Installing and Maintaining Supervisor and Product Bundles in LPA/ELPA for MVS/XA® and MVS/ESA® Sites
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ABSTRACT
The Customization Instructions for Base SAS® Software, Release 6.06, under MVS detail how to install the SAS supervisor bundles into the link pack area and outline requirements for renaming supervisor bundles in the link pack area. In addition to the supervisor bundles, several other product bundles can be installed into the link pack area as well. This paper lists which bundles can be installed in the link pack area, when a site should consider doing this, what benefits they might observe, and suggests a way to implement installing these bundles into the link pack area.

INTRODUCTION
Release 6.06 of the SAS System for MVS is distributed in four bundled configurations: two tailored for execution in the MVS/SP Version 1 (MVS/370) or MVS/SP Version 2 and Version 3 (MVS/XA® and MVS/ESA®) environments. In both environments one configuration is tailored for execution with selected modules installed in the link pack area (LPA), and one is tailored for execution with no modules installed in the LPA. The ENTRY parameter of the JCL cataloged procedure or TSO CLIST used to invoke the SAS System determines which configuration is used. Be aware that the code is identical between the four bundled versions. The only difference is the way the code is packaged.

Instructions for selecting a bundled configuration of the SAS System and for installing the bundled modules of either configuration (MVS/370 or MVS/XA and MVS/ESA) in the link pack area are documented in Sections 3.1 and 3.2 of Customization Instructions for Base SAS Software, Release 6.06, under MVS. This paper focuses exclusively on the MVS/XA (or ESA) bundled configuration.

THE MVS/XA (MVS/ESA) BUNDLED CONFIGURATION
The MVS/XA (or ESA) LPA configuration includes the following supervisor modules located in the installed SAS load library:

- SASXAL is the host supervisor for MVS. Attributes are re-entrant, reusable, refreshable, AMODE=31, RMODE=24 (size: 128K).
- SASXAL2 is the host supervisor for MVS. Attributes are re-entrant, reusable, refreshable, AMODE=31, RMODE=ANY (size: 436K).
- SABXSUPH is the portable supervisor for MVS. Attributes are re-entrant, reusable, refreshable, AMODE=31, RMODE=ANY (size: 1096K).

Module SASXAL represents a minimal portion of the MVS host supervisor that resides below the 16 megabyte line, while module SASXAL2 contains the bulk of the host supervisor and resides above the line. All of the code contained in modules SASXAL and SASXAL2 is host (MVS) specific. Module SABXSUPH contains the largest percentage of the supervisor code and represents that portion of the supervisor which is considered to be portable across other operating systems. Module SASXAL is the entry point. To execute the SAS System using this configuration specify ENTRY=SASXAL.

In addition to the three supervisor bundles listed above, some other Institute Program Products (IPPs) also have bundles that may be installed in the LPA/ELPA:

- SABDS is the DATA step compiler and execution component (size: 289K).
- SABDPDL are frequently used routines for display products (size: 288K).
- SABFSPL is a frequently used routine for full-screen products (size: 287K).
- SABSCCL is a Screen Control Language component (size: 467K).
- SABDBGL is a Screen Control Language debugger component (size: 104K).

The attributes for all five product bundles are re-entrant, refreshable, reusable, AMODE=31, and RMODE=ANY. Total space requirements for the XA/ESA configuration are 2967K for ELPA and 128K for LPA.

Several usage notes that document known problems and contain additional information for using the Release 6.06 bundled configuration with entry SASXAL follow:

- V6-SYS.SYS-0575 documents the additional product bundles that can be placed in LPA and provides a zap that makes them usable. The zap is Z6060575.
- V6-SYS.SYS-0600 describes a known problem that causes the DATA step bundle (SABDS) not to be used when running with entry SASXAL. The problem is corrected by fix Z6060600. Note that the fix associated with this usage note is a linkage editor job stream. Instructions for applying the fix are contained in the usage note.
- V6-SYS.SYS-0644 describes a known problem that causes a SOCI abend when the SASXAL bundle is placed in the pageable link pack area (PLPA). This problem is corrected by zap Z6060644.
- V6-SYS.SYS-0729 describes a known problem that causes the product bundles not to be used when the SASXAL bundle is placed in PLPA. This problem is corrected by zap Z6060729.

All of the zaps and fixes associated with the above usage notes should be applied by all sites using the SASXAL bundling configuration. Note that beginning with the October SAS Notes tape, all of the above maintenance has been pre-applied to replacement modules contained in the SAS maintenance files. Installation of the SAS maintenance files eliminates having to apply each of the zaps and fixes individually. Application of these zaps and fixes causes no adverse effects when using configurations other than SASXAL (such as SASHOST or SASXAL).
Two other usage notes of interest to sites placing product bundles in LPA are:

- **V6-SYS-SYS-0815** discusses the aliases associated with the SASHOST entry point and the four bundled configuration entry points. The aliases are not needed and should be removed from the load library.

- **V6-SYS-SYS-0720** describes how product bundles that are placed in LPA/ELPA can be renamed to ease maintenance and testing.

Usage note V6-SYS-SYS-0720 will be discussed in more detail later in this paper.

When a Site Should Install Bundles into LPA

Any site that has a number of concurrent users of the SAS System will benefit by placing the SAS supervisor bundles and DATA step bundles into LPA. Sites that have concurrent users of applications written with the SAS full-screen products and Screen Control Language will benefit by placing the above mentioned product bundles into LPA. Note that with the exception of the SASHXAl bundle, all bundles can reside above the 16 megabyte line and can be placed in the extended link pack area (ELPA).

Benefits of Installing Bundles in LPA

If the bundles are not placed in LPA, the bundles are loaded into each individual user’s address space when they execute the SAS System. By placing the bundles in the LPA, sites are most likely to see a decrease in working set size for each individual SAS job. This decreased working set size also decreases the burden placed on the paging subsystem. If the system has a large number of concurrent SAS users, the benefit of a decreased working set size becomes even more pronounced. Perhaps the most significant benefit, in addition to a decrease in real memory, is a reduction in the auxiliary storage required to keep up virtual page frames containing multiple copies of the bundles. Better online response times can be expected and online resources are maximized as the same amount of memory is used to support a greater number of users.

A quick test was performed to help illustrate the benefits of installing the bundles in LPA. A SAS execution was initiated under TSO/E 2.01.1 specifying ENTRY=SASHXAl to use the non-LPA bundled configuration. The operating system is MVS/ESA 3.1.0 running on half of an IBM 3090-600S. The initialization phase consumed 0.19 CPU seconds and 3045K. A SAS DATA step was then executed to force the DATA step bundles to be loaded. The DATA step code used was as follows:

```plaintext
data test;
do i = 1 to 1000;
  output;
end;
run;
```

The SAS system options MEMRPT, STIMER, and FULLSTATS enabled the SAS system to generate the following resource notes:

- CPU time = 00:00:00:05
- Elapsed time = 00:00:00:50
- EXCP count = 58
- Task memory = 1357K (97K data, 1260K program)
- Total memory = 25738K (19400K data, 6338K program)

A second SAS execution was initiated, but this time the TSO CLIST used to invoke the SAS System specified ENTRY=SASXAl; therefore, the LPA bundled configuration was used. The initialization phase used 0.18 CPU and only 1397K. The very same DATA step was executed and generated the following resource statistics:

- CPU time = 00:00:06:04
- Elapsed time = 00:00:06:05
- EXCP count = 15
- Task memory = 138K (97K data, 41K program)
- Total memory = 1516K (1440K data, 76K program)

Note that each site will experience the benefits of placing the bundles in LPA to varying degrees. This is due to the wide variety of SAS applications and the make up of each site’s system workload.

Suggested Plan for Installing Bundles in LPA for MVS/XA and MVS/ESA Sites

For sites that chose to install the SAS supervisor and product bundles into LPA/ELPA, it is recommended by SAS Institute Technical Support that the bundles remain in the SAS load library with their original names and the bundles installed into LPA/ELPA be renamed. There are two advantages to installing the bundles into LPA/ELPA in this manner:

1. All zaps for the SAS System can be applied as is to the SAS System load library.
2. After zaps have been applied to the SAS System load library they can be tested easily by using an entry parameter of SASHXAl and running the bundles out of the load library.

Instructions detailing the renaming procedure for supervisor bundles are documented in Section 3.2 (Step 3) of Customization Instructions for Base SAS Software, Release 6.06, under MVS. A summary of that procedure follows:

1. Change the ENTRY parameter value for the JCl cataloged procedure and TSO CLIST used to invoke the SAS System to the new name chosen for module SASHXAl.
2. The new name for module SASHXAl must be the same as the new name chosen for SASHXAl with a 2 appended to it. If the new name for SASHXAl is eight characters long, the 2 must replace the last character.
3. Change the default setting of the PSUP SAS system option from SASHXAl to the new name for SASHXAl.

Notice that the customization instructions recommend that sites not rename the bundles that are placed in LPA. This is because under MVS/370 certain bundles cannot be renamed. MVS/XA and MVS/ESA do not have this problem.

Two tasks must be accomplished to install the bundles in the suggested manner:

1. Copy the supervisor and product bundles into a separate load library where they will be installed into LPA at IPL time. The bundles will be renamed in this library.
2. Apply the zap referenced by Z6060720 to the renamed version of SASHXAl that resides in the separate LPA library.

A SAS execution using the PDS COPY procedure accomplishes the first task. The sample job step below illustrates executing PROC PDS COPY to first copy load modules from the SAS load library to the LPA library and then rename them:

```plaintext
PROC PDS COPY TO lib=global load. //
   libname=global load.;
```

The bundles remain in the SAS load library with their original names. The bundles installed into LPA/ELPA are renamed. The bundles can be moved into the LPA library to be used by the application.
As shipped, zap Z6060720 applies to module SASXAL and causes the SAS System load management subsystem to search for product bundles by names that are derived by taking the previous bundle name and appending the character 6 as a suffix. For example, the SABDS bundle is searched for by the name of SABDS6. To facilitate ease of maintenance and testing, the zap text should be modified to apply to the renamed version of SASXAL initially and whenever that module is refreshed in the LPA library instead of applying it directly to the original SASXAL. Below is a second job step to accomplish the second task of applying zap Z6060720.

Note that zap lines containing VERIFY ... have been edited to complete the customization based on the new name chosen for module SASXAL. As mentioned earlier, by default the character '6' (x'6') is appended as a suffix to each original bundle name. Any character may be chosen as a suffix by altering the REP data accordingly at offset x'e0'. Beware that any changes made to the REP data will result in an invalid CHECKSUM and therefore it is recommended that the default suffix character '6' be used. Whatever suffix is chosen, be sure that the product bundles are renamed accordingly in the LPA library to avoid load failures when the SAS System initializes.

Once the supervisor and product bundles have been copied from the SAS load library into the LPA library, renamed, and zap Z6060720 has been applied to the renamed SASXAL residing in the LPA library, the system programmer or appropriate staff members can install the modules into the LPA/ELPA using the standard procedure at your site. The two tasks above should be performed prior to the initial loading of the bundles into LPA/ELPA as well as following application of maintenance to any of the modules comprising the LPA bundled configuration prior to a refresh of LPA/ELPA.

CONCLUSION

Sites executing Release 6.06 of the SAS System under MVS/XA or MVS/ESA can select one of two bundling configurations. It is recommended that the MVS/XA (or ESA) LPA configuration be chosen (ENTRY=SASXAL) in order to experience the benefits of decreased working set size for individual SAS executions and decreased burden placed on the paging subsystem. There are five additional product bundles that may be placed in LPA/ELPA along with the three supervisor bundles. The suggested implementation for installing bundles in the LPA is that bundles remain in the SAS load library with their original names while bundles installed into LPA be renamed. This plan eases application of maintenance to the bundles and provides a method for testing the applied maintenance prior to refreshing the bundles in LPA.

Reference


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