

While You Were Sleeping - Scheduling SAS® Jobs to Run Automatically

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ABSTRACT

If you are tired of running the same jobs over and over again, this paper is for you. The Windows operating system is often viewed as strictly interactive in that a job is expected to run immediately when it is submitted. However, there are several options for scheduling SAS® jobs to run at a later time and on a repetitive basis. This paper will discuss how to use these options and how they have changed with recent versions of Windows. Scheduling issues related to Data Warehouse Administrator will also be discussed. The primary focus of the discussion will be its interaction with the Windows operating system.

By using one of the scheduling options discussed, you will no longer have to remember to submit a job at the proper time or get up in the middle of the night to start your jobs. Let Windows take care of all that for you, while you are sleeping.

INTRODUCTION

Production numbers are input every night at eleven, at the end of the night shift. The boss wants an up-to-date production report on his desk when he arrives at 7:30 each morning. You've written a program using SAS® for Windows to provide the desired information but you are not looking forward to getting up an extra hour earlier so you can run that report. But what else can you do?

Hit the snooze button one more time. There are some utilities native to Windows that give you the ability to schedule your PC SAS® jobs to run whenever you want.

A BRIEF HISTORY

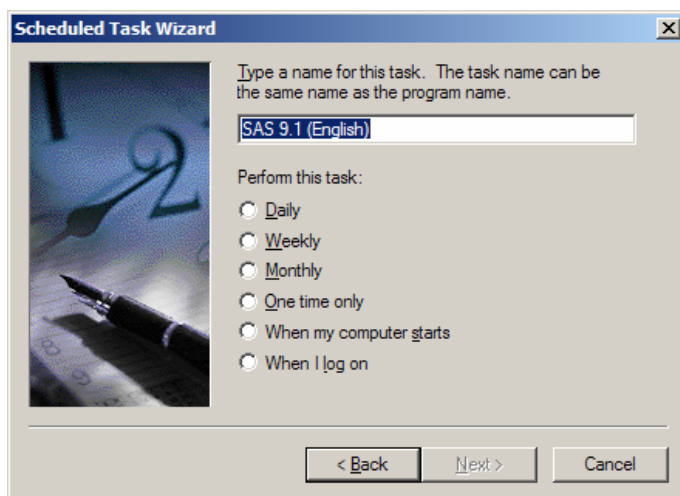
Scheduling capability was first provided as an integral part of Windows NT. In the Windows NT family, the task scheduler was lovingly referred to as the AT command. Unlike its modern counterparts, the AT command did not come with a wizard or graphical interface. Instead, it was configured completely from the DOS command prompt. The graphical scheduling utility was first provided with the Plus pack for Windows 95. However, beginning with Windows 98, the Scheduled Task Wizard is automatically installed when you install Windows. Throughout the remainder of this paper the term "Task Scheduler" will be used to refer to the Scheduled Task Wizard or Scheduled Tasks interface. With Windows 2000 the capability was introduced to allow the Task Scheduler to monitor and manage jobs scheduled through the AT command.

The coexistence of the Task Scheduler and the AT command has not been a completely peaceful one. If any parameters of an AT job were changed using the Task Scheduler, the AT job was automatically converted to a Scheduled Task. As a Scheduled Task, the job was no longer accessible for monitoring or management using the AT command. This caused problems with SAS/Warehouse Administrator® because the warehouse administrator interface uses the AT command to schedule its jobs on the Windows platform. The warehouse administrator would lose control of any job modified using the Task Scheduler. Microsoft has attempted to remedy this situation in Windows XP/2003. AT commands now appear as "Read Only" when opened with the Task Scheduler. You can view the parameters and status of the AT jobs using Task Scheduler but cannot make any changes. The AT command still exists in the latest versions of Windows but Microsoft has released a new command line tool called SCHEDULE that is intended to replace the AT command. SCHEDULE is compatible with the Task Scheduler graphical interface. For more information on SCHEDULE, see Microsoft Knowledge Base article 814596.

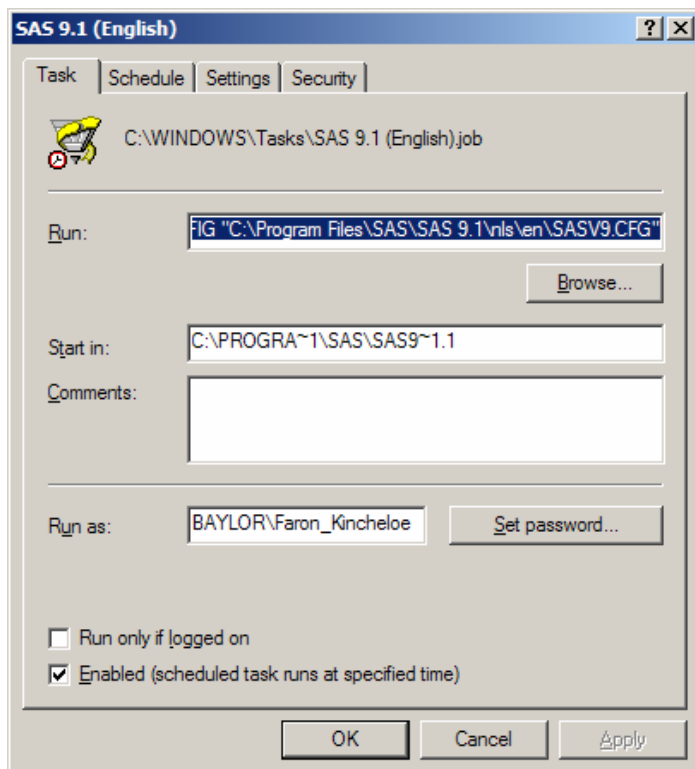
USING TASK SCHEDULER

The "Task Scheduler" utility can be accessed most quickly by double-clicking on the Scheduled Tasks icon in the Windows control panel (if you are using the Classic View mode of control panel in Windows XP). If you are opening the control panel using the Category View of Windows XP, you will find Scheduled Tasks under the Performance and Maintenance category. The Task Scheduler is also available through the click path Start – Programs – Accessories – System Tools. In order to use the Scheduled Task Wizard to create a scheduled task on a Microsoft Windows Server 2003-based computer, you must be a member of the Administrators group, the Backup Operators group, or the Server Operators group on the local computer. If you are running Windows 2000 or greater in an enterprise that uses Active Directory, it is possible that your system administrator has used group policies to disable the Task Scheduler.

When the Scheduled Tasks window opens double-click on the Add Scheduled Task icon to launch the Task Wizard. When the Task Wizard appears, you will be prompted to click Next to continue. Be aware that after you click next it may take several seconds for the wizard to search your computer for applications that are available for scheduling. Scroll down the list until you find "SAS 9.1 (English)" or the appropriate version of SAS®. If you do not see SAS listed click on the Browse button and locate the SAS® executable (SAS.exe) that you will be using to execute your program. After SAS has been selected and you have clicked Next, you will see a screen similar to the one shown below. The choices to perform the task daily, weekly, or monthly can be somewhat misleading. The daily selection provides additional choices for every day, weekdays, or every so many days. The weekly selection allows you to choose the number of weeks between each time the job is run and to select the specific days of the week on which to run the job. The monthly selection allows you to choose the day of the month based on date such as the 3rd day of the month or based on a weekday such as the last Friday of the month. This selection also allows you to choose the specific months in which the task is to be performed. One improvement of the Task Scheduler over the AT command is the ability to schedule a job to run when the computer is started up or when you log in. This is convenient if you need to start a program such as the Job Spawner that isn't set up to run as a Windows Service.



Start by changing the name of the task to something that is more specific to the program being scheduled. This is especially significant if you plan to schedule more than one SAS® job on your computer. Select the frequency at which the task is supposed to be performed and click Next to continue with the configuration. The next screen allows you to provide additional time and date parameters for when the job will run. You may be presented with a screen asking you to supply a user name and password. Beginning with Windows 2000, a "Run As" feature is provided that allows you to supply a user name and password for the scheduled task. For instance, you may want to schedule a job that accesses data that you cannot access from the account you normally use to log in. You could supply an authorized account in the "Run As" field and schedule the job without having to log out and log back in with the authorized account. Make sure the account you specify has sufficient rights to perform the task that you are scheduling or the task will not complete successfully. On the final screen that appears, there is a check box labeled, "Open advanced properties for this task when I click Finish." Be sure to check this box as it will take you directly to a screen that allows you to specify your specific SAS® program. A window similar to the one below should appear:



If you selected SAS® from the list, the text in the Run box may also include a parameter that points to your SAS® configuration file. Use a single mouse click to get a cursor at the end of all the text in the Run box. Make sure none of the text is highlighted before you begin to type. Add a space and then the word `-sysin`. Follow this with another space and the complete path to your SAS® program inside quotes. For example:

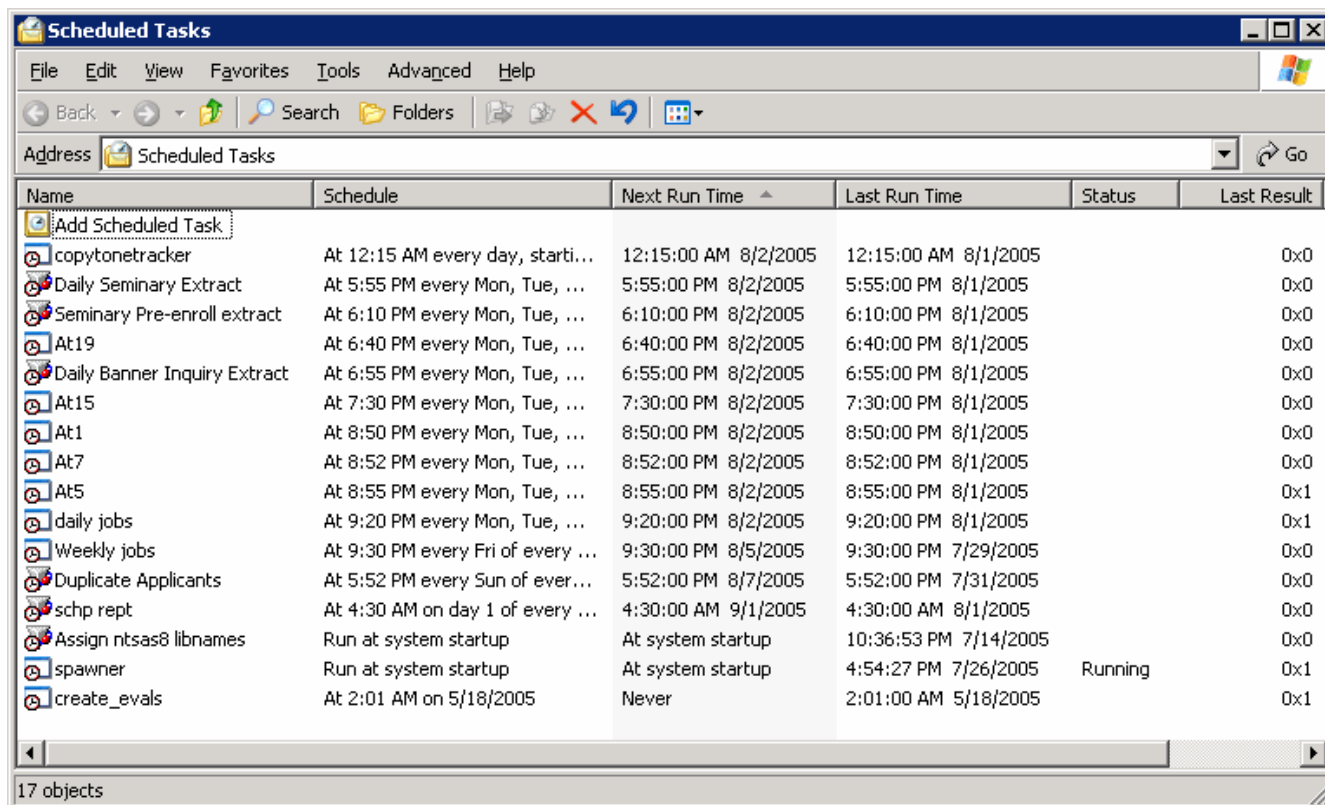
`-sysin "C:\My Documents\SAS programs\Production Report.sas"`

The sysin parameter tells SAS® what program to run when it is launched by the scheduler. The quotes are essential or the scheduler will interpret spaces in the path as delimiters between commands. You could also add other system options such as –log and –print to redirect the log and listing output respectively; however, this makes the command line extremely long and cumbersome. By default, the log file and listing output are saved in the folder where SAS® is installed or in the folder specified in the “Start In:” box. It is recommended instead to use proc printto and other options inside the SAS® program whenever possible.

Do not use mapped drive letters in any path statements for scheduled jobs. Unless you are logged on and the scheduled job starts in your Windows session, the mapped drive letters will not be assigned. If you must access programs or data from network shares use the UNC path instead of the drive letter.

Use the settings tab of this advanced properties window to configure other controls such as whether the computer should wake up to run the program. Clicking OK will close the window and add an icon for the job in the Scheduled Tasks folder.

A sample Task Scheduler window is shown below. This example shows a number of jobs scheduled using the procedure described above as well as a number of jobs scheduled through the SAS/Warehouse Administrator® using the AT command.



DATA WAREHOUSE ADMINISTRATOR

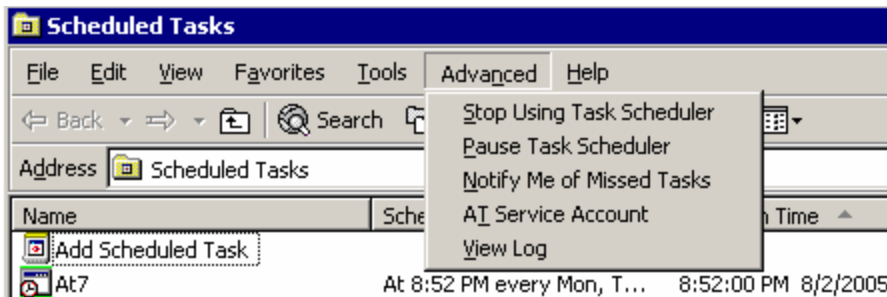
The SAS/Warehouse Administrator® software does not have an integral scheduler. However, it can serve as a front end or graphical interface for the AT command on Windows server systems and for the cron command on Unix systems. Job scheduling in this environment is intended to automate the loading of data into the warehouse rather than facilitate stand-alone jobs as described in the preceding sections. The jobs scheduled by the warehouse administrator will contain code that is generated as the load process is configured for your data warehouse tables. Job scheduling is integrated into the creation of the load process.

It is assumed that the reader has a basic familiarity with the structure of a data warehouse and navigation within the SAS/Warehouse Administrator® software. Rather than reproducing SAS® documentation in this paper, let me refer you to Chapter 15 of the SAS/Warehouse Administrator® User's Guide, Release 2.0.

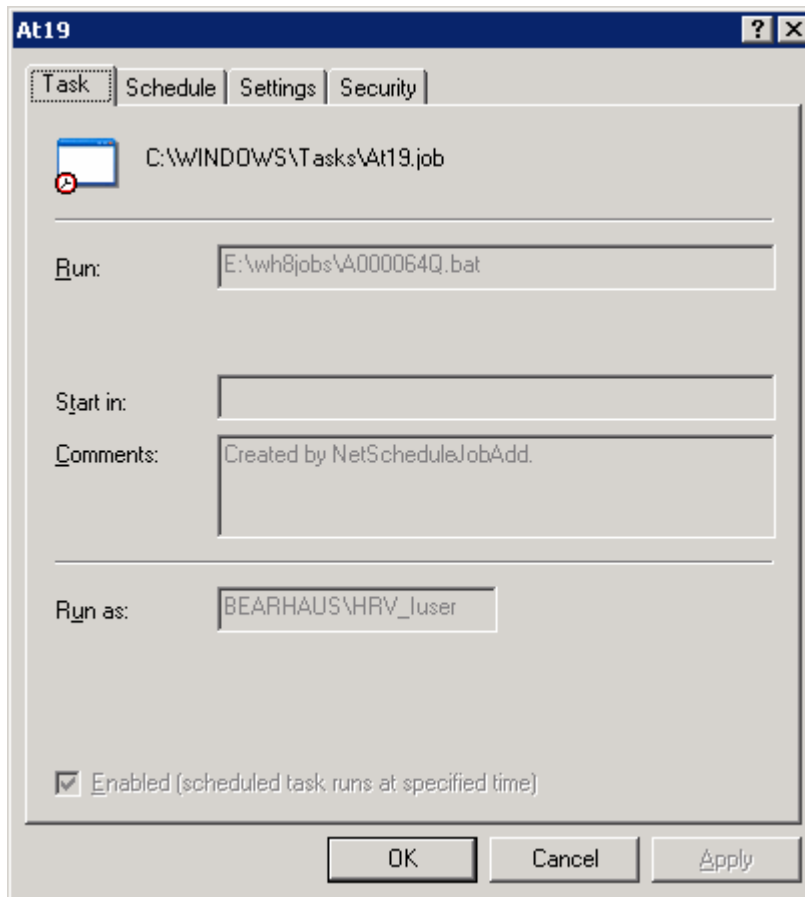
Before SAS/Warehouse Administrator® can generate code to schedule a job, the following tasks must be completed.

1. Define the scheduling server where the job will run.
2. Define an appropriate Jobs Information library.

Jobs submitted through the AT command, by default, run under a system account. If any file level security has been used to protect your data warehouse, it is very likely that the default account does not have sufficient access rights to successfully run the scheduled jobs. It is recommended that, before scheduling any load processes, you change the default AT account to an account that has the necessary access level. The account is changed by opening the Scheduled Tasks window, clicking on the Advanced menu item, and clicking on AT Service Account as illustrated in the figure below.



Data Warehouse Administrator first creates a SAS® program. Then it creates a batch file to launch the SAS® program. It then uses the Windows AT command to schedule the batch job. The batch file is necessary because the AT command has a 255 character limit which is easily exceeded by long path names and job parameters. The example below shows the properties of a job scheduled by the warehouse administrator. These properties are displayed by opening the Scheduled Tasks window, right clicking on a job, and selecting **Properties** from the popup menu. Notice that all of the parameters are grayed out because Windows 2003 does not allow AT jobs to be edited through the Task Scheduler.



The Run line shows the name of the batch file that will be executed at the scheduled time. The line below shows the contents of the batch file, all created by the SAS/Warehouse Administrator® software:

```
"E:\Progra~1\Sasins~1\sas\V8\sas.exe" -sysin "E:\wh8jobs\A000064Q.sas" -log
"E:\wh8jobs\A000064Q.log"
```

Observe that the batch file, the SAS® program and the log file have the same basic name. These names are also generated automatically by the SAS/Warehouse Administrator® software.

THE AT COMMAND

With the ease and power of the Scheduled Tasks Wizard and the release of SCHEDULETASKS.exe, there is little reason to choose the AT command for scheduling jobs. However, a discussion of the AT command is included here to provide the reader with some insight into what goes on behind the scenes of SAS/Warehouse Administrator®. Although not recommended, the procedure below could be used to alter or verify a task scheduled by SAS/Warehouse Administrator®.

As mentioned earlier the AT command is configured completely from the DOS command prompt. A DOS command prompt window

can be opened by clicking on Start, then Run, typing the word **command** or **cmd** in the Open text box, and clicking OK. Simply type in AT and press enter to get a listing of all of the jobs that are currently active. Typing in the command shown below will display all of the options available for the AT command:

AT /?

In order to use the AT scheduler, it is essential to understand how Windows converts long folder names to 8 character names for backwards compatibility. First, the spaces are removed from the name. Then the name is shortened to only the first six characters. Finally, the tilde (~) and a number are added to complete the 8 characters. The number will be 1 (one) unless a folder with that name already exists. If the name exists the number will be incremented until a unique name is created. For example, the Program Files folder will be called Progra~1 when used with the AT command. For a full explanation of long filename conversion see Microsoft Knowledge Base article #101601.

A scheduled job is created by entering AT followed by the time, occurrences, date and the command to be executed. Time should be entered in 24 hour military time format (i.e.: 22:00 for 10pm). The number of occurrences is specified by the keyword /next: or /every:. Use /next: to schedule the job to run only once. Use /every: for repetitive jobs. The date must immediately follow the colon. It may be a day of the week or a day of the month. Multiple days are separated by a comma. To conserve space, use only the first letter or two of the day's name. Sa and Su are used to distinguish between Saturday and Sunday. For the day of the month, simply enter the number. This is followed by the full path of the command to be executed. As with the Scheduled Task Wizard, the -sysin switch is used to specify the specific SAS® program to be executed. Since there is a 255 character limit, you may have to store your SAS® programs in a folder that is near the root (C:\) in order to save space. The following command would be entered to schedule our program to run every Tuesday and Thursday at 9:00pm:

```
AT 21:00 /every:Tu,Th c:\progra~1\sasins~1\sas\v8\sas.exe -sysin
C:\MyDocu~1\SASpro~1\Produc~1.sas
```

Windows will automatically assign a number to the job. You will see this number when you use AT to display the active jobs. You will need to use this number in the command line if you want to delete the job from the active list.

LSF SCHEDULER

On August 14, 2001, SAS announced that it had begun shipping Platform Computing's LSF JobScheduler with SAS/Warehouse Administrator® software Release 2.2. LSF JobScheduler for SAS works in conjunction with SAS/Warehouse Administrator. LSF JobScheduler for SAS provides a wide array of features to schedule, monitor, and analyze the processing of data warehouse jobs. Since the focus of this paper is primarily on native Windows utilities and LSF JobScheduler is intended to be used specifically with SAS/Warehouse Administrator®, LSF JobScheduler is beyond the scope of this paper.

CONCLUSION

The Windows operating system includes powerful tools which can be used to schedule jobs to run automatically without purchasing additional software. A little time spent familiarizing yourself with the available utilities will pay great benefits the next time your SAS® jobs run while you are sleeping.

REFERENCES

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