

Presenter Information

Bin Liu is a senior Research Programmer in the Department of Public Health Sciences at Henry Ford Health System. She has been involved in data mining, cleaning, dataset output and analysis in numerous health and healthcare-related research projects. She graduated from a medical school in China (MD equivalent), holds a PhD degree in Physiology and a Master in Public Health degree. She is a SAS certified Base and Advanced Programmer for SAS 9 and has been using SAS for 7 years.



Automating SAS Program Execution using the Scheduling Tools on Windows Systems

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Outline

□ Introduction

- SAS automation and scheduling

□ Methodology

- Execute SAS program automatically using the scheduling tool on Windows systems



□ Summary

INTRODUCTION



SAS Automation

□ Advantages

- Eliminate repetitive tasks
- Improve efficiency
- Increase productivity
- Reduce workload
- Improve accuracy
- Improve output quality

□ Disadvantages

- Additional training and technical help may be needed
- Maybe affected by the downtime or system failure

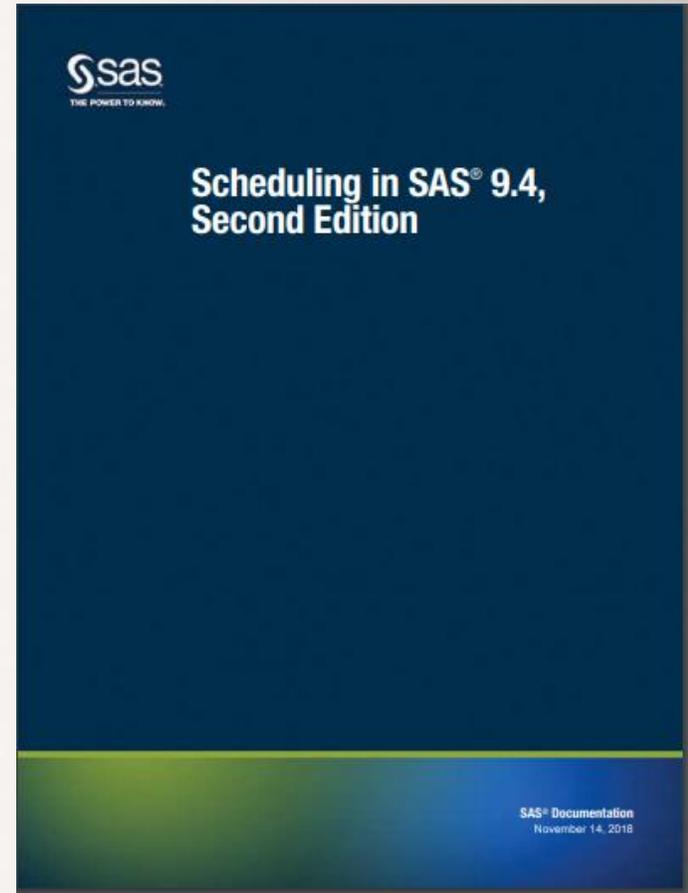
SAS Scheduling Tools

❑ SAS Management Console

- Scheduler Manager plug-in
- Operating system scheduler
- Server Enterprise license
 - Determining SAS components licensed
 - **proc setinit; run;**

❑ Platform Suite for SAS

- Process Manager
 - job scheduler owned by SAS
- More advanced scheduling capabilities
- Extra cost on license and additional software



SAS Scheduling Tools

□ **BASE SAS**

- Batch file
- Operating system scheduler
 - **Windows: Task Scheduler**
 - UNIX: Cron
 - z/OS: Job Entry Subsystem

□ **SAS Enterprise Guide**

- Built-in Enterprise Guide Scheduler
- Schedule project or program followed by File -> Schedule project
- Operating system scheduler

METHODOLOGY

Steps to Execute SAS Program Automatically

- ❑ Creating a batch (.bat) file
 - Containing the instructions to execute the SAS programs
- ❑ Launching the batch file by using the Windows Task Scheduler
 - Steps to schedule a task
- ❑ SAS programs for automatic data extraction
 - Key SAS sections



Batch (.bat) File

- ❑ A text file saved with the .bat file extension
- ❑ Can be written using Notepad or any other text editor
- ❑ Stores operating system commands in a serial order
- ❑ Supported by many operating system, such as Windows, Unix and z/OS
- ❑ Read by the shell program (command.com, cmd.exe etc) to execute its commands

Batch (.bat) File Example

REM Heart Failure study

"C:\SAS94TS1M2\SASFoundation\9.4\sas.exe"

-sysin "C:\Study_folder\HeartFailure_Data.sas"

-SASUSER "C:\Users\bliu\Documents\My SAS Files\9.4\94u2"

-log "C:\Study_folder\HeartFailure.log"

-print "C:\Study_folder\HeartFailure.lst"

Comment line

Instruction to open SAS

Path to the SAS program location

Permission to login SAS Server

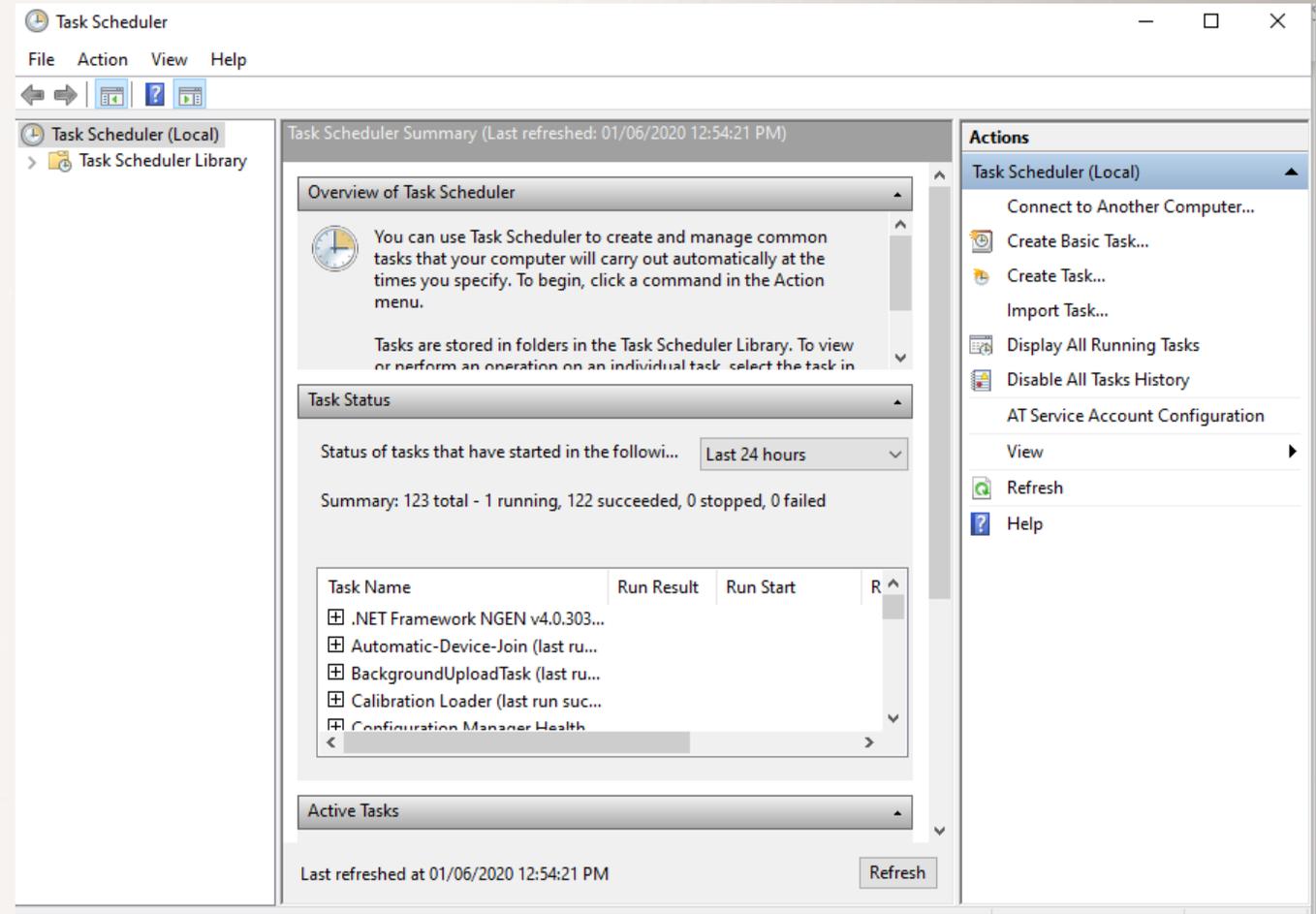
Path to the log file location

Path to the output file location

All codes should be on a single line.

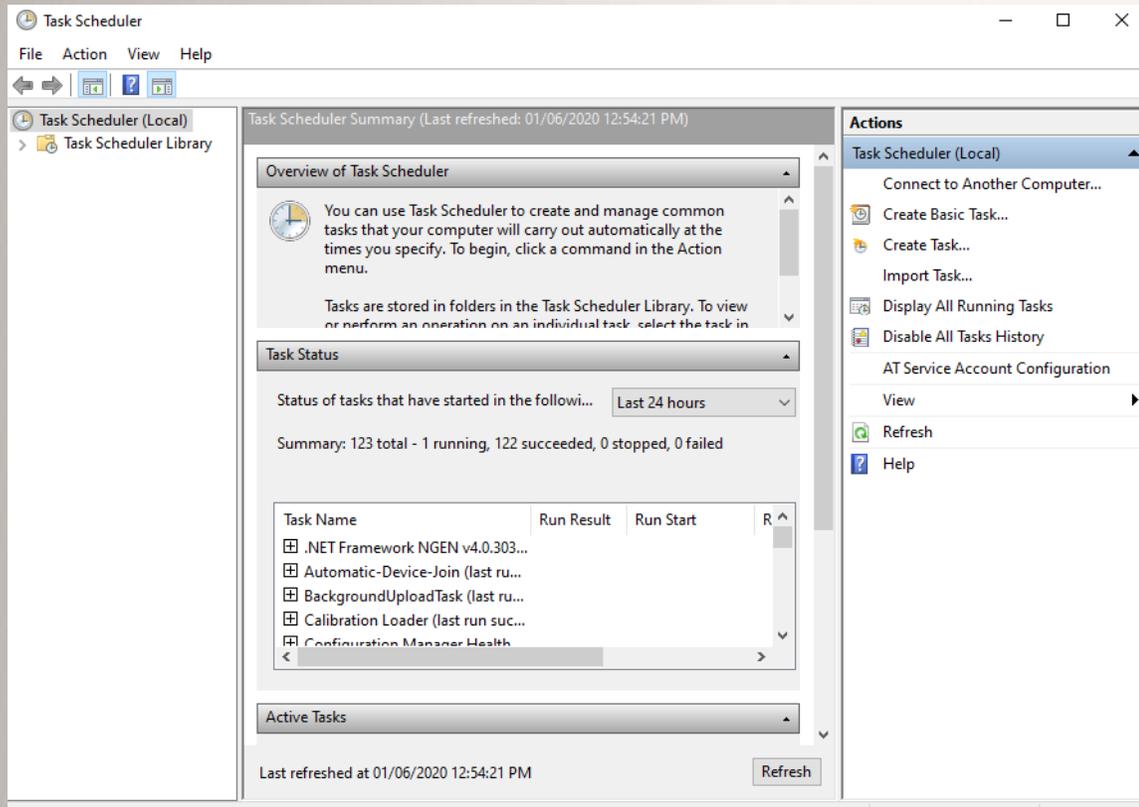
Task Scheduler

- ❑ A component of Microsoft Windows
- ❑ Provides the ability to schedule the launch of programs or scripts
- ❑ Administrative admission may be needed to set up the scheduling tasks

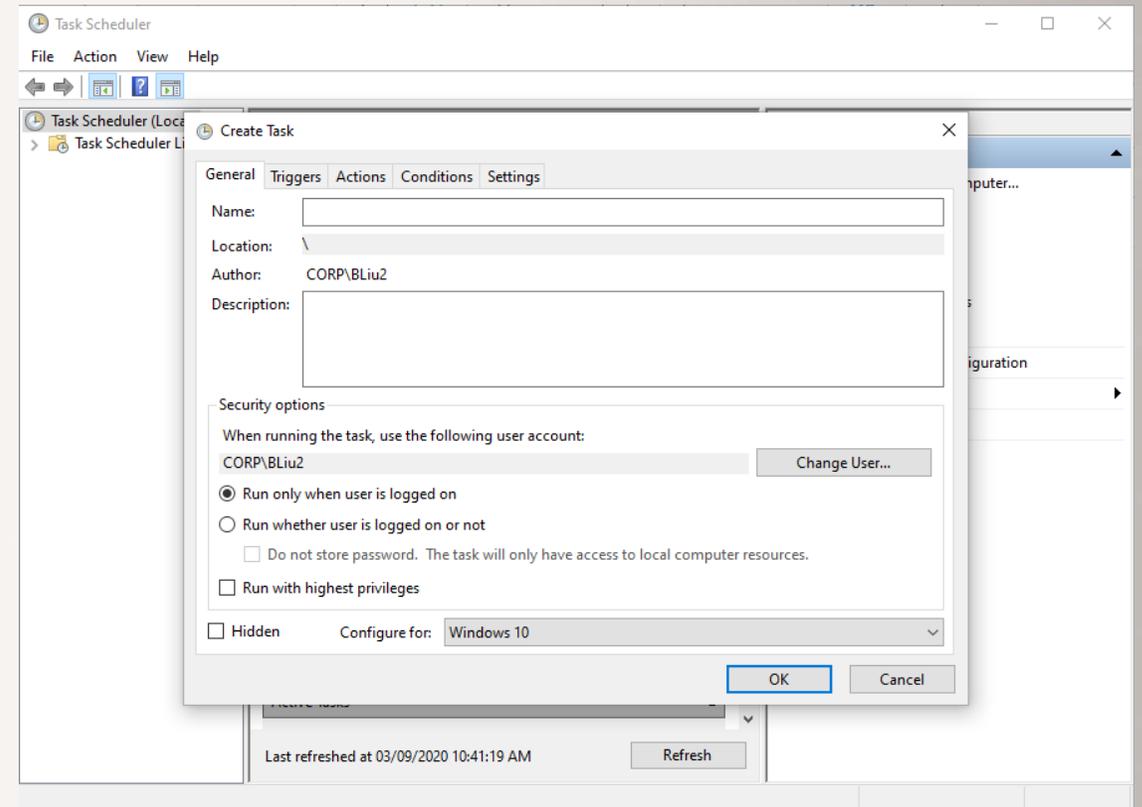


Launch the Batch file using Task Scheduler

1. Select Create Task



2. Type in the task name



Launch the Batch file using Task Scheduler (Con'd)

3. Select the option in the Tigger

The 'New Trigger' dialog box is shown with the following settings:

- Begin the task: On a schedule
- Settings:
 - One time:
 - Daily:
 - Weekly:
 - Monthly:
- Start: 03/09/2020 10:47:16 AM Synchronize across time zones
- Recur every: 1 weeks on:
 - Sunday:
 - Monday:
 - Tuesday:
 - Wednesday:
 - Thursday:
 - Friday:
 - Saturday:
- Advanced settings:
 - Delay task for up to (random delay): 1 hour
 - Repeat task every: 1 hour for a duration of: 1 day Stop all running tasks at end of repetition duration
 - Stop task if it runs longer than: 3 days
 - Expire: 03/09/2021 10:47:16 AM Synchronize across time zones
 - Enabled:

4. Start a Program and select the batch file

The 'New Action' dialog box is shown with the following settings:

- You must specify what action this task will perform.
- Action: Start a program
- Settings:
 - Program/script: Browse...
 - Add arguments (optional):
 - Start in (optional):

Launch the Batch file using Task Scheduler (Con'd)

Options in the Conditions

General Triggers Actions **Conditions** Settings History

Specify the conditions that, along with the trigger, determine whether the task should run. The task will not run if any condition specified here is not true. To change these conditions, open the task property pages using the Properties command.

Idle

Start the task only if the computer is idle for: 10 minutes
Wait for idle for: 1 hour

Stop if the computer ceases to be idle
 Restart if the idle state resumes

Power

Start the task only if the computer is on AC power
 Stop if the computer switches to battery power
 Wake the computer to run this task

Network

Start only if the following network connection is available:
Any connection

Options in the Settings

General Triggers Actions Conditions **Settings** History

Specify additional settings that affect the behavior of the task. To change these settings, open the task property pages using the Properties command.

Allow task to be run on demand

Run task as soon as possible after a scheduled start is missed

If the task fails, restart every: 1 minute
Attempt to restart up to: 3 times

Stop the task if it runs longer than: 3 days

If the running task does not end when requested, force it to stop

If the task is not scheduled to run again, delete it after: 30 days

If the task is already running, then the following rule applies:
Do not start a new instance

Check out the “Task Status” to see whether it was successful

Key Sections in the SAS program

- Date/time macro for path, log, dataset, program and others
- Create directory structure and work library
- Create a study folder if not exist
- SAS codes for data extraction and output
- Save the log

Date/time macro

```
/* get the date the data is to be pulled for */
%let StartDate=%sysfunc(intnx(month,%sysfunc(today()),-1,beginning));

%let EndDate=%sysfunc(intnx(month,%sysfunc(today()),-1,end));

/* get year and month of the data pull */
%let yrDate=%sysfunc(year(&StartDate));
%let mmDate=%sysfunc(putn(%sysfunc(month(&StartDate)),z2.));
%let yymm = &yrDate._&mmDate.;
```

Create directory structure and work library

```
%let letDir = &yymm._Data;  
  
%let output = \\test\output;  
%let location = &output.\&letDir. ;  
  
libname output "&location." ;  
  
/* Set options. */  
*OPTIONS Mlogic symbolgen Mprint;
```

Create a study folder if not exist

```
options noxwait xsync;

%MACRO mkDir();
    %IF %SYSFUNC(fileexist("&location.")) = 0 %THEN %DO;
        x "mkdir &location.";
    %END;
%MEND;

%mkDir();

/* noxwait = the command processor automatically returns
    to the SAS session after the command is executed*/

/* xsync = the operating system command execute
    synchronously with the SAS session*/
```

Data extraction and output

```
proc sql;  
    create table output.pat_list as  
    select distinct a.pat_id, a.birth_date  
    from clarity.patient a  
    inner join clarity.pat_enc b on a.pat_id = b.pat_id  
    where datepart(birth_date) between &StartDate and &EndDate;  
quit;
```

```
PROC EXPORT DATA= output.pat_list  
            OUTFILE= "&output.\pat_list.txt"  
            DBMS=TAB REPLACE;  
PUTNAMES=YES;  
RUN;
```

Save the log

Beginning of the SAS program

```
/* get date to add to log filename */  
%let runDate=%sysfunc(putn(%sysfunc(today()), yymmddn8.));  
%put &runDate;  
  
/* output to log */  
PROC printto log="\\test\test_log&runDate..log";  
run;
```

End of the SAS program

```
/* end output to log */  
PROC printto;  
run;
```

Other information may be tracked

- Find the last updated file to append new data
- Find the latest file/folder in a directory to use as input
- Check the log file for errors or warnings
- Send email from SAS with report attached
- Others

SUMMARY

Summary

SAS Scheduling Tools

SAS Management Console

Platform Suite for SAS

BASE SAS

SAS Enterprise Guide

Operating System Scheduling Tools

Windows

Unix

z/OS

Steps to Achieve the Automatic Execution

Batch file

Task Scheduler

SAS programs



References

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Thank you !

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