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SAS[®] Human Capital Management: Securing Sensitive Data for HCM Administration

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Introduction

This document explains the procedure for securing SAS Human Capital Management data to restrict access to certain data-sensitive tables. After performing this procedure:

- Data-sensitive tables from the staging, Detail Data Store (DDS), Error Data, and Conform libraries will reside in separate, secured libraries.
- In SAS® Data Integration Studio, only specified users [typically, users who perform human capital management (HCM) data administration tasks] will have access to these secured libraries.
- A new login will be associated with the HCM data mart in MySQL, and a new group (MYSQL HCM Users) with this login is added to SAS® Management Console.
- In SAS Data Integration Studio, only users who belong to the MYSQL HCM Users group will be able to run jobs that load tables in the HCM data mart.
- In the portal, only SAS Human Capital Management users who belong to the MYSQL HCM Users group will be able to create or refresh SAS® Web Report Studio reports that access the HCM data mart.

The procedure begins with the DDS area and continues with the HCM data mart. Performing this procedure involves:

- creating additional folders and libraries
- moving some existing files to new locations
- creating additional users and groups and then assigning them to the new folders and libraries
- modifying some of the ETL jobs in SAS Data Integration Studio and running those jobs to verify that the changes have been made successfully

This document assumes that only the following HCM tables (in the StageDDS, Detail Data Store, and Conform libraries) need to be secured:

- Employee
- Employee_Action
- Pay_Level
- Compensation

In addition, the following tables in the Error Data library need to be secured:

- Employee
- Employee_Action
- Pay_Level
- Compensation

- Employee_Action_Lkup_Err
- Employee_Action_Lkup_Exc
- Compensation_Lkup_Err
- Compensation_Lkup_Exc

This paper explains how to modify the associated ETL jobs for these tables. If your site needs to secure additional tables, then follow the same steps for those tables.

This information is intended for SAS Human Capital Management administrators or data administrators who are responsible for implementing and maintaining the SAS Human Capital Management environment.

Step 1: Back Up the Data

Before making any changes, back up the metadata repositories and the MySQL tables—for example, by using the Backup, Restoration, and Migration (BRM) tool.

Step 2: Move the Physical Tables

1. Create folders for the StageHCM, DDSHCM, ErrHCM, and the ConformHCM libraries, as follows:
 - a. In the file system, navigate to the **SAS-config-dir\Lev1\Data** directory. In this path, **SAS-config-dir** is the name of the configuration directory.
 1. For Windows, this path is typically **C:\SAS\SASSolutionsConfig**.
 2. For UNIX, this path is typically **/usr/local/SAS/SASSolutionsConfig**.
 - b. In the **Data** directory, create the following folders:
 1. **StageHCM**
 2. **DDSHCM**
 3. **ConformHCM**
 4. **ErrHCM**
2. Move the files for the data-sensitive tables (that is, employee, employee_action, pay_level, and compensation) from the **stagedds**, **DDSData**, and **ConformedDataMart** folders to the **StageHCM**, **DDSHCM**, and **ConformHCM** folders respectively.

Be sure to move both the SAS data set (.sas7bdat) and the index (.sas7bndx) files for each table.

For the employee and pay_level tables, you also need to move the cross-reference tables (employee_x.sas7bdat and pay_level_x.sas7bdat), if they exist. These tables are created with the load of the Detail Data Store (DDS) rather than upon installation.

3. Move the files for the data-sensitive tables, if they exist, from the **errorData** folder to the **ErrHCM** folder.

Step 3: Create the DDS Libraries

Follow these steps to create the StageHCM, DDSHCM, and ErrHCM libraries:

1. Log on to SAS Data Integration Studio with Detail Data Store as the default metadata repository.
2. Create the folder to hold the StageHCM library:
 - a. On the **Custom** tab, select **Repositories ► Detail Data Store**.
 - b. Right-click **SAS Data Integration Studio Custom Tree** and select **New Folder**.
 - c. Name the folder **StageHCM**.
3. In the same way, create the **DDSHCM** and **ErrHCM** folders.
4. Create the StageHCM library, as follows:
 - a. In the tree view of the **Inventory** tab, select **Repositories ► Detail Data Store ► Libraries**.
 - b. Right-click the **Libraries** folder and select **New** to display the New Library Wizard.
 - c. Select the type of library to define. For StageHCM, select **SAS Base Engine Library**.
 - d. Click **Next**.
 - e. Enter **StageHCM** as the library name and click **Next**.
 - f. Enter **STAGEHCM** as the libref for the library.
 - g. Select the path to the folder that you want the libref to point to—for example, **C:\SAS\SASSolutionsConfig\Levl\Data\StageHCM** or **/usr/local/SAS/SASSolutionsConfig/Levl/data/StageHCM**.
 - h. Click **Next**.
 - i. Select **SAS Main** as the SAS server to which this library is to be assigned.
 - j. Click **Next**.
 - k. Select **Repositories ► Detail Data Store ► SAS Data Integration Studio Custom Tree ► StageHCM** as the folder in which to create the new library.

- l. Click **Next**.
 - m. Verify the information and click **Finish**.
5. Create the DDSHCM library. Follow the same steps that you used to create the StageHCM library, but with the following changes:
 - Specify **DDSHCM** as both the library name and the libref.
 - Select the path to the folder that you want the libref to point to—for example, **C:\SAS\SASSolutionsConfig\Lev1\Data\DDSHCM** or **/usr/local/SAS/SASSolutionsConfig/Lev1/data/DDSHCM**.
 - Create the new library in the **Repositories ► Detail Data Store ► SAS Data Integration Studio Custom Tree ► DDSHCM** folder.
 6. Create the ErrHCM library. Follow the same steps that you used to create the StageHCM library, but with the following changes:
 - Specify **ErrHCM** as the library name and **ERRHCM** as the libref.
 - Select the path to the folder that you want the libref to point to—for example, **C:\SAS\SASSolutionsConfig\Lev1\Data\ErrHCM** or **/usr/local/SAS/SASSolutionsConfig/Lev1/data/ErrHCM**.
 - Create the new library in the **Repositories ► Detail Data Store ► SAS Data Integration Studio Custom Tree ► ErrHCM** folder.

Step 4: Create the ConformHCM Library

ConformHCM is a concatenated library that looks through the **ConformHCM** folder to the **DDSHCM** folder. Follow these steps to create the ConformHCM library in the Solutions repository:

1. Log on to SAS Data Integration Studio with Solutions as the default metadata repository.
2. Create the folder to hold the ConformHCM library:
 - a. On the **Custom** tab, select **Repositories ► Solutions**.
 - b. Right-click **SAS Data Integration Studio Custom Tree** and select **New Folder**.
 - c. Name the folder **ConformHCM**.
3. Create the ConformHCM library, as follows:
 - a. In the tree view of the **Inventory** tab, select **Repositories ► Detail Data Store ► Libraries**.
 - b. Right-click the **Libraries** folder and select **New** to display the New Library Wizard.
 - c. Select the type of library to define. For ConformHCM, select **SAS Base Engine Library**.

- d. Click **Next**.
- e. Enter **ConformHCM** as the library name and click Next.
- f. Enter **CNFRMHCM** as the libref for the library.
- g. Select the paths to the folders that you want the libref to point to:
 1. First, select the path to ConformHCM—for example,
C:\SAS\SASSolutionsConfig\Levl\Data\ConformHCM or
/usr/local/SAS/SASSolutionsConfig/Levl/Data/ConformHCM.
 2. Then select the path to DDSHCM—for example,
C:\SAS\SASSolutionsConfig\Levl\Data\DDSHCM or
/usr/local/SAS/SASSolutionsConfig/Levl/Data/DDSHCM.
- h. Click **Next**.
- i. Select **SAS Main** as the SAS server to which this library is to be assigned.
- j. Click **Next**.
- k. Select **Repositories ► Solutions ► SAS Data Integration Studio Custom Tree ► ConformHCM** as the folder in which to create the new library.
- l. Click **Next**.
- m. Verify the information and click **Finish**.
- n. After you create the library, right-click the library name and select **Display Libname**. Confirm that the path includes both **ConformHCM** and **DDSHCM**, in that order.

Step 5: Modify Library Assignments in the Detail Data Store Repository

Modify the library assignments for the data-sensitive tables that reside in the Detail Data Store repository, as follows.

1. Modify the data-sensitive staging tables, as follows:
 - a. Log on to SAS Data Integration Studio with Detail Data Store as the default metadata repository.
 - b. On the **Custom** tab, move the data-sensitive tables from the **Staging Tables** folder to the **StageHCM** folder. (To move one or more tables, right-click the table name or names and select **Move to Folder**.)
 - c. On the **Custom** tab, assign the data-sensitive tables to the StageHCM library, as follows:
 1. In the **StageHCM** folder, right-click a table name and select **Properties**.
 2. Click the **Physical Storage** tab.
 3. From the **Library** list, select **StageHCM**.

4. Click **OK**.
5. **Repeat steps i–iv** for each of the data-sensitive tables.

Modifying the library assignments for the data-sensitive table automatically affects any jobs that use those tables. When the code for the job is generated, the table's new library assignment is used.

2. Modify the data-sensitive DDS Tables, as follows:
 - a. Log on to SAS Data Integration Studio with Detail Data Store as the default metadata repository.
 - b. On the **Custom** tab, move the data-sensitive tables from the **Detail Data Store (DDS)** folder to the **DDSHCM** folder.
 - c. On the **Custom** tab, assign the data-sensitive tables to the DDSHCM library:
 1. In the **Detail Data Store (DDS)** folder, right-click a table name and select **Properties**.
 2. Click the **Physical Storage** tab.
 3. From the **Library** list, select **DDSHCM**.
 4. Click **OK**.
 5. **Repeat steps 1–4** for each of the data-sensitive tables.
3. Modify the data-sensitive error tables, as follows:
 - a. Log on to SAS Data Integration Studio with Detail Data Store as the default metadata repository.
 - b. On the **Custom** tab, move the data-sensitive tables from the **Error Tables** folder to the **ErrHCM** folder. In this step, you need to move the tables Employee_Action_Lkup_Err, Employee_Action_Lkup_Exc, Compensation_Lkup_Err, and Compensation_Lkup_Exc. Because the error tables Employee, Pay_Level, Employee_Action, and Compensation are not registered in the metadata, you do not need to move those tables.
 - c. On the **Custom** tab, assign the data-sensitive tables to the ErrHCM library:
 1. In the **Detail Data Store (DDS)** folder, right-click a table name and select **Properties**.
 2. Click the **Physical Storage** tab.
 3. From the **Library** list, select **ErrHCM**.
 4. Click **OK**.
 5. **Repeat steps 1–4** for each of the data-sensitive tables.

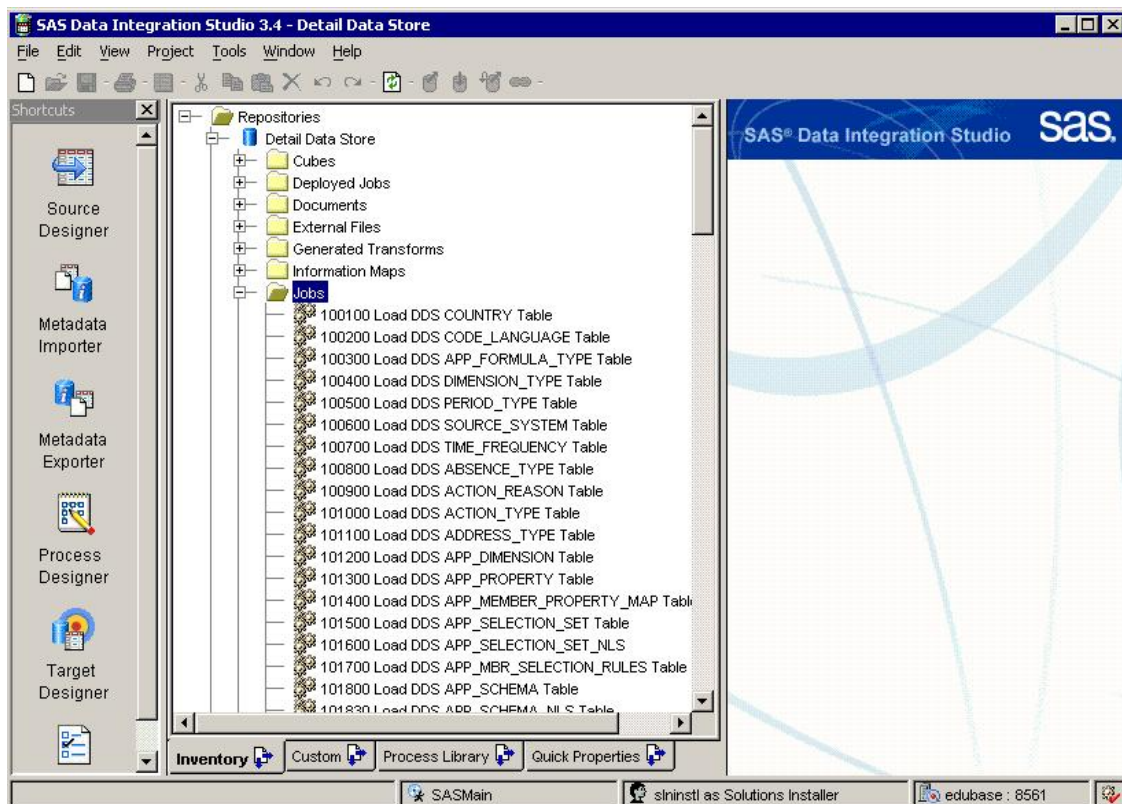
Step 6: Update Jobs That Perform Data Validation Transformations

In addition to modifying the library assignments for the data-sensitive tables, you must modify the jobs that perform a Data Validation transformation on those tables. The following jobs are affected:

- 104800 Load DDS PAY_LEVEL Table
- 106000 Load DDS EMPLOYEE Table
- 107200 Load DDS COMPENSATION Table
- 107600 Load DDS EMPLOYEE_ACTION Table

Modify each of the listed jobs, as follows:

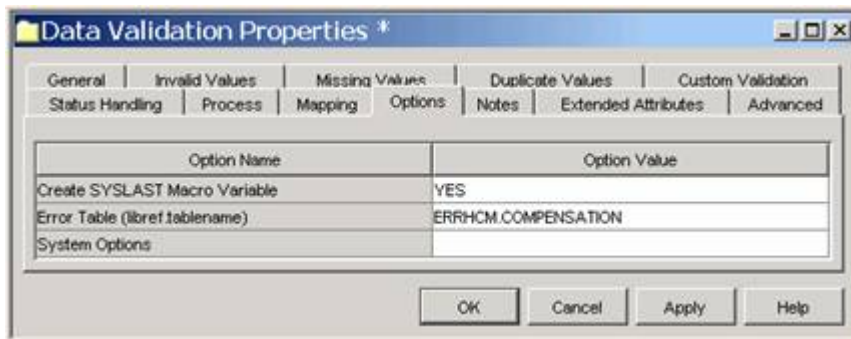
1. Rename the job.
 - a. On the **Inventory** tab, under **Jobs** (as shown in Display 1), right-click the job name and select **Rename**.



Display 1. Renaming a Job on the Inventory Tab

- b. Change **DDS** to **DDSHCM**.

2. Modify the libref for the error table that is used by the Data Validation transformation.
 - a. Right-click the job and select **View Job**.
 - b. In the Process Designer, right-click the **Data Validation** transformation and select **Properties**.
 - c. In the Properties window, click the **Options** tab.
 - d. Change the libref for the error table from **err_data** to **ERRHCM**, as shown in Display 2.



Display 2. Changing the Libref in the Data Validation Properties Dialog Box

- e. Click **OK** to close the Data Validation Properties dialog box.
3. Assign the ERRHCM libref in the preprocessing code for the job, as follows:
 - a. On the **Inventory** tab, right-click the job and select **Properties**.
 - b. Click the **Pre and Post Process** tab.
 - c. Select the **Pre Processing** check box.
 - d. Click **Edit**, and add the following code:

```
%bldLibNm(
  saset1_sasLibRef=ERRHCM,
  saset1_OMRSASLibraryObjName=,
  saset1_ChkDepRepos=Y,
  saset1_useMLE=N
);
```

- e. Click **OK**.

Note: When you close the job or execute it, you might be prompted to regenerate the code for the job or to save your changes. You should click **Yes** in the prompt.

Step 7: Apply Operating-System Security

You need to apply operating-system security to the StageHCM, DDSHCM, ErrHCM, and ConformHCM folders that you created. You can apply security for individual users, or you can create an operating-system group, depending on your site's requirements. Follow your site's standards for setting up this security, which varies for different sites and servers.

At a minimum, users who will run Extract, Transform, Load (ETL) jobs or SAS jobs in these tables need Read, Write, and Modify permissions for the folders and their contents.

Step 8: Create Security Groups and Apply Library Security

With SAS Management Console, secure the StageHCM, DDSHCM, ErrHCM, and ConformHCM libraries so that the HCM Data Administrators group has full access to these libraries. Deny access to other groups and users as required for your site. These security restrictions determine which users can view these libraries in SAS Data Integration Studio.

1. First, create the HCM Data Administrators group.
 - a. Log on to SAS Management Console as the SAS Administrator.
 - b. Select the foundation repository.
 - c. Right-click **User Manager** and select **New ► Group**.
 - d. Name the group **HCM Data Administrators**.
 - e. Click the **Members** tab and select the members to include in the group.
2. Secure the StageHCM, DDSHCM, and ErrHCM libraries.
 - a. In SAS Management Console, select the Detail Data Store repository.
 - b. In the navigation tree, select **Authorization Manager ► Resource Management ► By Location**.
 - c. Right-click **StageHCM** and select **Properties**.
 - d. Click the **Authorization** tab.
 - e. Click the **Add** button.
 - f. Move **HCM Data Administrators** to **Selected Identities** and click **OK**.
 - g. Grant all access to the HCM Data Administrators group.
 - h. Deny access to other groups and users as required for your site.
 - i. Click **OK**.

Step 9: Run the DDS Jobs

1. Log on to SAS Data Integration Studio as a user who is a member of the HCM Data Administrators group, with Detail Data Store as the default repository.

2. To confirm that the DDS jobs have been modified correctly, run those jobs that move data from the StageHCM library into the DDSHCM library:
 - 104800 Load DDS PAY_LEVEL Table
 - 106000 Load DDS EMPLOYEE Table
 - 107200 Load DDS COMPENSATION Table
 - 107600 Load DDS EMPLOYEE_ACTION Table

Before running these jobs, make sure that the remote services and the managed servers are running so that you can receive status messages from the jobs.

Step 10: Update the Conform Jobs (If Applicable)

Follow these steps only if your site uses the Conform and ConformHCM physical table areas.

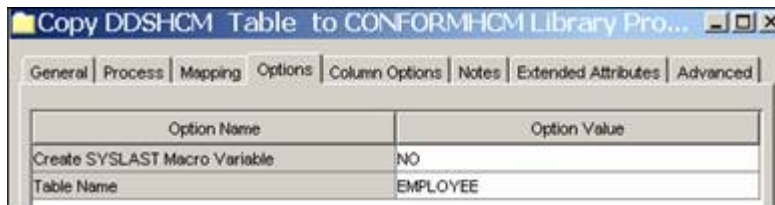
1. Log on to SAS Data Integration Studio as a user who is a member of the HCM Data Administrators group, with Solutions as the default repository.
2. Make a copy of the **Copy DDS table to Conform library** transformation. Name the new transformation **Copy DDSHCM table to ConformHCM library**.
3. Make a copy of the **Copy all DDS tables to Conform library** transformation. Name the new transformation **Copy all DDSHCM tables to ConformHCM library**.
4. Modify the transformations, as follows:
 - a. Right-click the **Copy DDSHCM table to ConformHCM library** transformation and select **Properties**.
 - b. Click the **Source Code** tab.
 - c. Change all instances of **Conform** or **DDS** to **ConformHCM** or **DDSHCM**.
 - d. Click **OK**.
 - e. Make similar changes to the **Copy all DDSHCM tables to ConformHCM library** transformation.
5. Make a copy of the **Copy DDS table to Conform library** job. Name the new job **Copy DDSHCM table to ConformHCM library**.
6. Make a copy of the **Copy all DDS tables to Conform library** job. Name the new job **Copy all DDSHCM tables to ConformHCM library**.

7. Modify the two new jobs so that they use the new transformations.
 - a. In each new job, delete the old transformation.
 - b. Insert the new transformation.
 - c. Within the job, open the transformation properties and change the name to reflect the correct transformation name.

Step 11: Run the Conform Jobs (If Applicable)

Follow these steps only if your site uses the Conform and ConformHCM physical table areas.

1. Log on to SAS Data Integration Studio as a user who is a member of the HCM Data Administrators group, with Solutions as the default repository.
2. Run the **Copy all DDSHCM tables to ConformHCM library** job.
3. Test the **Copy DDSHCM table to ConformHCM library** job, as follows:
 - a. Right-click the job name and select **View Job**.
 - b. Within the job, open the properties for the transformation.
 - c. Click the **Options** tab.
 - d. Enter a DDSHCM table name in the **Table** field, as shown in Display 3:



Display 3. Entering a Name for the DDSHCM Table

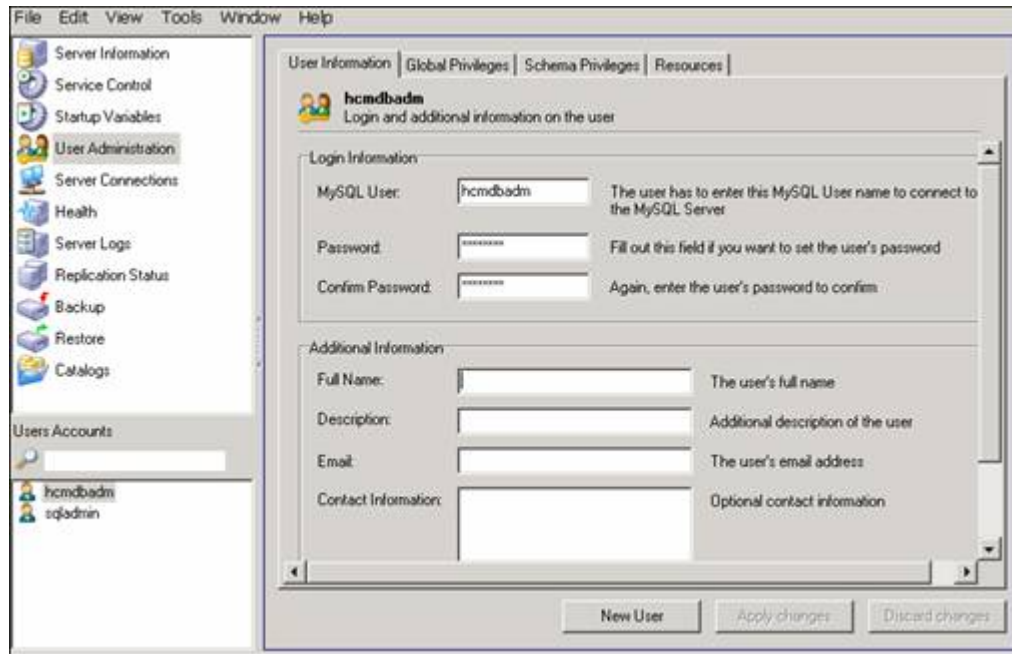
- e. Save your changes and run the job.

Step 12: Secure the HCM Data Mart

The following steps will restrict any user who is not part of the MYSQL HCM Users group from accessing data in the HCMData library.

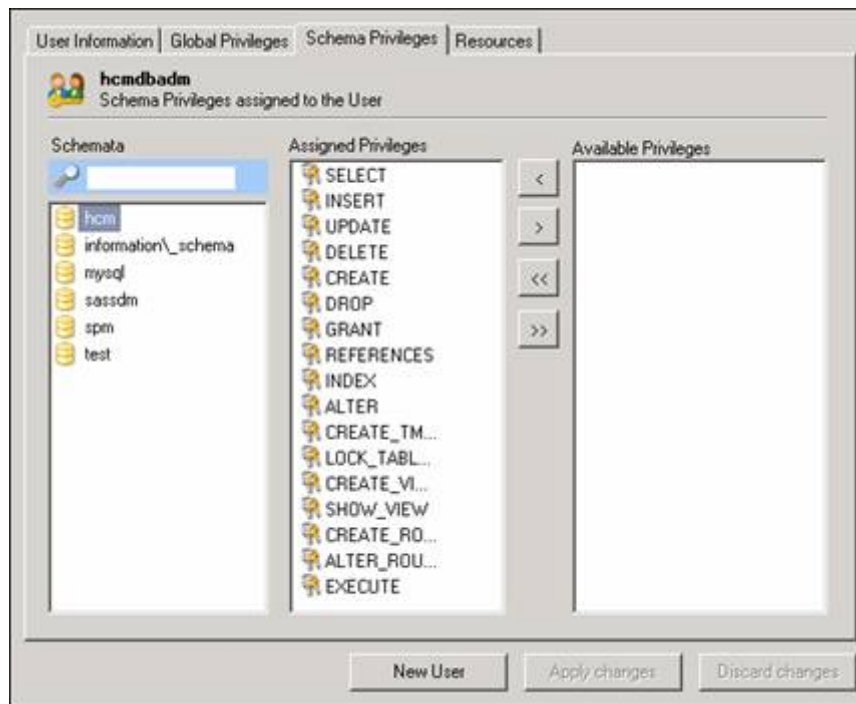
1. Create a MySQL user and assign privileges, as follows:

- a. Log on to the MySQL Administrator.
- b. Enter the **hcmdbadm** in the MySQL User field to create a new user named hcmdbadm, as shown in Display 4.



Display 4. Naming the MySQL User in the MySQL Administrator Window

- c. For the HCM schema, assign all schema privileges to the hcmdbadm user, as shown in Display 5.



Display 5. Assigning Schema Privileges in the MySQL Administrator Window

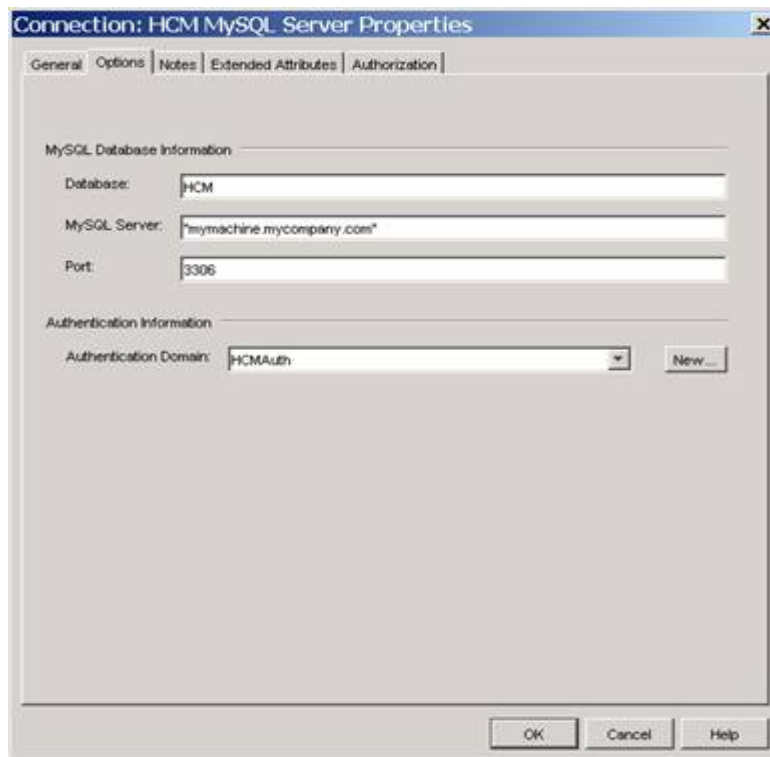
2. Create the MYSQL HCM Users Group, as follows:
 - a. Log on to SAS Management Console as the SAS Administrator.
 - b. In the foundation repository, create a group called MYSQL HCM Users.
 - c. On the **Logins** tab, create a logon ID using the hcmbadm user and password.
 - d. For the **Authentication Domain**, click **New** and create an authentication domain called **HCMAuth**, as shown in Display 6.



Display 6. Creating an Authentication Domain

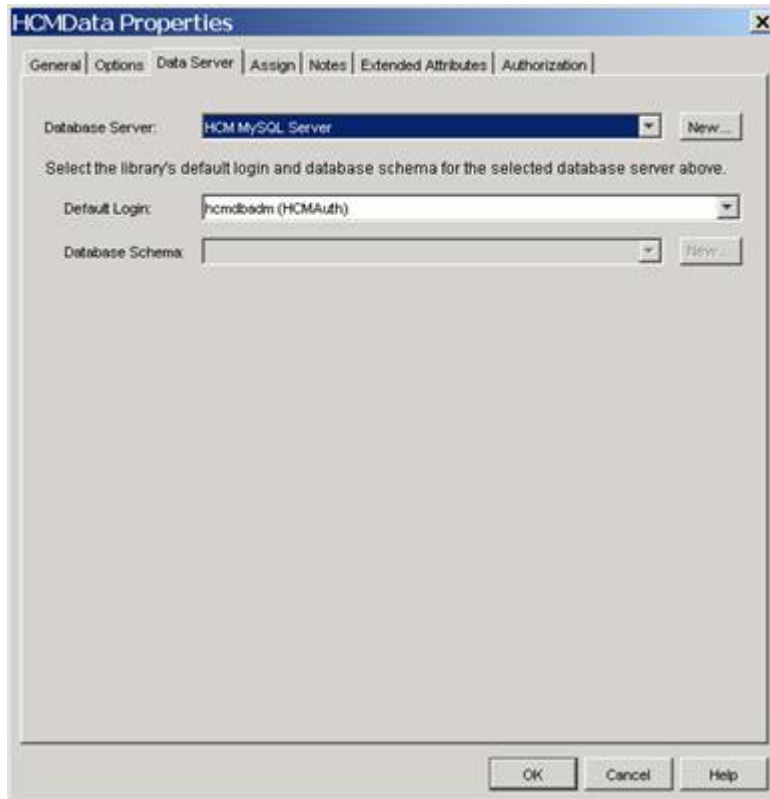
- e. Assign users and groups to the MYSQL HCM Users group, as follows:
 1. Reassign SAS Human Capital Management users or groups from MYSQL Users to MYSQL HCM Users.
 2. Do not assign users of other solutions to MYSQL HCM Users.
 3. Assign members of the HCM Data Administrators group to both MYSQL HCM Users and MYSQL Users.
 4. Assign the SAS General Servers group to both MYSQL HCM Users and MYSQL Users.
3. Modify the connection properties of HCM MySQL Server, as follows:
 - a. Log on to SAS Management Console as the SAS Administrator.
 - b. Select the HR repository.
 - c. Under Server Manager, select **HCM MySQL Server**.
 - d. In the right pane, open the connection properties for this server by right-clicking **HCM MySQL Server** and selecting **Properties**.
 - e. Click the **Options** tab.

- f. From the **Authentication Domain** list, select **HCMAuth**.



Display 7. Selecting the Authentication Domain in the Connection Properties

- g. Click **OK**.
4. Modify the default login for the HCMData library, as follows:
- Log on to SAS Management Console as the SAS Administrator.
 - Select the HR repository.
 - Then select **Data Library Manager ► SAS Libraries**.
 - Open the properties for the HCMData library by right-clicking the library name and selecting **Properties**.
 - Click the **Data Server** tab.
 - From the **Default Login** list, select **hcmdbadm (HCMAuth)**, as shown in Display 8.



Display 8. Selecting the Default Login for the HCMData Library

If **hcmbadm (HCMAuth)** does not appear in the list:

1. Click **More Logins . . .**
 2. Select the **View All** radio button.
 3. Under **Login Results**, select **hcmbadm (HCMAuth)**.
 4. Click **OK**.
- g. Click **OK**.
- h. Right-click the HCMData library name and select **Display Libname**. The display that appears should include the secured user ID.
5. Modify permissions for the HCMData Library.
- With SAS Management Console, secure the HCMData library so that the HCM Data Administrators group has full access to that library and the MYSQL HCM Users group has Read Metadata access to that library.
 - Deny access to other groups and users as required by your site.

Step 13: Update and Run the HCM ETL Jobs

1. Modify the data-sensitive Conform tables. HCM jobs that use the data-sensitive tables as input need to use the new ConformHCM library tables as the source. Because this flow is from ConformHCM to HCMData, you need to modify the library source so that it references ConformHCM rather than Conform. You modify the tables as follows:
 - a. Log on to SAS Data Integration Studio as a member of the HCM Data Administrators group, with Solutions as the default repository.
 - b. On the **Custom** tab, move the data-sensitive tables from the **Conform** folder to the **ConformHCM** folder. (You can move one or more tables by right-clicking a table name and selecting **Move to Folder**.)
 - c. On the **Custom** tab, assign the data-sensitive tables to the ConformHCM library, as follows:
 1. In the **ConformHCM** folder, right-click a table name and select **Properties**.
 2. Click the **Physical Storage** tab.
 3. From the **Library** list, select **ConformHCM**.
 4. Click **OK**.
 5. **Repeat steps 1–4** for each of the data-sensitive tables.

Assigning the tables to the new library affects all jobs that use these tables, unless a job contains user-written source code with hard-coded library references. In that case, you must manually update the source code.

2. Update HCM ETL jobs that use source code. HCM ETL jobs that contain user-written code transformations call a SAS macro with librefs to the Conform library. If the macro is called in a job for a data-sensitive table, then the macro must be changed to use the ConformHCM library. You update the jobs as follows:
 - a. Modify the %ACTHIST macro, which is used in the Load HCM Acthist Detail Table job:
 1. Copy the acthist.sas file from **!SASROOT\hrds\sasmacro** (under Windows) or **!SASROOT/sasautos** (under UNIX) to the following location:


```
SAS-config-dir\Levl\SASMain\SASSolutionsServices\SASMacros
```
 2. Open the acthist.sas file (in its new location) for editing.
 3. Modify any reference to **Conform.Employee_Action** to use **CNFRMHCM.Employee** instead.
 4. Modify any reference to **Conform.Employee** to use **CNFRMHCM.Employee** instead.

Note: These references are NOT case sensitive.
 5. Save the file.
 - b. Follow a similar procedure to copy and modify the %WRKGRP macro, which is called by the Load HCM WrkGrp Detail Table job.

c. Modify the %HCMLIB macro, which assigns the librefs:

1. Copy the hcmlib.sas file from **!SASROOT\hrds\sasmacro** (under Windows) or **!SASROOT/sasautos** (under UNIX) to the following location:

SAS-config-dir\Lev1\SASMain\SASSolutionsServices\SASMacros

2. Open the hcmlib.sas file (in its new location) for editing.
3. Add the following code to the file, just before the %MEND statement.

```

/* Libname for data-sensitive HCM tables */
%bldLibNm(seset1_sasLibRef=CNFRMHCM,
          seset1_OMRSASLibraryObjName=,
          seset1_ChkDepRepos=Y,
          seset1_useMLE=N,
          seset1_continue=Y
        ) ;

```

4. Save the file.

d. Ensure that the operating-system permissions for ***SAS-config-dir\Lev1\SASMain\SASSolutionsServices\SASMacros*** are the same as the permissions for ***SAS-config-dir\Lev1\SASMain\SASSolutionsServices\SASCode\Jobs***. Without these permissions, the macros cannot be executed.

3. Run the HCM ETL jobs, as follows:

- a. Make sure that the remote services and the managed servers are running.
- b. Log on to SAS Data Integration Studio as a member of the HCM Data Administrators group, with HR as the default repository.
- c. Run the applicable jobs to move the data from the ConformHCM library to the HCM data mart.

