# GENERATING AN IMAGE OF AN IBM SYSTEM/38 DATA BASE IN SAS

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## Abstract

This paper describes a system developed at Lilly Research Laboratories which provides utilities for producing an image of an IBM System/38 (S/38) data base in SAS. Image is defined as the data and its underlying definition within the S/38 environment as well as references to associated dictionaries. The system includes methods for reading S/38 file descriptions and automatically generating SAS code to build SAS datasets and format libraries.

## Introduction

The IBM S/38 is a relational data base machine which supports both batch and interactive processing with the emphasis on the latter. The S/38 provides a high-level machine interface in that many typical operations are performed by hardware instead of software. Also, it supports both COBOL and RPG.

The S/38 is used by Lilly Research Laboratories to manage the data obtained in clinical trials. The data flow from the moment that a case report form (CRF) is mailed from the investigator's office to its final residence in a SAS dataset is obviously a multistep process. Below is a list of the six ways in which the S/38 contributes to this process.

1. CRF logging and tracking
2. Key entry/verification of the data
3. Interactive query and update of medical dictionaries
4. Monitoring safety data via interactive inquiry and summary reports
5. Editing the data
6. Profiling the data, i.e., reporting the data with all dictionary code-to-term translations

Note that there is one CRF per patient enrolled in a study; the CRF, however, is usually received one or two visits at a time.

## The Problem

Before the current system existed, the S/38 data was copied to tape in its raw form and then transported to an IBM 3033. A SAS program was then written to input the data into a SAS dataset. It sounds very simple and it is, in theory; however, have you ever written an INPUT statement for as many as 1200 fields, not to mention a LABEL and FORMAT statement for each? This was pure drudgery, time consuming, and prone to error. In fact, writing the INPUT statement alone was so frustrating that no one ever used LABELs or FORMAT libraries. Thus, reports generated in SAS were lacking the data descriptions that were available on the S/38.

## The Solution

A S/38 physical file is, in many ways, like a SAS data set. It consists of two parts - a file description portion, and the data in fixed length records. The file description contains the file name and a file label as well as a field-by-field description which includes the field name, the field label, the field type (character, packed decimal, or zoned decimal), the field length in bytes, and the starting location of the field. It turns out that the file description portion of a S/38 physical file is not very difficult to read so that a system was written to interface the S/38 and SAS in a way that automatically creates an image of a S/38 file in a SAS dataset.

The system is intended for use with IBM's System Productivity Facility (SPF) Dialog Manager under OS/VS2 MVS Release 3.8. It consists of a primary option menu (Figure 1) and four panels (Figures 2-5). The user invokes the CLIST MEDSYS either under SPF or TSO. The Dialog Manager Display Service then presents the primary option menu and one of four other CLISTs is executed conditional upon the option selected. These other CLISTs perform the same general functions; they:

* Display a panel for data entry with a modicum of edit checks
* Invoke the File Tailoring service to modify skeleton SAS code
* Allocate the necessary files
* Invoke SAS

## Using The System

When Option 1 is selected, the S/38 file description data is read into a SAS dataset and a report is produced for the user which describes the S/38 file. This report is actually a worksheet upon which the user can supply new SAS variable names to replace the five character S/38 field names and he/she can assign format names corresponding to an appropriate dictionary on the S/38. The appropriate format name is obtained from a codebook produced by another utility which constructs format libraries from S/38 dictionaries and uses PROC FMTLIB to print them. The S/38 dictionary - SAS format library utility will not be discussed here; however, additional information will be provided upon request.

Choosing Option 2 places the user into PROC FSEDIT (Figure 6) to allow a selective update of the S/38 file description SAS dataset. The new variable names and/or the format names can be entered from the worksheet. If documentation of the changes is desired, the user invokes Option 3 for a printed report of the dataset.

Finally, Option 4 calls a SAS program which constructs SAS INPUT, LABEL, and FORMAT statements using the S/38 file description SAS dataset. The program then uses %INCLUDE to execute the code just generated and documents the image of the S/38 file with a PROC CONTENTS. Note that in Figure 5 the user had the option of reproducing the S/38 data structure with or without using the actual data. Without any data, a SAS dataset with zero observations is created. This feature is useful when the layouts of reports are available prior to the completion of a clinical trial and the user wishes to test his/her report writer.

## Conclusions

Although methods for writing SAS program generators and for using SPF as a SAS - TSO interface have been around for some time, this system integrates those methodologies with the concept of data definition, i.e., the idea that an accurate description of data is as valuable as the raw data. Furthermore, this successful experiment which interfaces the SPF Dialog Manager with SAS and with SAS/FSP, in particular, provides very useful tools for future applications.

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Figure 1

```
**************************************
*   SYSTEM/38 - SAS INTERFACE        *
**************************************

     SELECT OPTION ===

  1.  CREATE THE FILE DESCRIPTION SAS DATA SET
  2.  EDIT THE FILE DESCRIPTION SAS DATA SET
  3.  PRINT THE FILE DESCRIPTION SAS DATA SET
  4.  CREATE THE SYSTEM/38 SAS IMAGE DATA SET
```

Figure 2

```
**************************************
*   SYSTEM/38 - SAS INTERFACE        *
**************************************

OPTION 1. CREATE A SAS DATA SET CONTAINING
          THE SYSTEM/38 FILE DESCRIPTION.

ENTER THE FULLY QUALIFIED DATA SET NAME
  WITHOUT APOSTROPHES.

SYSTEM/38 FILE DESCRIPTION DATA SET:
              SAS DATA LIBRARY NAME:
                  SAS DATA SET NAME:

HIT ENTER AFTER VERIFYING YOUR ENTRIES,
  SAS WILL CREATE THE FILE
DESCRIPTION DATA SET AND SEND YOU A WORKSHEET.
```

Figure 3

```
**************************************
*   SYSTEM/38 - SAS INTERFACE        *
**************************************

 OPTION 2. EDIT THE SAS DATA SET CONTAINING
           THE SYSTEM/38 FILE DESCRIPTION.

 ENTER THE FULLY QUALIFIED DATA SET NAME
   WITHOUT APOSTROPHES.

       SAS DATA LIBRARY NAME:
           SAS DATA SET NAME:

 HIT ENTER AFTER VERIFYING YOUR ENTRIES.
   SAS WILL ENTER ITS FULL SCREEN EDITING
   MODE.  HIT PF2 TO EXIT THE EDIT MODE.
```

Figure 4

```
**************************************
*   SYSTEM/38 - SAS INTERFACE        *
**************************************

 OPTION 3. PRINT THE SAS DATA SET CONTAINING
           THE SYSTEM/38 FILE DESCRIPTION
           AFTER MODIFICATIONS.

 ENTER THE FULLY QUALIFIED DATA SET NAME
   WITHOUT APOSTROPHES.

       SAS DATA LIBRARY NAME:
           SAS DATA SET NAME:

 HIT ENTER AFTER VERIFYING YOUR ENTRIES.
```

Figure 5

```
**************************************
*   SYSTEM/38 - SAS INTERFACE        *
**************************************

OPTION 4. CREATE A SAS DATA SET CONTAINING THE SYSTEM/38 DATA
          USING THE SYSTEM/38 FILE DESCRIPTION.

ENTER THE FULLY QUALIFIED DATA SET NAME WITHOUT APOSTROPHES.

          SAS DATA LIBRARY WITH FILE DESCRIPTION:
                                SAS DATA SET NAME:
                                   SYSTEM/38 DATA:
                        (ENTER N IF IT IS NOT AVAILABLE)
                    SAS DATA LIBRARY FOR SYSTEM/38 DATA:
                     OS DATA SET FOR SAS GENERATED CODE:
                      (ENTER D IF YOU WANT TO DELETE IT)

HIT ENTER AFTER VERIFYING YOUR ENTRIES.  SAS WILL CREATE THE
IMAGE OF THE SYSTEM/38 DATABASE AND YOU WILL RECEIVE A COPY
OF THE CONTENTS.
```

Figure 6

```
                    EDIT SAS DATA SET:  SASFD.TEST          | SCREEN 1 |
                                                            | OBS 1    |
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -|_ _ _ _ _ |

                     SAS DATA SET NAME:  SUMMARY

                     SAS DATA SET LABEL:  SUMMARY

SYSTEM/38 FIELD NAME:  PROJE  POSITION:  1  LENGTH:  4  FIELD TYPE:  A

SYSTEM/38 FIELD DESCRIPTION:  PROJECT IDENTIFICATION

SAS VARIABLE NAME: _ _ _ _ _ _ _ _  SAS FORMAT NAME: _ _ _ _ _ _ _ _

(S/38 NAME IS THE DEFAULT)
```