Paper PO13

Automatic Conversion of SAS "Enhanced Programs" to PDF

Dirk Spruck, Accovion, Marburg, Germany
Piia-Piret Eomois, German Cancer Research Center, Heidelberg, Germany

ABSTRACT

This paper describes a method how SAS programs can automatically be converted to PDF documents. To increase readability of the programs not only plain text is converted but instead the colored program code from the Windows SAS Enhanced Editor is used.

In a first step the programs are opened in the SAS Enhanced Editor, which became available under Windows with SAS Version 8. The enhanced program text then is copied to the clipboard using SAS DM commands, one of them barely documented and hard to find. The process continues by opening Word from within SAS and inserting the copied text from the clipboard into a new Word document using Dynamic Data Exchange (DDE) technology. In a last step the Word document is converted to PDF.

INTRODUCTION

SAS programs are typically stored as plain ASCII files. However, lately there has been a raising demand for SAS programs to be published and submitted as PDF documents to the regulatory authorities, e.g. Food and Drug Administration. This can be attributed to the increasing number of eCTD submissions and the study data specification of the eCTD guidelines requesting SAS programs in ASCII and PDF format [1]. Storing SAS programs in PDF format could also be used as a way for archiving and annotating SAS programs.

The SAS Enhanced Editor which is supplied with the Windows version of SAS offers the nice feature of color coding, which increases readability of programs [Figure 1].

```
*) Example;
                                                *----:
*----:
                                                *) Example;
data _null_;
                                                *----:
                                                data null;
   event= "PhUSE 2009";
                                                   event= "PhUSE 2009";
   start= "180ct2009"d;
                                                   start= "180ct2009"d;
   end= "210ct2009"d;
                                                   end= "210ct2009"d;
   put ( all ) (=);
                                                   put (_all_)(=);
   format start end date9.;
                                                   format start end date9.;
                                                   run;
   run:
```

Figure 1: Rich Text Code from Enhanced Editor compared to plain text

When SAS programs are converted to PDF documents it would be nice to keep this color coding intact. Unfortunately SAS (at least up to version 9.1) does not offer the capability to save the program in any other format than plain text although LOG files can already be saved as RTF documents (LOG window -> File -> Save As -> Save as file type: RTF files).

Although "enhanced" SAS programs can not directly be saved in PDF or RTF this paper will introduce a process to automatically convert programs to a Rich Text Format (RTF) document, which then can be converted into PDF.

COPY CODE FROM SAS ENHANCED EDITOR TO CLIPBOARD

Before the SAS program can be processed it needs to be loaded into the SAS Enhanced Editor and then copied to the clipboard. This seems to be an easy task but in fact this was the most difficult piece of the process. The bits and pieces needed appeared to be poorly documented and were finally found in the SAS usage notes [2]. The following SAS DM commands were used to copy the SAS code to the paste buffer / clipboard:

```
dm 'whostedit; ①
  include "<insert program name here>"; ②
  EDCMD selectall; ⑤
  EDCMD copy; ②
  EDCMD winclose;' ⑤;
```

• WHOSTEDIT:

Open a new Enhanced Editor window.

@ INCLUDE:

Load the specified SAS program into the Enhanced Editor window.

❸ EDCMD SELECTALL:

Select all code in the Enhanced Editor window.

4 EDCMD COPY:

Copy the selected code to the paste buffer.

© EDCMD WINCLOSE:

Close the Enhanced Editor window.

CONVERT TEXT TO RTF

Once the SAS program is available in the clipboard a new Word document is created and the code is inserted. The rich text elements from the Enhanced Editor are still available in the clipboard and are carried over into the Word / RTF document.

DDE technology is used to start Windows Word and to communicate between SAS and the Word application.

```
x 'insert pathname here\winword.exe'; 1
filename worddoc dde 'WinWord|System';
data null;
  file worddoc;
   *** copy the program to Word; 2
   put '[StartOfDocument]';
   put '[EditPaste]';
   *** change font size; §
   put '[EditSelectAll]';
   put '[FontSize 8]';
   *** change page margins;
   put "[FilePageSetup.LeftMargin = ""1IN""]";
   put "[FilePageSetup.RightMargin = ""1IN""]";
   *** print document to PS file; 4
   put "[FilePrint"
       " .PrintToFile=1, "
       " .PrToFileName=""insert Postscript filename here"", "
       " .OutputPrinter=""insert name of Postscript printer driver here""]";
  put '[FileCloseAll 2]'; 6
   put '[AppClose]';
run;
filename worddoc clear;
```

- **①**: Microsoft Word is started using the X command and the Dynamic Data Exchange (DDE) channel is opened between SAS and the application in the filename statement.
- **②**: Visual Basic commands are sent through the DDE channel to create a new document and to paste the SAS code from the clipboard into the new document.
- **3:** Font size and margins are customized.
- **1.** The file is sent to a Postscript printer device. The PrintToFile= 1 command is responsible that a PS file is created instead of a printed paper copy.
- **6**: Close all open files and end the Word application.

Changing font size and margins are just examples of customization that can be done once the Word/RTF document is available. The document metadata, header and footer information can be changed in a similar way.

CONVERT RTF TO PDF

There are many ways to convert the Word/RTF file to PDF. In this example the document in printed to a Postscript (PS) file and the PS file is then converted to PDF. Many printer drivers offer PS support and can be used for printing (see section **9** of code above). The popular freeware tool Ghostscript can then be used for conversion of the PS file to PDF.

Of course there is also the option of creating a PDF file directly from the RTF file, i.e. by using the full version of Adobe Acrobat. In our case the intermediate step of creating a PS file was chosen to have the option of adding PDFMARK language in the conversion process. PDFMARK language can be used to add elements like bookmarks, annotations, or file properties (e.g. author) to the PDF document.

By choosing this approach it would be possible to accumulate multiple programs in one PDF document with bookmarks pointing to the individual programs and thus creating a SAS program library in PDF for documentation purposes. The bookmarks could be generated using the PDFMARK language. An example how PDFMARK language is used can be found in the PharmaSUG 2003 paper "Using RTF, EPS, PDFMARK to Automate the Creation of Your DEFINE.PDF Document for Electronic Submissions" [3].

HARD AND SOFTWARE REQUIREMENTS

SAS version 9.1 under Windows 2003 was used together with the DDE interface to Windows applications. The Enhanced Editor is available for Windows SAS beginning in Version 8.

Microsoft Word 2003 was used for processing the RTF document.

Ghostscript installed under Windows was used for the conversion from Postscript to PDF.

The process described in this paper was developed under Windows SAS Version 9.1. At the time this paper was conceived the authors did not have the opportunity to work with SAS Version 9.2. Since the functionality of saving LOG files in RTF format is already available it could very well be that SAS programs can be saved in RTF format as well in a SAS version beyond version 9.1.

CONCLUSION

If SAS programs are needed as PDF files it is a nice add-on to have color coded code. This paper presents a method for automatic conversion of SAS programs into PDF while keeping the color coded features from the SAS Enhanced Editor. Implementing the presented solution was not as easy as initially thought because of the poorly documented 'SELECTALL' DM command, which could not be found in the SAS help but was hidden in the SAS usage notes.

DDE may not be the latest technology however it still works well and may be a good solution for SAS programmers with only SAS BASE available.

In SAS 9.1 there is a feature to save LOG files in RTF. It would be nice if SAS provided the same functionality for the Enhanced Editor.

REFERENCES

- 1. Electronic Common Technical Document (eCTD): Study Data Specifications (8/7/2007) (http://www.fda.gov/downloads/Drugs/DevelopmentApprovalProcess/FormsSubmissionRequirem ents/ElectronicSubmissions/UCM163561.pdf)
- SAS Usage Note 13800: "How to programmatically mark and copy all text in Enhanced Editor" (http://support.sas.com/kb/13/800.html)
- Using RTF, EPS, PDFMARK to Automate the Creation of Your DEFINE.PDF Document for Electronic Submissions, Dirk Spruck, PharmaSUG 2003 (http://www.lexjansen.com/pharmasug/2003/fdacompliance/fda077.pdf)

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CONTACT INFORMATION

Your comments and questions are valued and encouraged. Contact the authors at:

Dirk Spruck Accovion Softwarecenter 3 35037 Marburg Work Phone: +49 6421 9484937

Fax: +49 6421 9484961

Email: dirk.spruck@accovion.com

Piia-Piret Eomois German Cancer Research Center Im Neuenheimer Feld 280 69120 Heidelberg

Work Phone: +49 6221 422215

Fax: +49 6221 422203 Email: p.eomois@dkfz.de

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