Paper 009-31

Everyone Trying to Update at the Same Time? Let's Try the Source Control Manager! (SAS/AF® Development Tool)

Larry Altmayer, U.S. Census Bureau, Washington, DC

ABSTRACT

The SAS/AF development tool Source Control Manager (SCM) is a source file management facility featuring SAS® file check-out/check-in capability. This feature allows several developers to have edit access to the same files, while ensuring that no one makes changes to a program while another developer is making changes to the same program. You use it with SAS/SHARE®.

The Standard Economic Processing System (StEPS), a batch and SAS/AF system developed by the U.S. Census Bureau for processing data from its economic surveys, is a prime candidate for SCM. Several developers requiring edit access to its files maintain it. This paper describes how SCM has been implemented for StEPS, providing a basis for how it can be used by other organizations.

INTRODUCTION

The Source Control Manager is an application providing source file management for applications development using SAS/AF. Its features include a convenient GUI interface, SAS file check-out/check-in capabilities, and revision control. It allows a team of software developers accessing the same catalog entries, to update files using a check-out/check-in procedure. This prevents individual users from attempting updates at the same time. The application is used with SAS/SHARE. In maintaining StEPS code we have experienced instances when "almost" simultaneous updates result in loss of intermediate versions of program code. These occurrences motivated the implementation of SCM in our system. Although SAS/SHARE provides a message when update is attempted while another user is accessing a file, this was insufficient for our development needs.

An important feature of SCM is revision control. This refers to the creation of a backup for each file after check-in. The concept of backup is very important in any file system, and StEPS had developed a custom macro (%saveold) for our catalog entry backup prior to introducing SCM. However, the use of this macro is manual, and would not provide a complete record of code updates (if two users happen to be updating the same program at nearly the same time).

In the following sections, we give a brief overview of StEPS, as it relates to SCM, and describe installation and usage of SCM based on our experience with it in StEPS. For installation, we referred to the SAS System Help documentation on SCM installation, while creating our own sets of instructions as these related to StEPS. These sets of instructions are available upon request, from the author.

StEPS

StEPS is a generalized system developed in the Economic Directorate of the U.S. Census Bureau, to process the data from over 100 current economic surveys. As mentioned above, it is a batch and SAS/AF system. We introduced SCM on our development machine, for source file management of the catalog entries of the system, for which SCM is designed. Although StEPS uses many libraries for the data it processes, most of its program code is contained in the library PROGRAMS. This library contains the catalogs just mentioned. The main interactive SAS/AF screen for StEPS is shown in Figure 1 below.
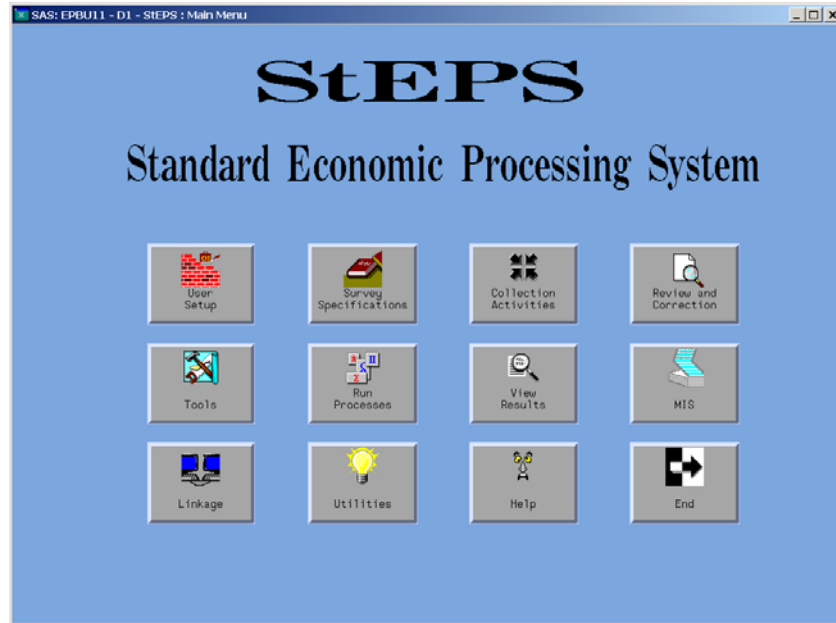
Figure 1

Maintenance of the system is performed by a team of developers in a branch dedicated to StEPS development, along with several other branches of developers devoted to surveys whose data StEPS processes. Attempts at simultaneous access to the many catalog files in StEPS by these developers sometimes cause unintended code overwrites, making StEPS an ideal candidate for SCM.

INSTALLING SCM (AN EXAMPLE USING StEPS)

The installation of SCM described in this section is from an administrator viewpoint. It assumes a SAS/SHARE server for SCM is running. The main parts of installation are:

- SCM directory setup
- Invoking SAS
- SCM Administration Wizard
- Setting up user ID
- Registering Program Files

SCM DIRECTORY SETUP

The first step of SCM installation is to create a directory in which the SCM control database (CDB) will reside. The CDB is a set of SAS data sets containing information about your usage of SCM. Some of the data set information is used for some of the SCM operations. For example, ARCHIVES contains the names of previous versions of programs you make updates to, and is used by the application if you are reverting to a previous version of a program. The HISTORY data set provides the information you enter as you check a program back into the application, giving details on the update you made to the program.

Assume here that you are using SCM with a UNIX® operating system. You create the directory as follows, assuming you are starting in the directory, /steps:

        mkdir scm
        cd scm
        mkdir cdb

INVOKING SAS

StEPS runs in an xwindows environment, after you invoke SAS from a common menu, using a common autoexec file, which creates many of the LIBNAMEs required by StEPS. After invoking SAS, the next steps in preliminary installation of SCM are:

- Clear the LIBNAME for the directory containing catalogs of interest (in our case, the PROGRAMS libname): *libname programs clear;*
- Assign the LIBNAME 'SCMCDB' for the library containing the SCM control database: *libname scmcdb '/steps/scm/cdb' server=steps';* (Assume you are using a library on a SAS/SHARE server for your CDB.)
- Invoke SCM (by typing 'scm') either on the program editor command line, or in the Toolbox: Explorer Window. This gives you the SCM – Initial Allocation Window, shown in Figure 2 below:
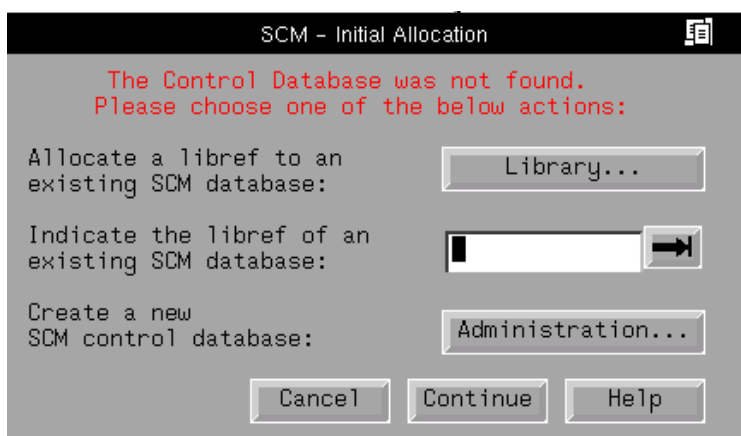

Figure 2

SCM ADMINISTRATION WIZARD

The SCM administration wizard, as with installation wizards in general, easily guides you through the steps of creating a new control database. While going through the wizard, you specify three important things:

- The library where the control database will be located.
- How many revisions will be stored.
- Data sets where user preferences will be stored in SASUSER.

You click on the "Administration…" button in Figure 2 above, to get the administration wizard started. Due to lack of space, the screens of the administration wizard corresponding to the above properties are not shown here, but can be seen in the sets of instructions we developed, referred to in the introduction. After you go through the administration wizard, you have created a new, empty SCM database.

SETTING UP USER ID

After setting up the new SCM database, you need to set up a user ID, before proceeding to the next step. This must be done so SCM will recognize you when you enter the application. To set up the user ID, you go back into SCM as you originally did, described in the Invoking SAS section above, by typing 'scm' on the program editor command line or in the Toolbox: Explorer Window. Then you get the SCM – Initial Allocation Window again (Figure 2 above).

In the "SCM – Initial Allocation" window click the button and a "Select a Library" window appears. In the "Select a Library" window, select the "Scmcdb" library, and the following window appears:

Figure 3

Type in a user ID in the "User ID:" field and press the "OK" button. The "Team Libraries:" window appears (shown below).
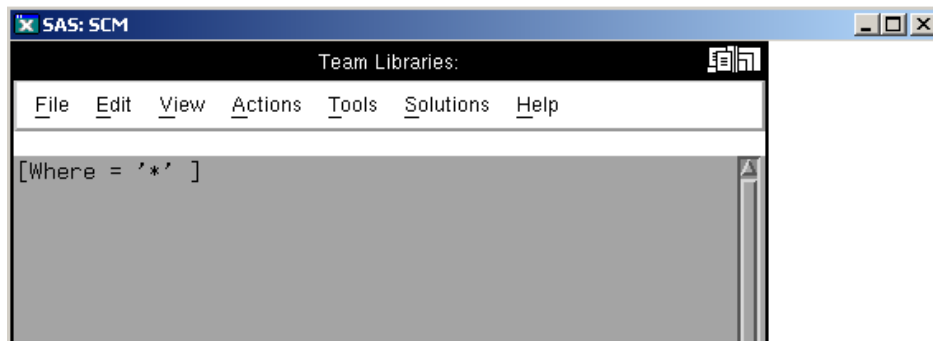

Figure 4a

REGISTERING PROGRAM FILES

In order to be able to use SCM to update program files, you must register your program files in SCM. This consists of a few simple steps:

- Assigning the StEPS PROGRAMS library to the SAS/SHARE server: *libname programs /steps/programs' server=steps;*
- Specifying the location of the team library and archive location under the Tools menu in the Team Library Window.
- After registering the program files, you get an updated Team Library Window, as shown in Figure 4b below:
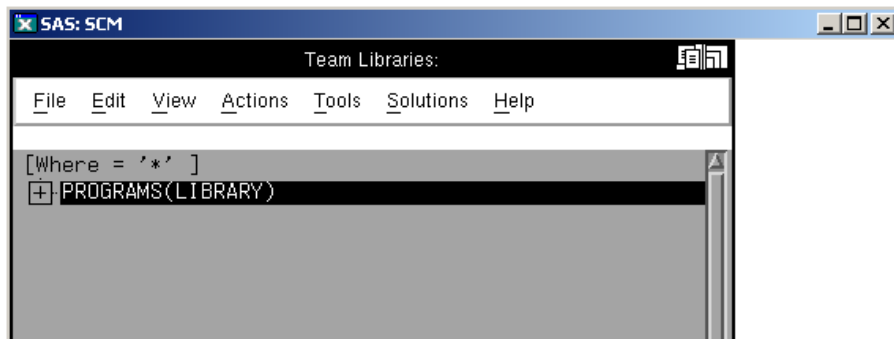

Figure 4b

USING SCM (FROM A DEVELOPER PERSPECTIVE)

Developer usage of SCM described here is divided into two parts: one time setup, and normal use.

ONE TIME SETUP

Developers are given a simple set of instructions for creating their user ID, and setting up initial directory mappings and file options.

Setting up User ID

Invoking SAS the first time after the administrator has installed SCM, you get the SCM – Set User ID screen shown above in Figure 3. After you type in an assigned user ID, and click the "OK" button, SCM registers you as an SCM user, and creates SASUSER files referred to above, in the SCM Administration Wizard section.

The Team Library Window appears, showing the programs library (Figure 4b). You can expand the library to show the catalogs it contains, by clicking the '+' on the left. Doing so, you get the following screen:
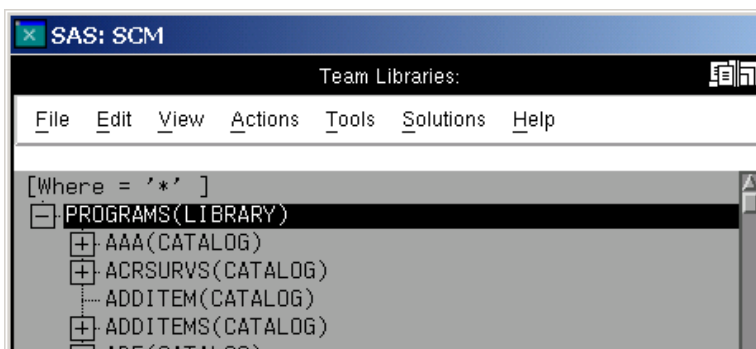

Figure 5

Setting up the Local Window

You next need to setup the Local Window. The Local Window is where local programs reside. Two operations have to be accomplished for the Local Window: library mapping, and optionally, local file deletion after check-in, to preserve space in the developer's local area.

Library Mapping: By clicking on Tools>Options>SCM Options… in the Team Window, an SCM – Options Window appears, with several tabs, including 'Library Mappings'. In the 'Library Mappings' tab, you specify the local directory to which files should be checked out.

Local File Deletion after Check-in: By clicking on the 'Options' tab in the SCM – Options Window, you can click on a radio box to indicate that local files should be deleted after the check-in command.

NORMAL USE

Developers are given a set of instructions for:

- Development in sessions where updating is not done.
- Checking programs out and in.
- Creating and registering catalogs and entries.
- Additional operations (e.g., reverting to previous versions of a program; locking and unlocking files).

Development in sessions where updating is not done

These instructions are specific to StEPS, and not part of the SCM documentation. There has been concern in StEPS that, since SCM requires the programs library to be read/write, developers might unintentionally overwrite existing programs. In the past this library has been read only. Developers would only change the protection at the time they copy their programs into it.

To prevent unintentional overwrites, developers are instructed to exit from SCM after entering SAS, by clicking on File>Close in the Team Library Window. This de-assigns the programs library. They then submit the following line of code from the Program Editor Window of the SAS session:

```
libname programs "&programs" server=&stpserv access=readonly;
```

Figure 6

Checking programs out and in

As mentioned above, one of the main premises of SCM is the prevention of simultaneous updates to programs by different developers at the same time. In order to accomplish this, you check a program out to the Local Window to do updates, and then check it back in to the Team Library Window when finished updating. During this process, you are locking and copying the SAS/AF entry or catalog from the Team to the Local Window.

Checking out a program

After selecting a file, by clicking on it to highlight it, you click on Actions>Check Out in the Team Window, to check the file out to the Local Window. Alternatively, the "Check Out" icon (arrow pointing down) in the Toolbox: Explorer window can be clicked to check the file out. The file will then appear in the Local Window if you bring that window up.

After the file has been checked out, a blue padlock icon appears to the left of it in the Team and Local Windows for the user who has the file checked out. Other users see a gray padlock icon in front of the file in the Team Window on their screens. The Team Window with a file locked is shown in the following:
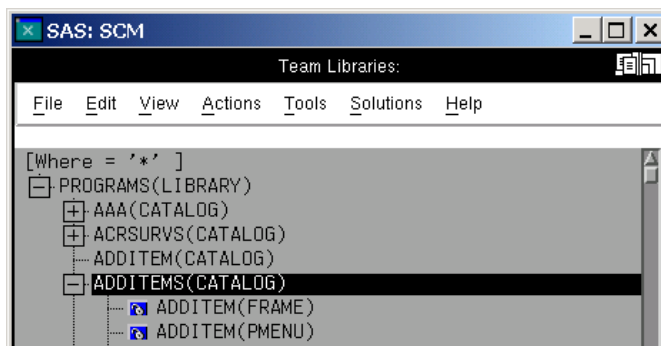

Figure 7

Checking in a program

After finishing updates, you check the program back into the Team Library Window by clicking on Actions>Check In in the Local Window. As with check-out, alternatively, the "Check In" icon (arrow pointing up) in the Toolbox: Explorer window can be clicked to check the file in.

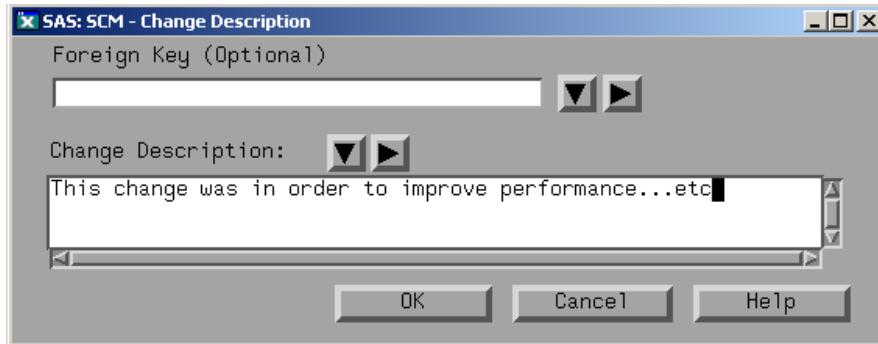After check-in, you must enter a change description in the "SCM – Change Description" window as shown:

6

Figure 8

The information entered into this screen is put into the HISTORY data set in the library containing the SCM control database.

Creating and registering catalogs/entries in the Team/Local Windows

You may have a need to create a new catalog and entries, or new entries for an existing catalog. In either case, you first go to the Local Window, and Edit>New… on the menu. This gives the following screen, with the new catalog and entry shown. You click on 'Create.'
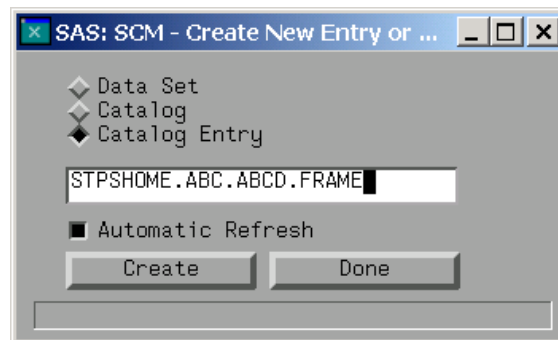

Figure 9

For a new frame and scl entry, the familiar frame entry displays. You edit the frame and corresponding scl entry as usual. After saving the new entries, you get a message that the file already exists in the Create New Entry or Member window above. Ignore this, and click the 'Done' button. Finally, compile the frame in the Local Window as usual, by going to Tools>Compile.

Next, you must copy the new catalog and entries to the SCM Team Window. In the Local Window, making sure the new catalog is highlighted, got the Actions>Copy To… on the menu. The SCM – Copy Selection(s) window comes up, as shown below. Specify the new catalog, along with library as shown, and click 'OK.'
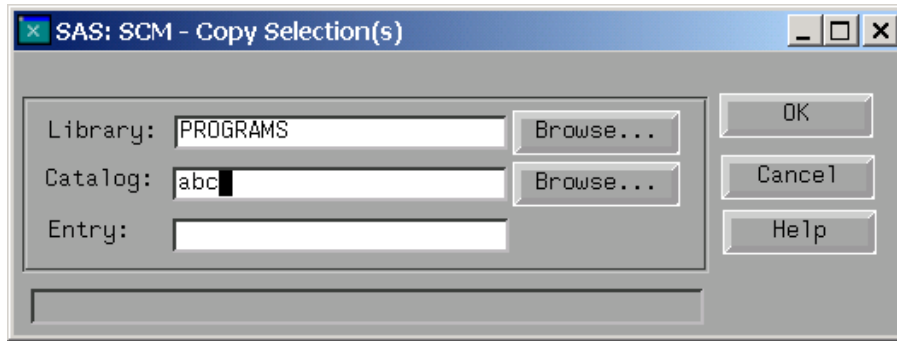
Figure 10

Registering new catalogs in the Team Window

Before the new catalog will show up in the Team Window, it must be registered in SCM. This is accomplished by going to Tools>Administration Utilities>Source Data. After entering the information shown below, click the 'Register' button. When registration is complete the screen will appear as shown below. Click 'OK.'
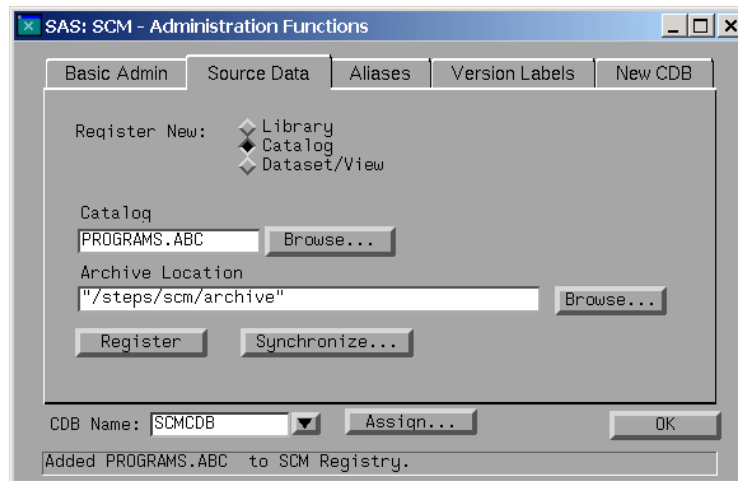

Figure 11

Back in the Team Window, click View>Refresh to get the new catalog to show up in the PROGRAMS library.

Creating new entries in existing catalogs in the Team Window

This process is similar to the above one of creating and registering a new catalog. Again, you go to the Local Window, and Edit>New… on the menu. On the following screen, you specify the new entry in the existing catalog, as shown in Figure 12 below, and then click 'Create.'
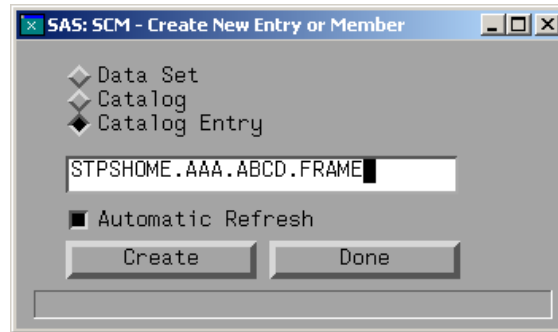
Figure 12

Again, the familiar new frame entry displays. Edit the frame and corresponding scl entry as usual. After saving the new entries, you get a message that the file already exists in the Create New Entry or Member window above. Ignore this, and click the 'Done' button. Finally, compile the frame in the Local Window as usual, by going to Tools>Compile.

Back in the Local Window, you must add the new entry to the existing catalog in the Team Window. After highlighting the desired entries in the Local Window, right click to get the pop-up menu shown in Figure 13 below, and click 'ADD.'
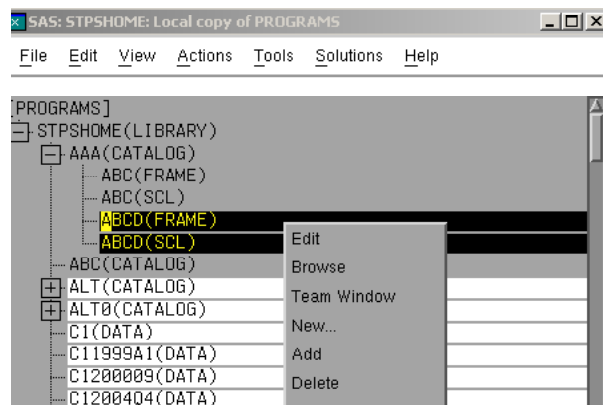

Figure 13

After doing this, you must again enter a change description in the "SCM – Change Description" window as shown:
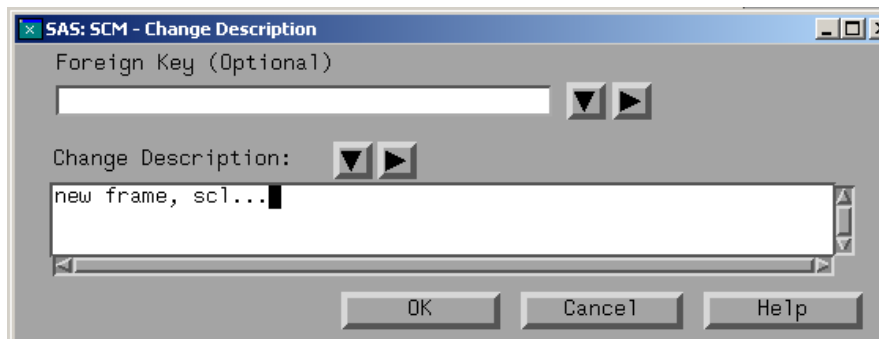

Figure 14

Back in the Team Window, you may have to click View>Refresh, in order to have the new frame and scl, ABCD, in the existing catalog, AAA, appear as shown below.
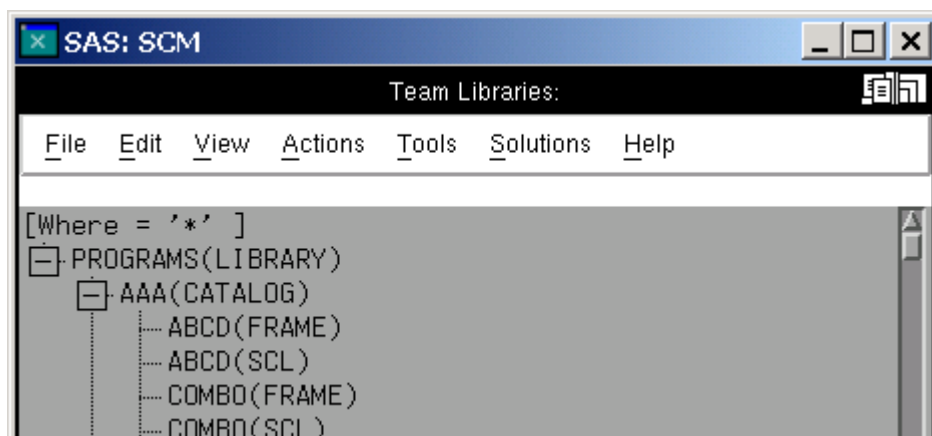

Figure 15

At this point, you have registered the new catalog entries AAA.ABCD frame and scl in SCM.

CONCLUSION

The SAS/AF development tool source control manager provides a means for preventing simultaneous edit access by multiple developers, while maintaining programs in a team environment. This facility also maintains previous versions of programs. This paper has described installation of SCM, as well as file check-out and check-in, practices which can be added to prevent unintended file overwrites, and creating and registering catalogs and entries. Other features not covered here include reverting to previous versions of a program, and locking and unlocking files. Details on these are available from the author, on request.

REFERENCES

SAS Institute Inc. (2001), *SAS System Help, Release 8.02*, Cary, NC: SAS Institute Inc.

Tasky, D., et al. (1999). "Get In Step With StEPS: Standard Economic Processing System," *Proceedings of the Twelfth Annual NorthEast SAS Users Group Conference*, 167-175.

CONTACT INFORMATION

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

> Larry Altmayer
> U.S. Census Bureau
> ESMPD, Room 1223-4, MS 6200
> Washington, DC 20233-6200
> (301) 763-2569
> lawrence.w.altmayer@census.gov

SAS, SAS/AF and SAS/SHARE are registered trademarks or trademarks of the SAS Institute Inc. in the USA and other countries. ® indicates USA registration.

Other brands and product names are registered trademarks or trademarks of their respective companies.