Review the analysis report to ensure that the migration package was created correctly. Figure 4 illustrates the types of files and directories created by the utility.



**Figure 4. Files and Directories Created by the Migration Utility**

3. Review the migration utility log files. A `migration.log` file is located in each machine subdirectory (e.g., `<file-system>\SASMigrationUtility\metadata@server1.sas.com\migration.log`). Search for "ERROR" or "NOTFOUND" to review critical messages. Not all messages with these labels will be

serious, so please review carefully. Neither the deployment wizard nor the migration utility validates that the package is complete and accurate.

- a. Check that all products you have deployed are found.
  - b. Review the NOTFOUND messages. You should see NOTFOUND messages for SAS products that you did not deploy because the migration utility looks for all available SAS products. You should make sure there are no NOTFOUND messages for products that you have deployed.
  - c. Review the analysis reports, as all products that will be migrated should have a table in one of the analysis reports.
  - d. Check that your metadata has been packaged and there are no errors in the log, `\<package-dir>\<machine-dir>\metadatasrv\backupserver.log`.
  - e. Check that you have WebDAV content in the machine directory for the machine that you specified the `-davtier` option. You should have a directory called `\<package-dir>\<machine-dir>\WFS\Area#` that contains the WebDAV content in XML files.
4. Backup the migration package. If the package creation fails on a subsequent machine, you can restore the package to a previous state.
  5. Run the utility on other server machines in the environment. If you are using the utility on a server with a WebDAV store, such as Xythos or Apache, include the option `"-davtier"` at the end of the command. You do not need to run the utility on any client machines.
    - a. If you are not using a shared directory, you will need to copy the directory to the local machine before running the utility.
    - b. When you are done, you should have a folder for each server machine in your environment.

## CHANGING HOST NAMES AND PORT NUMBERS

If you were to proceed directly with the migration at this point, the SAS automated migration tools assume that you will retain the machine ports that you used for your various SAS 9.1.3 products. During a migration, the only ports that the deployment wizard prompts for are for products that are new to SAS 9.2 and the Web application server (if used). All other port numbers are read in from the migration package file. You may want to change the port numbers, particularly if you want to SAS 9.2 to run side-by-side on the same machines that are running your 9.1.3 environment. If this is the case, you should use the Port Remap utility, which partially automates the steps required to change port and host names.

**Note:** *The Port Remap utility requires the public domain, third-party library `xsltproc`. Most operating systems already have it installed. If you encounter any problems, a machine that is missing the `xsltproc` library might be the cause.*

To change a port or a host name used by a SAS 9.1.3 product that you are migrating, follow these steps:

1. Locate the deployment plan file that you will use to migrate to SAS 9.2.
  - a. To download the latest SAS 9.2 standard deployment plans, go to <http://support.sas.com/installcenter/plans>.
  - b. Open the plan file, search for "Machine Id", and record the names of your various SAS tiers.  
  
(If you are using a standard plan, the diagram that accompanies it contains the tier names.) Also, be sure to have a list of the machine names to which you want to migrate. Keep this information handy as you will need to refer to it later in this procedure.
2. Log on to a machine in your deployment with the user ID you used to create the migration package, open a command prompt or console, and change to the portremap/operating-system subdirectory under utilities/smu in your SAS 9.2 software depot. For example:

```
cd \SAS Software Depot\utilities\smu\portremap\win
```

3. Run the transform script.

- Windows:

```
transform.bat
```

- UNIX and z/OS:

```
./transform.sh
```

4. When prompted, provide the transform script with the absolute path to your migration package on the current machine. In the example above, this would equate to <file-system>\SASMigrationUtility\.

The script copies one of the migration package files (template.xml) to a new file (deployment-wizard.xml). Inside deployment-wizard.xml, the script copies the <original-tiers> section and renames this copy <newTiers>. Within the <newTiers> section the script inserts placeholders for the tier and host names. No placeholders are used for ports. However, you can make any port changes that you require.

For example:

```
<newTiers>
<tier name="[Insert machine name from plan file here]"
  host="[Insert host name from plan file here]"
  configdir="/data1/config913/Lev1" osfamily="Unix" os="s64" primary="true">
<products>
<product id="metadatasrv">
  <deployments>
    <deployment singleton="true"
      URL="1d7dfa85c836c5d1:255b9d6e:11d6954d386:-7fff">
      <port URL="sas12:metadatasrv" sdwprop="iomsrv.metadatasrv.port"
        functionLabel="">8561</port>
      </deployments>
    </product>
  ...
```

When the transform script is finished, it writes a file named deployment-wizard.xml to the migration-schemas subdirectory in your migration package.

5. Open deployment-wizard.xml in a text editor and make the following changes:

- ✓ Replace the string [Insert machine name from plan file here] with the name of the tier that matches the machine ID in your deployment plan file (from step 1 above).
- ✓ Replace the string [Insert host name from plan file here] with the fully qualified name of the target machine. This must match the same host server name you specify in the deployment wizard.
- ✓ Change ports as needed.

For example:

```
<newTiers>
<tier name="Metadata Tier"
  host="server1.sas.com"
  configdir="/data1/config913/Lev1" osfamily="Unix" os="s64" primary="true">
<products>
<product id="metadatasrv">
  <deployments>
    <deployment singleton="true"
      URL="1d7dfa85c836c5d1:255b9d6e:11d6954d386:-7fff">
      <port URL="sas12:metadatasrv" sdwprop="iomsrv.metadatasrv.port"
        functionLabel="">28561</port>
```

```
</deployments>
</product>
...
```

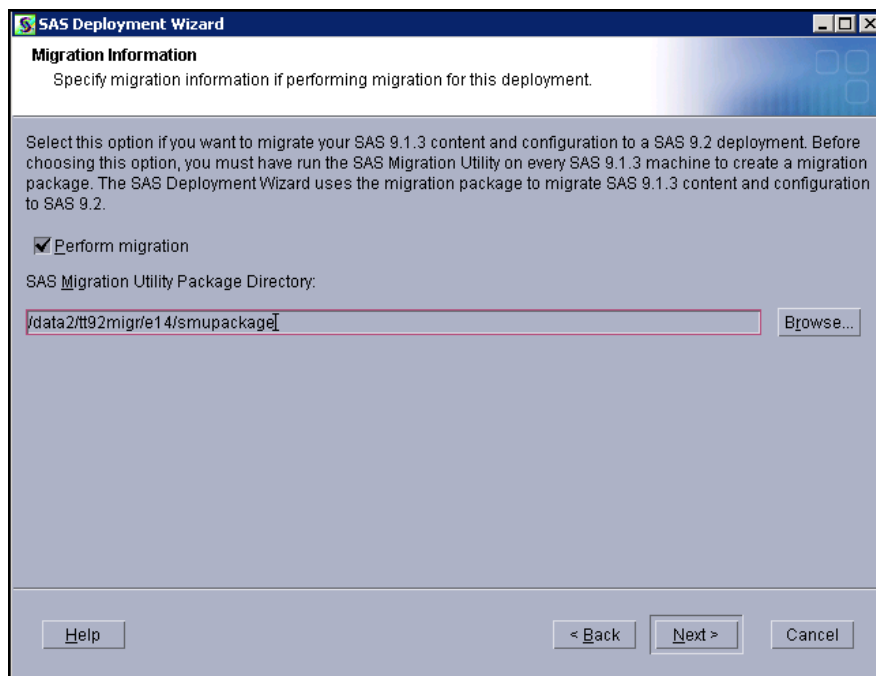
6. Load `deployment-wizard.xml` in a Web browser to verify that your XML edits are well-formed and correct. Review your changes carefully, as the deployment wizard does not validate host names contained in `deployment-wizard.xml`.

## INSTALL SAS 9.2 AND DEPLOY THE SAS MIGRATION PACKAGE

When you are ready to perform the migration, you will run the deployment wizard to install and configure SAS 9.2, as well as deploy the migration package you created above. In a multiple-machine system, you must install the software on your machines in a specific order:

1. Always install SAS software on the metadata server machine first.
2. Install SAS application servers (such as SAS Workspace Server or SAS<sup>®</sup> Stored Process Server) on machines other than the metadata server machine.
3. Install the middle tier with SAS<sup>®</sup> Foundation Services (that is, Remote Services).
4. Install the middle tier with SAS Web Infrastructure Platform.
5. Install the middle tier with other Web applications (such as SAS<sup>®</sup> BI Dashboard, SAS<sup>®</sup> Web OLAP Viewer, SAS<sup>®</sup> Web Report Studio, and so on).
6. Install software on machines that will host only clients last.

When you launch the deployment wizard, you will be prompted by a number of screens. Answer the prompts as if you are installing and/or configuring your SAS 9.2 environment as you would expect. Once you specify your local host machine name, you will be prompted whether you will be performing a migration (figure 5).



**Figure 5. SAS Deployment Wizard Dialog Box for Migration**

Check the box to “Perform migration” and specify the location for your migration package. In the example used in the paper, it is `<file-system>\SASMigrationUtility\` (the directory is different from Figure 5). The deployment wizard will load the information from the migration package, then proceed with rest of the screens. You should see default values populated from your 9.1.3 configuration in the dialog boxes.



This paper will not cover the details of using the deployment wizard. Please refer to the “Recommended Reading” documents below for the details.

## POST-MIGRATION STEPS

After the deployment wizard has completed, you should follow the steps in the `instructions.html` document for post-installation steps. There may be some additional steps to take, as well.

- ✓ If you are migrating SAS® Data Integration Server content, check the `ETL*.log` files in the `<sas-config>\Lev1\Logs\Configure` directory. They could contain additional information about specific Data Integration content migration.
- ✓ Reapply any server startup configurations from SAS 9.1.3 into your server startup scripts for SAS 9.2.
- ✓ If you are migrating SAS® Enterprise Miner™ 5.2 or 5.3 content, you will need to:
  - Re-apply any custom workspace server configurations
  - Copy Enterprise Miner 5.2 or 5.3 projects from the SAS 9.1.3 machine to the SAS 9.2 machine. If you specified a default project path for your Enterprise Miner 5.x projects and migrate to a different machine, be sure an identical path exists on the SAS 9.2 machine and that users have correct permissions to that location.
  - If you specified a command in the MPCONNECT launch comment field on your Enterprise Miner 5.x installation, it is likely that the value points to files in your SAS 9.1.3 configuration directory. For example, you might have added a value such as:

```
SAS -metaautoresources "SASMain" -config  
"C:\SAS\EMiner\Lev1\SASMain\sasv9.cfg"
```

This command might not be valid on your SAS 9.2 installation. It should be changed to a path on the SAS 9.2 system, such as:

```
C:\SAS\EMiner\Lev1\SASMain\WorkspaceServer\Workspaceserver.bat -  
metaautoresources "SASMain"
```

- ✓ Run and review the authorization differences report to compare your SAS 9.1.3 effective permissions with the effective permissions in SAS 9.2. A few authorization rules were updated in SAS 9.2, which could impact initial access settings for SAS content. This report will highlight where those changes occurred so you can take the appropriate action.
  - Copy the program “SecRptAfter.sas” located in `<sas-install>\SASFoundation\9.2\core\sasmisc\sasconf\metadatasrv\config\Deployment` to another directory (or to `<sas_config>\Lev1\SASMeta\MetadataServer\reports`)
  - Edit the program to add the metadata server connection information

```
Options metaserver=<host_name> metaport=28562  
metauser="<host>\sasadm" metapass="password1";  
  
%let rptdir= "<sas-config-  
dir>\Lev1\SASMeta\MetadataServer\reports\";
```
  - Submit program with SAS 9.2.
- ✓ Rebuild your OLAP cubes in SAS 9.2. The structure of SAS cubes has changed in 9.2 to support incremental updates, so you must rebuild them. There are tools to help you do so, and they will utilize the structures defined in metadata to streamline the process. As a best practice, you should rebuild your cubes before trying to modify them with SAS® OLAP Cube Studio.

## CONCLUSION

SAS has provided these migration tools to help streamline the process of migration. For most customers, these tools should be sufficient for running a migration on their own, if they have a strong knowledge of SAS 9 administration. With the appropriate planning and validation processes, the migration process should go smoothly. There is also the option to deploy SAS 9.2 out of the box, and use promotion tools to move selected content over. How to determine the approach that’s best for you is discussed in the previous paper from 2009 (see list of “Recommended Reading”).

Regardless of the approach, upgrading from SAS 9.1.3 to SAS 9.2 is not a trivial exercise. In some cases, you might determine that the upgrade process requires help from SAS® Professional Services®. If you need help in understanding the requirements for migrating, please contact your SAS account executive.

## RECOMMENDED READING

SAS Institute Inc. 2009. *SAS 9.2 Intelligence Platform: Installation and Configuration Guide*. Cary, NC: SAS Institute Inc. Available at <http://support.sas.com/92administration>.

SAS Institute Inc. 2009. *SAS Intelligence Platform: 9.1.3 to 9.2 Migration Guide*. Cary, NC: SAS Institute Inc. Available at <http://support.sas.com/92administration>.

SAS Institute Inc. 2009. *Special Considerations for Customers Upgrading to SAS 9.2*. Available at <http://support.sas.com/92administration>.

SAS Institute Inc. 2010. SAS Knowledge Base/Focus Areas: Migration. Available at <http://support.sas.com/rnd/migration>.

SAS Institute Inc. 2009. *SAS Enterprise Miner 6.1: Migration Guide*. Cary, NC: SAS Institute Inc. Available at <http://support.sas.com/documentation/onlinedoc/miner/index.html>.

Hatcher, Diane, and McNeill, Sandy. 2009. "Getting from SAS® 9.1.3 to SAS® 9.2: Migration Tools or Promotion Tools." *Proceedings of the SAS Global Forum 2009 Conference*. Cary, NC: SAS Institute Inc. Available at <http://support.sas.com/resources/papers/proceedings09/267-2009.pdf>.

## ACKNOWLEDGEMENTS

Special thanks to Gerry Nelson and Greg Rakauskas of SAS for providing excellent content and reviewing this paper.

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