

Running Clinical Trials Programs with Enterprise Guide

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ABSTRACT

Geographical distribution of SAS programming teams across continents and oceans impacts the access to study programs and data, so that it is only practical for local programmers to use direct GUI access to files, whereas remote programmers are forced to take copies of files onto their local systems to experience fast access. With Enterprise Guide (EG), as all the executed code and data is still located on the designated server, but the viewing and editing of files is done on the local PC, network traffic is dramatically reduced, reducing the impact of remote working. This paper describes the steps needed to use EG, instead of batch SAS, to run server-based study programs from anywhere in the world.

ENVIRONMENT SETUP

When a SAS session is started on the server using Enterprise Guide (EG), the current folder used is always the user's home folder by default, e.g. **C:\WINDOWS\System32, /home/user**, etc. To change the current folder to a study-specific location the SAS code below can be used, for example:

```
%sysexec cd
    /fileSPACE/product/indication/studynumber/analysis/final/tables/programs;

%sysexec setenv PWD
    /fileSPACE/product/indication/studynumber/analysis/final/tables/programs;
```

Any automatic initialisation programs that calculate locations based on the current path will now be able to set all the study-specific macro variables and allocate the library and filename references.

If an autoexec.sas program is being used to set the study-specific macro variables and allocate the library and filename references, then it must be started here too.

```
%include 'autoexec.sas' / source2;
```

CHANGES TO AUTOMATIC INITIALISATION PROGRAM

The only change required to the automatic initialisation program would be to alter the way the program name is obtained. In batch SAS sessions the program name forms part of the SYSPROCESSNAME macro variable, e.g. "Program report.sas". However, when submitted from EG, the SYSPROCESSNAME macro variable in the SAS session always contains "Object Server", with no program name at all. Fortunately the label of the EG code node submitted is stored in the _EGTASKLABEL macro variable. This label can be any string until the code is saved to disk, but, once saved, it is replaced by the name of the saved file.

Replace:

```
%let pgm = %scan(&sysprocessname, 2, %str( ));
```

with:

```
%if "&sysprocessname" = "Object Server"
    %then %let pgm = &_egtasklabel;
    %else %let pgm = %scan(&sysprocessname, 2, %str( ));
```

The code change in the automatic initialisation program above uses the _EGTASKLABEL macro variable, instead of the SYSPROCESSNAME macro variable, but only if the SYSPROCESSNAME macro variable contains "Object Server", so batch SAS sessions will not be impacted.

LIMITATIONS OF ENTERPRISE GUIDE SOFTWARE

- As EG acts as an editor and batch scheduler for separate SAS systems, it cannot be used to run SAS applications that have their own GUI interfaces or interactive features, e.g. SAS/AF, SAS/EIS, SAS/INSIGHT, SAS/ASSIST, SAS/GIS, SAS/Spectraview, etc. All processes should be considered to be batch jobs, in that they have no interactive facilities. However, the SAS code is actually running in a single SAS session on the selected SAS server, so, from the first code submission, WORK data sets, option settings and macro variables are retained until the end of the server session, or until they are manually deleted.
- The batch SAS processes can only return the following items back to EG:
 - SAS Log
 - SAS Output via ODS
 - SAS Graphs
- Although the EG user interface includes elements relating to Base SAS, SAS/STAT, SAS/GRAPH, SAS/ETS and SAS/QC, their applicability will depend on the SAS License installed on the SAS Server selected to run the code.

ACCESSING LOCAL SAS INSTALLATIONS

EG can be used as a point-and-click front-end to a locally-installed SAS system. This requires client SAS software to be installed on the Windows system, including the local version of SAS Integration Technologies, which is supplied as part of Base SAS. The only SAS component that must be licensed is Base SAS.

Accessing the locally-installed SAS system may require it to be registered using the **/REGSERVER** option on SAS.EXE, if the installation has not been installed into the default location, or if several different versions have been installed on the same PC. For automated installations, it is recommended that this registration is carried out even if the location is the default.

ACCESSING SERVER-BASED SAS INSTALLATIONS

A remote SAS server requires only Base SAS and SAS Integration Technologies to be installed and licensed to be accessed, although if SAS/STAT, SAS/GRAPH, SAS/ETS and SAS/QC are installed and licensed on the server, then they can have code generated for them by EG using standard Tasks. Other components can also be used, but will require direct coding in a SAS Code node to be executed from EG.

The remote SAS server must be configured using the SAS Enterprise Guide Explorer, which can be accessed from EG by clicking Tools > SAS Enterprise Guide Explorer. New servers can be added using the Server Wizard, which can be started from inside the SAS Enterprise Guide Explorer by clicking File > New > Server.... Each new server definition requires the following information: server name (user-defined, but must be unique), connection protocol (probably IOM), host address (either URL or IP address) and port number of the Object Spawner on the remote server.

WHY YOU CANNOT USE AUTOEXEC.SAS

EG communicates with the SAS System via a special interface component called SAS Integration Technologies. As the requests for SAS functionality are normally small and frequent, starting a full SAS session each time would be wasteful, and probably too slow. As a consequence SAS Integration Technologies only starts a minimal system which can be extended, if required, as the code is compiled. This minimal system does not include any 'autoexec' processing, so any processing required to be carried out prior to each request must be initiated using the **-INITSTMT** option. Therefore, the following option is the equivalent to the **-AUTOEXEC** option:

```
-INITSTMT '%INCLUDE "/home/user/autoexec.sas;"'
```

When using the Enterprise Guide Administrator, this **-INITSTMT** option is specified during the server setup screens by typing the following text in the SAS Server Startup Statements box on the Options tab:

```
%INCLUDE "/home/user/autoexec.sas";
```

As an alternative, the **-INITSTMT** option can be added to the **-sasCommand** option in the SAS Object Spawner configuration file.

WHY DO PLATFORM-SPECIFIC SYSTEM COMMANDS FAIL?

The starting parameters on the SAS Object Spawners that start the SAS server sessions can have an impact on the permitted functionality of the SAS code submitted to run on the server. Statements such as **X**, **%SYSEXEC**, **SYSTASK** and **CALL SYSTEM**, the **SYSTEM** function, and the **FILENAME** option **PIPE** will not work unless the **-ALLOWXCMD** or **-NONOXCMD** parameters are explicitly added to the Object Spawner configuration. However, the use of these options should only be permitted with great caution, as other platform-specific operating system commands can also be submitted from submitted SAS code, which could be dangerous when used by inexperienced or malicious users!

Note that even if you only run your SAS code on the Local Server, you will not be able to use statements such as **X**, **%SYSEXEC**, **SYSTASK** and **CALL SYSTEM**, the **SYSTEM** function, and the **FILENAME** option **PIPE**, unless you have

allowed operating system commands. The Local Server parameters are stored in the Windows Registry and can be changed as follows (NB. after a backup of the Windows Registry has been taken, as any manual updates of the Registry can impact the operation of Windows!):

1. To back up the Windows Registry, click Start > All Programs > Accessories > System Tools > Backup.
2. Select **Back up files and settings**, then click Next >.
3. Select **Let me choose what to back up**, then click Next >.
4. Expand My Computer, and select **System State**, then click Next >.
5. Click Browse to select a location for the backup, then click Save, then click Next >, and then click Finish to start the backup.
6. To edit the Windows Registry, click Start > Run, then type REGEDIT, and click OK.
7. Select **HKEY_CLASSES_ROOT** with **CLSID=440196D4**, then click the **LocalServer32** key.
8. Right-click Default, then click Modify.
9. Remove “-noxcmd”, which should be the last item in the list, then click OK.
10. Click View, then click Refresh.
11. Exit the Registry window.

CHANGING THE CURRENT DIRECTORY

When you start a server SAS session the current directory is always your home directory on the server platform, e.g. **C:\WINDOWS\System32** on Windows, or **/home/user** on Linux or UNIX. To change this to a different location you will need to have the ability to run operating system commands (see 'Why Do Platform-specific System Commands Fail?' above). Any of the 6 different techniques described are applicable:

1. **X** statement

On a Windows server:

```
OPTIONS NOXSYNC NOXWAIT;  
X 'd:; cd d:\data\lib';
```

On a Linux or UNIX server:

```
OPTIONS NOXSYNC NOXWAIT;  
X 'cd /data/lib';
```

2. **%SYSEXEC** statement

On a Windows server:

```
OPTIONS NOXSYNC NOXWAIT;  
%SYSEXEC d:;  
%SYSEXEC cd d:\data\lib;
```

On a Linux or UNIX server:

```
%SYSEXEC cd /data/lib;
```

3. **SYSTASK** statement

On a Windows server:

```
OPTIONS NOXSYNC NOXWAIT;  
SYSTASK COMMAND 'd:; cd d:\data\lib';
```

On a Linux or UNIX server:

```
OPTIONS NOXSYNC NOXWAIT;  
SYSTASK COMMAND 'cd /data/lib';
```

4. **CALL SYSTEM** statement

On a Windows server:

```
OPTIONS NOXSYNC NOXWAIT;  
DATA _NULL_;  
  CALL SYSTEM('d:; cd d:\data\lib');  
RUN;
```

On a Linux or UNIX server:

```
OPTIONS NOXSYNC NOXWAIT;  
DATA _NULL_;
```

```
CALL SYSTEM('cd /data/lib');  
RUN;
```

5. **SYSTEM** function

On a Windows server:

```
OPTIONS NOXSYNC NOXWAIT;  
DATA _NULL_;  
  rc = SYSTEM('d:; cd d:\data\lib');  
RUN;
```

On a Linux or UNIX server:

```
OPTIONS NOXSYNC NOXWAIT;  
DATA _NULL_;  
  rc = SYSTEM('cd /data/lib');  
RUN;
```

6. **FILENAME** statement with the **PIPE** option

On a Windows server:

```
FILENAME cmd PIPE 'd:; cd d:\data\lib';  
DATA _NULL_;  
  INFILE cmd TRUNCOVER;  
  INPUT;  
  PUT _INFILE_;  
RUN;
```

On a Linux or UNIX server:

```
FILENAME cmd PIPE 'cd /data/lib';  
DATA _NULL_;  
  INFILE cmd TRUNCOVER;  
  INPUT;  
  PUT _INFILE_;  
RUN;
```

GENERATING SAS CODE USING EG TASKS

All the GUI tasks in EG generate SAS code which can be submitted automatically, but use of the Preview Code option gives the user an opportunity to copy the generated code prior to submission and paste it into a separate SAS code node in EG to edit and run later.

AUTOMATICALLY SAVING LOGS TO DISK

By default, EG stores Logs inside the project file, and not to disk. However, it is possible to add an Export node to automatically save the Log to disk, either to a locally referenced folder using the Local Server, or to a folder connected to the Remote Server.

To create an Export node for a Log you must have already run the code and generated a Log:

1. Open the Project Explorer.
2. Find the Log you wish to Export and right-click it.
3. Click menu option Export > Export Log As A Step In Project...
4. Click Next >.
5. Select Log File (*.log) in the list and click Next >.
6. Click SAS Servers radio button and then click Edit...
7. Double-click the appropriate server from the list and find the correct folder, edit the filename and then click Save.
8. Click Next >.
9. Click Finish.

REFERENCES

- Philip R Holland, Chapter 6 of “Saving Time and Money Using SAS”, SAS Press, August 2007.

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This paper and associated sample SAS code can be downloaded from the Holland Numerics Ltd web site at:

www.hollandnumerics.com/SASPAPER.HTM

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