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Let the Schedule Manager Take Care of Scheduling Jobs in SAS[®] Management Console 9.4.

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ABSTARCT

Report automation and scheduling are very hot topics in many corporate industries. Automating reports have many advantages including reducing work load, elimination of repetitive tasks, generate accurate results and better performance. In recent years SAS [®] institute launched more powerful tools to present and share business analytics data across the world.

This paper illustrates stepwise process of how to deploy and schedule reports on server using SAS® Management Console 9.4. Many of us know that the scheduling jobs can be done using windows as well as server level and it is important to note that the server side scheduling has more advantages than scheduling jobs on windows. Windows scheduler invokes SAS® programs on local PC and more often subject to system crashes. The main advantage scheduling on server is most jobs scheduled run during nighttime facilities faster record retrieval and less load burden on database servers. Other advantages scheduling on server side are all scheduled jobs are at one location and it is also easy to maintain and keep track of log files if any scheduled jobs fail to run.

INTRODUCTION

Business reports are an integral part in any industry and the management uses reports to track progress towards various goals, predict trends, control expenditure and increase revenue. Most of the reports are generated by analysts using various software tools in information technology. SAS has an excellent report automation technology that includes advanced scheduling job servers.

In this paper we discuss on report automation team architecture and step by step process of how to schedule reports using schedule manager.

REPORT AUTOMATION TEAM

In order to maintain hundreds of reports those are scheduled on server would probably require systematic organizational set up such as report automation team who maintain scheduling jobs, reviewing SAS programs and setting up appropriate folders only can access secured end users. SAS Administrator can set permissions to report automation team in SAS Management Console to schedule programs using Schedule Manager. Below mentioned figure 1 give you an idea of report automation team architecture at corporate level. Report automation team review SAS programs received from analysts to make sure appropriate code logic that supports server, validate data elements and passing date time variable that SAS scheduler interprets correctly to pull required data elements from databases. It is also a good practice to maintain biasness requirement document for each program that need to schedule on SAS server. Use appropriate naming conventions for the SAS programs those need be scheduled on server as shown below.

(Schedule SAS Program Number)_ (Trigger Event)_(Report Name)_(Customer Name)_(Folder Number)

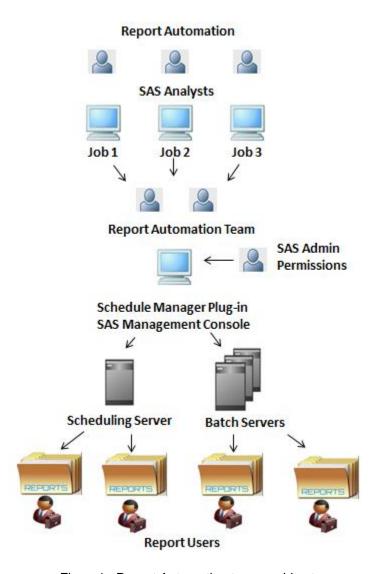


Figure 1. Report Automation team architecture

MANAGEMENT CONSOLE

The SAS scheduling tools enable you to automate scheduling and execute SAS jobs using SAS Management Console. SAS Management Console is a single point of control that is used through SAS business intelligence architecture to manage server definitions, libraries definitions, resource access controls and metadata repositories as shown below figure 2.

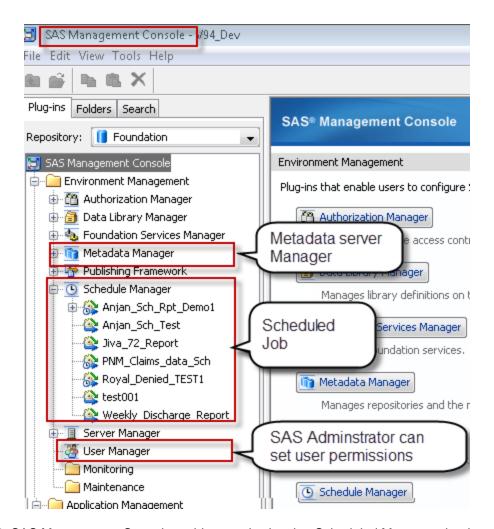


Figure 2. SAS Management Console architecture is showing Scheduled Manager plug-in and User Manager to setup user authentications by SAS Administrator.

When it comes to scheduling process, schedule manger is a plug-in component in SAS Management Console create job that need to be scheduled. Report automation team schedule SAS programs for automation and that job is placed in deployment directory and this job sent to either to SAS metadata server or directly to scheduled where scheduled manager can access them.

SCHEDULE MANAGER

The Schedule Manager is a SAS Management Console plug-in that works with scheduling servers to schedule jobs that you create in other applications. Using Schedule Manager you can schedule single SAS program or add flow which contains one or more deployed jobs for scheduling. You have greater advantage to create and edit dependencies for job flow in which you can define specific conditions based on time, other jobs or files that are placed on shred drives. SAS supports scheduling through five different types of scheduling servers in Schedule Manager. All below mentioned servers requires Schedule Manager In order to schedule jobs.

Platform Processes Manager Server provides full featured enterprise scheduling capabilities. It is a part of SAS Grid Manager to enable scheduling of SAS jobs across multiple machines in a SAS Grid environment.

Operating System Scheduling Server provides that ability to schedule jobs through the services provided through server operating system. This server provides basic level of scheduling at no additional cost involved as it comes with the software.

Distributed In-Processes Scheduling server also provides basic scheduling services for scheduling jobs directly from certain SAS applications.

In-Process Scheduling Server provides the ability to schedule jobs from certain web-based applications such as Web Report Studio without using separate server.

Oozie Scheduling Servers enables you to scheduling Jobs in a SAS Grid Manager for Hadoop environment. You can use this server to schedule SAS DATA step batch program.

In this paper we discuss on operating system scheduling that provides the ability to schedule jobs through server operating system. We discuss step-by-step process to schedule reports which includes database connections, using date time variable, adding conditional flow, adding one or more SAS programs and scheduling time events.

CONNETING TO DATABASES

SAS administrator can setup database connections using Server Manager SAS Management Console and create user authentication profile in User Manager. Report automation team can also use LIBNAME statements in SAS program and place this program as an include file in a secured folder in metadata server. Windows authentication team will assign directory permissions only to report automation team. Below mentioned example are showing LIBNAME statements connecting to Oracle, SQL server and SYBASE using generic user names and passwords. Database administrators should be able to set up generic user names and password accounts to connect various databases.

```
*---Establish connections to different databases---*;
%LET USER OR =generic user;
%LET PWD = generic password;
*---connect to ORACLE database---*;
LIBNAME ORACON oracle path="xxx" user="&USER OR" password="&PWD."
schema='xxx' READBUFF=1500;
*---Connect to SYBASE---*;
%LET USER SY = generic;
LET PWD SY = generic pws;
LIBNAME SYBCON sybase user="&USER SY" password="&PWD SY" db="xxx"
server="xxxxx" schema='xxxx';
*---Connect to SQL server---*;
%LET USER SQL = generic USR;
%LET PWD SQL = generic PWS;
LIBNAME SQLSVR odbc user="&USER SQL." password="&PWD SQL." DSN="JIVARPT"
schema='dbo';
```

After setting up of user authentication to include file, you can use below sample code in every SAS program that need to schedule on server. Note that NOSOURCE and SOURCE in OPTIONS statement specifies not to write SAS source to SAS log which eventually suppress user names and passwords in log file

```
*---Database connection code in SAS programs need to be scheduled---*;
OPTIONS NOSOURCE NOSOURCE2;
%include "\\SAS metadata server\folder location\databse_connections.sas";
OPTIONS SOURCE SOURCE2;
```

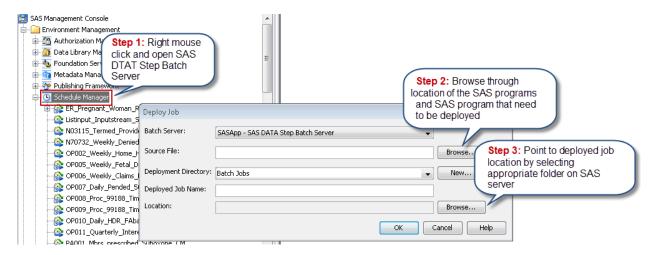
PASSING DATE VARIABLELS

After having appropriate connections to the databases to the metadata server, you need to parse date and time variable with reference to system date in SAS programs to retrieve data from databases. You can define date and time macro variable in DATA _NULL_ step and use as macro variable within PROC SQL or in DATA step. Below given examples showing to calculate month difference using today function, note that 'B' denotes for begin and 'E' denotes for end of the month. You can further explore more ways to define date time macro variable options in SAS help.

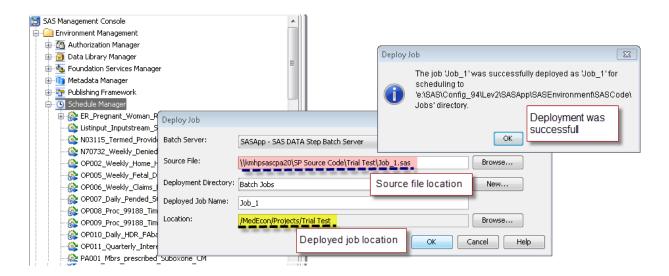
```
*---Month variable---*;
data null;
run date =today();
Begin dt =intnx('month', today(), -1, 'B');
end dt = intnx('month', today(), -1, 'E');
call symput("Rpt Start dt", trim(left(put(Begin dt,date9.))));
call symput("Rpt end dt", trim(left(put(end dt, date9.))));
run;
proc sql;
create table table1 as
select variable
from your table joins
where DOS between "Rpt Start dt." and "Rpt End dt.";
quit;
proc sql;
create table table2 as
select variable
from your table joins
where DOS >= between intnx("month", today(), -1, 'B')
and DOS <= intnx("month", today(), -1, 'E');</pre>
quit;
*---weekday---*;
proc sql;
create table table2 as
select variable
from your table joins
where DOS between Date()-7 and Date()-1;
quit;
```

DEPLOYMENT OF SAS PROGRAMS

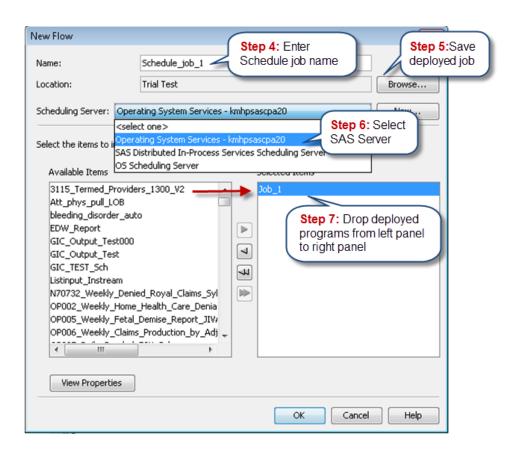
In order to schedule a job, you can follow below mentioned steps provided in screenshots. To deploy a SAS job, select Schedule Manager plug-in, and then select SAS DTAT step batch server from actions menu, the pop-up-menu, or the toolbar. The Deploy Job window appears as shown below.



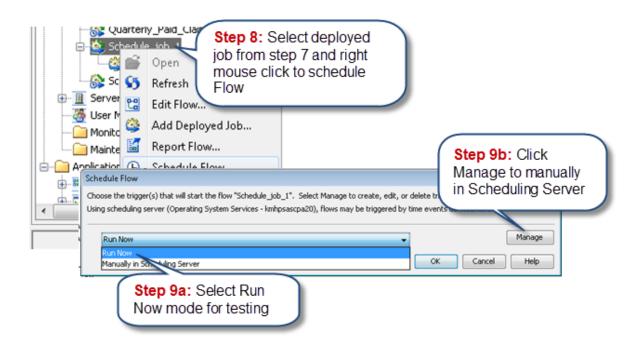
Find source file location where original SAS programs that need to be scheduled on server. Add deployment job name and location in metadata server.



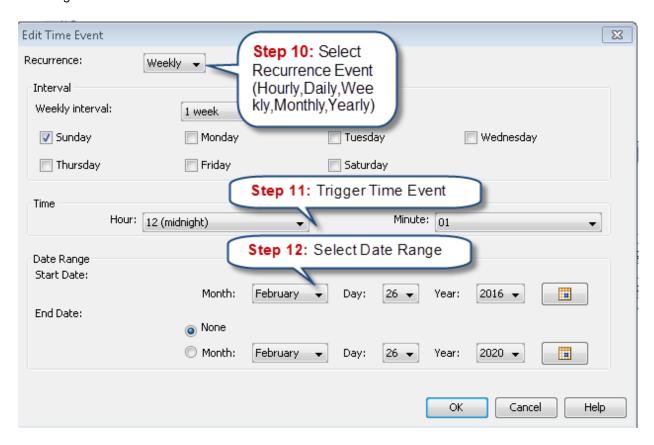
Once you find SAS jobs location then system prompts with notification that the deployment job was successful. Next step is to go to main navigational tree to select New Flow and follow step by step instructions below screenshot.



Under New Flow panel you can give a name and location where deployment job need to be stored. Select scheduled sever that is already configured on your system. Under available items panel you can select one or more SAS jobs need to be scheduled as shown in step 7.



After completing deployment you can schedule reports by selecting Schedule Flow under Schedule manager. You have an option to Run Now mode for testing purpose or schedule day and time trigger events by selecting New Time Event window. Finally, you can setup recurrence of trigger events by selecting date and time as shown below.



CREATING FLOW

Schedule Manger has excellent scheduling capabilities by creating a flow, and then adding one or more jobs to flow. Flow is a group of jobs and dependencies. You can create a flow from navigational tree and select New Flow form actions menu. In the New Flow Window provide a name and location of the flow. Then select server from drop-down list for Scheduling Servers. In Available Items field lists all the jobs that have been defined and deployed for scheduling. Select a job and use arrow to move the job to selected items list to include as shown in below Figure 3. After you have created flow, you can specify dependencies for the flow. You can Add File Event from Action under menu bar then the New File Event dialog box appear in which you can specify the information required define the file event. You can use conditional statement by adding Add Gate Node.

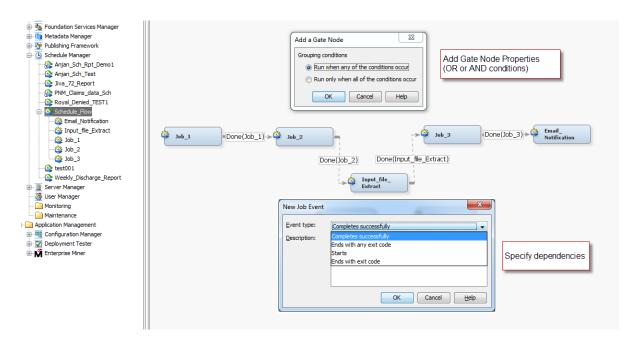
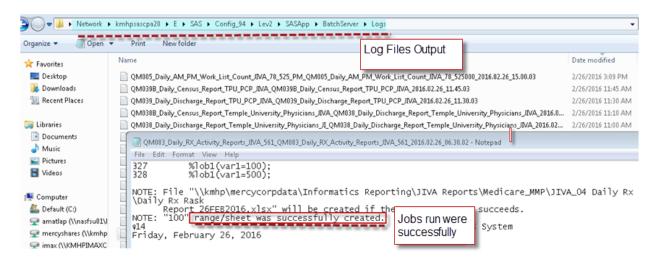


Figure 3. Creating a Flow showing job dependencies and Gate Node option

MONITOR THE SCHEDULED JOBS

There are several ways to monitor scheduled jobs on server, when SAS server triggers any SAS job on server generates log files in metadata server location. You can review log file for each job and troubleshoot if any easy fixes that need to be corrected in original program or send this log file to analysts who were originally owned or created SAS program to fix errors.

Log file path: \kmhpsascpa20\E\SAS\Config_94\Lev2\SASApp\BatchServer\Logs



Other way to monitor scheduled jobs, you can add auto email code either scheduled jobs runs successfully or you can add conditional email code to notify if scheduled job runs successfully or fails with errors. Schedule Manager also has an option to send email upon completion of flow.

REDEPLOYMENT AND EASY FIXINGS IN SHEDULED JOBS

Redeployment or rescheduling a report that have been previously scheduled is an easy task, you can open SAS program as text file and implement changes wherever is needed then save program and go to Scheduled Manger right mouse and select redeploy option. In some scenarios, you may need to completely delete deployed job from metadata server and redeploy scheduled program that you have been previously scheduled.

You have an option to unscheduled scheduled jobs in Schedule Manager. You also have option to delete existing job by deleting deployed jobs in metadata server folder or you can delete jobs on a flow and relink current flow.

SCHEDULING ENTERPRISE POINT AND CLICK PROGRAMS

SAS programs generated by Point and Click method should be converted as SAS code before scheduling on SAS server. You can convert Point and Click program as a single modular SAS code by choosing given options under Export drop list as shown below figure 4. You can organize SAS code in as sequential order by removing unnecessary system generated code and pass any necessary prompt values that are used in the code.

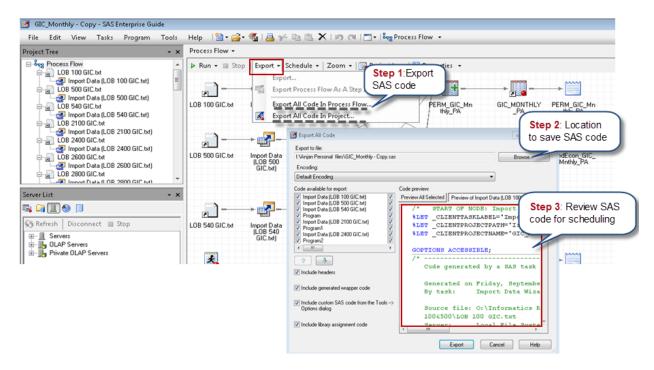


Figure 4.Steps showing to convert Point and Click SAS program into a single SAS program for scheduling

PLATFORM LOAD SHARING FACILITY (LSF)

LSF job scheduler for SAS provides a wide array of features to schedule, monitor and the process of data warehouse jobs. SAS Gird Manager supports LSF that handles the load balancing and execution of batch commends. Platform LSF manages and accelerates batch workload processing for computes and data intensive applications.

BATCH SERVER

Batch Servers provide the command needed to run the programs that have been submitted for scheduling. SAS supports basic three types of servers one is SAS JAVA Batch Server, second is SAS DATA Step Batch server and the third one is SAS Generic Batch server, each of which provide the command to run a schedule SAS job from a specified application in specific environment.

CONCLUSION

Report automation is great asset in any corporate industry once step up is done then reports are automatically generated and distributed to all necessary end users. In this paper we discussed all possible options to automate reports and SAS analysts can certainly take advantage by scheduling their programs on SAS server this will free up their work and help to concentrate other high priority tasks.

REFERENCES

Laura Liotus. Scheduling Your SAS Jobs & Go with the Glow. SAS Global Forum: 359-2012.

Anjan Matlapudi. Let SAS Handles Your Job While You are Not at Work. Global SAS Forum: 1702-2014.

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