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ABSTRACT

SAS[®] Drug Development (SDD) is a web-based SAS system on UNIX operating system. Internet status, limited abilities to run multiple processes at a time and some SDD unique features take more time to operate a program in SDD. To run SDD efficiently is important for accomplishing tasks for programmers. In this paper, several methods that can make SDD more efficient will be examined.

INTRODUCTION

SAS[®] Drug Development (SDD) is a web-based UNIX operating system with a user interface platform. SDD is developed by SAS for efficient execution and management of analysis and reporting activities to support clinical research in drug development. It contains some programming-friendly features such as the parameter window and Scheduler.

Several pharmaceutical and biotechnology companies, as well as clinical research organizations (CRO) use SDD to analyze and report clinical study data. Reading and storing information in SDD takes more time due to the web-based distance transmission. To help programmers complete tasks in less time, several methods for improving SDD efficiency are discussed.

METHODS

Calling in appropriate macros and data sets from the parameter window In SDD, calling in macros and data sets are different from PC SAS[®]. In SDD, the parameter window can define and locate macros and data sets (Display 1).

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Explorer Results Work Library

Display 1. The parameter window in SDD

Since SDD is a web-based system, executing programs requires sending and receiving information to the server. The more data and codes are involved, the longer it will take to execute a program. When executing a program, eliminating useless data, macros and codes can improve SDD efficiency.

To define the location of SAS data sets in the SDD parameter window, the location should be set as a folder. In the SDD parameter window, there are three kinds of folders: "Input", "Output" and "Input and Output". The "Input" folder defines the location of a folder for data used in a program. One or more data sets from the defined folder can be read into SDD when a program is executed. If the "Input" folder is defined as "Get all files", all the SAS data in the defined folder will be read into SDD. If the "Input" folder is defined as "Get all files", the "Get selected files", only selected files in the defined folder will be read into SDD (Display 2). The "Output" folder defines the location of a folder where output data from a program will be saved. There is no need to specify any data in the "Output" folder (Display 3). The "Input and Output" folder defines the location of a folder where data will be read from and saved to. Similar to the "Input" folder, read-in data sets need to be specified (Display 4).

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Display 2. Input folder with "Get all files" option (left) and Input folder with "Get selected files" option (right)

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Display 3. Output folder

Display 4. Input and Output folder

The data being used should be clearly defined to avoid missing data or reading in data multiple times. In addition, avoiding calling data that will not be used in a program helps SDD work more efficiently.

Macros in SDD can be called into a program two ways. First, similar to SAS data sets, macros can be called from a defined folder. It is more efficient to call only the macros that will be used in the program. Second, macros can be called in as input files. As shown in Display 5, the name and location of an input file are referenced in the parameter window. The second way is more efficient and preferable.





Display 5. Input file

Using Job Editor

Job Editor, a unique feature in SDD (Display 6), can execute all the programs together instead of opening all the programs one by one.

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5 cdash_lis_bld.sas	cdash_lis_bld.sas	/MDS/production/		
6 cdash_lis_chk.sas	cdash_lis_chk.sas	/MDS/production/		
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Display 6. Job Editor

Using Job Editor saves time since we do not need to open individual SAS programs. However, if there are errors within any individual program, Job Editor will not provide error messages before all the programs are executed. Moreover, errors cannot be corrected in Job Editor, so individual programs where errors occur, need to be opened in order to debug and fix. Each program will then need to be executed and updated separately. More time is required if any of the programs in the Job Editor contain any errors. It is therefore important to ensure all programs work correctly before using Job Editor.

Using Scheduler

Jobxml, a unique feature in SDD (Display 7), can run a set of programs in order. The Scheduler can define a time to execute one or more Job Editors. It can also define the frequency required to execute the Scheduler, such as once, daily, weekly, and monthly. It therefore makes SDD more efficient, especially for programs requiring long execution time.

While SDD is limited to execute one program at one time, using the Scheduler allows more programs to be handled simultaneously. It is preferable to use the Scheduler to execute programs that are ready, and require long execution times. An additional benefit is that another program can be modified and executed, at the same time.

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Display 7. SDD Scheduler

Using appropriate data sets

Creating Tables, Figures and Listings (TFLs) is a common task for programmers. To make data ready for analysis, a program first needs to process many macros and loops which will require time. Therefore, developing analysis data sets prior to TFL production will improve the efficiency, e.g., generating TFLs from Analysis Data Model (ADaM) data. ADaM data sets contain baseline, analysis flags, grouping variables, and treatment variables to help create TFLs.

CONCLUSION

In conclusion, calling in appropriate macros and data sets from the parameter window, using Job Editor, the Scheduler, and appropriate data sets, can make SDD more efficient. Programmers can select a combination of these methods to complete SDD tasks in less time.

REFERENCES

- 1 Clinical Data Interchange Standards Consortium, "Analysis Data Model v2.1." December 17th, 2009. Available at http://www.cdisc.org
- 2 Chun Feng, Xiaopeng Li, 2012, Export SAS Data to Excel in SAS[®] Drug Development, *Proceedings of the PharmaSUG 2012*, San Francisco, CA.
- 3 Xiaopeng Li, Katrina Canonizado, Chun Feng, Nancy Wang, 2012, Streamlining Regulatory Submission with CDISC/ADaM Standards for Non-standard Pharmacokinetic/Pharmacodynamic Analysis Datasets, *Proceedings of the PharmaSUG 2012*, San Francisco, CA.

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