SYSTEM 2000® Data Management Software Update

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Abstract

During the past year, the Institute has spent considerable effort to improve and expand SYSTEM 2000 Data Management Software across the three major hardware systems: IBM®, Unisys®, and CDC®. This effort ranges from new releases to documentation and new procedures. This paper gives an overview of these current and future developments.

SAS® System Interfaces to SYSTEM 2000® Software

The SAS System and SYSTEM 2000 Data Management Software are a great match. The marriage of these two products provides the end user and programmer with the features and benefits of both systems in one integrated package.

The SYSTEM 2000 user gets the world's foremost data analysis system, graphics, statistical analysis, decision support, project planning, quality assurance, and fourth generation application development system. The SAS user gets enhanced data management, including indexing, sophisticated storage techniques, comprehensive security and data recovery features.

The integration of SAS software and SYSTEM 2000 software has been accomplished through the development and enhancement of SAS procedures. With the S2K procedure, the first procedure developed, the SAS user can access available SYSTEM 2000 data using familiar methodology and syntax. No training is necessary; users can immediately extract data from SYSTEM 2000 data bases through this procedure and use it with the data analysis and report procedures of the SAS System.

The S2KLOAD procedure populates a SYSTEM 2000 data base from existing SAS data sets. The QUEST procedure allows Self-Contained Facility (SCF) users the benefits of the SAS Display Manager System: scrolling, browsing, testing, and printing capabilities. All of the SCF commands are available in PROC QUEST, including CONTROL, DEFINE, QUEUE, and REPORT commands. Combine these SYSTEM 2000 commands with the SAS macro language to create shorthand requests for predefined reports or queries. You can even use the macro language to develop your own query language. And, of course, you have on-line HELP to all SYSTEM 2000 commands.

PROC FSEDIT (Full Screen Editing)

The most recent addition to the interface family is the enhanced FSEDIT procedure. This full-screen data editor permits direct access to SYSTEM 2000 data bases. With PROC FSEDIT, you can build custom screens, check data entries, and browse and extract data. You can query data as well as graph the structure of your data base. Additionally, you can interactively design new data bases.

The benefits to SAS users can be summed up in one word: "speed." Imagine having 10,000, 100,000 or 1,000,000 observations and being able to display any of them equally as fast; that's the power of indexing.

SYSTEM 2000 software can be executed in a full Multi-User™, multi-threaded environment. This means many users can query, browse and update SYSTEM 2000 data bases at the same time and still retain fast retrieval against a very large number of records. (Be sure to check Barbara Barrett's paper elsewhere in the proceedings for more details in using PROC FSEDIT with SYSTEM 2000 Data Management Software.)

The following enhancements to the interface procedures will be available with Release 5.18 of the SAS System.

PROC S2K (Data Extract)

Where-clause

- Significant performance enhancements were implemented for the extract with where-clause process. In one experiment, an extract of 4,000 observations went from 22.87 CPU seconds to 2.67 CPU seconds, representing an 856% performance improvement.
In another example involving an extraction of 600 observations, the CPU time needed to complete this request went from 1.88 CPU seconds to 0.73 CPU seconds, an improvement of 255%. The improvement will vary depending upon the data base design and what records are extracted.

• Items in the where-clause need not be selected for extract, but used to help qualify other data items.

• Items in the where-clause can be referred to by the SYSTEM 2000 component number or name, or (if selected) by the SAS name.

• Special symbols can be used in place of the operator names. Either or both forms can be used in the where-clause. The new valid symbols are:

```
AND &
NOT -
GT >
GE >=
NE <=
OR |
EQ =
LT <
LE <=
```

• HAS, AT, NOT, and NON-KEY can now be used in a where-clause.

• Quoted strings can be used in a where-clause. This may be helpful when referring to SYSTEM 2000 text fields or fields containing lowercase data. Any value entered within quotes is left as is; all unquoted values are upercased. For example, where lastname = Smith extracts the data for SMITH; where lastname = ‘Smith’ extracts the data for Smith.

In line mode, the WHERE = statement requires 2 quotes around the literal because the whole where-clause needs to be quoted. For example, where = ‘lastname = “Smith”’. 

• When the where-clause contains errors, the where-clause and extract items are reshown on the selection panel for correction.

• When using a saved mapping data set (created with the SAVESEL option), you may override the where-clause saved with that data set by using the WHERE = grammar.

• Miscellaneous problems have been fixed, including the use of parentheses, dates, and decimal values. Note: when using dates in a where-clause, the format of the value is MMDDYY.

Selection Panel and Grammar

• If the default SAS name generated for a selected item contains dashes (because the SYSTEM 2000 name does), the dashes are converted to underscores to avoid SAS errors.

PROC QUEST (Interactive Commands)

• HELP $2Kcommand can be entered on the editor window command line for any SCF command.

SYSTEM 2000® Product Status on IBM

QUEXTM SOFTWARE

QueX software, once a collection of products running differently on various systems, is now a cohesive package that reflects improvements across all systems. For those interested in CICS programming, the benefits are significant. QueX software now includes a new view builder along with the ability to define which QueX functions the PF keys perform.

IBM RELEASE 11.6

We have divided Release 11.6 into groups of primary and secondary features. Primary features are regarded as those requiring a fair degree of changes to the system, and are completed solely for the benefit of the user community. Secondary features are those that became easier once primary features were implemented, and so the cost was small for the payback.

Primary Features

The ten features currently on the primary feature platter are faster SAVE/RESTORE processing, tuning tools, DYNAMIC where-clause in PLEX, new item types, extended buffer manager, BDAM
format enhancements, enhanced console support, COPY TREE command, new distribution format, and DYNAMIC where-clause support in QueX software.

- **Faster SAVE/RESTORE Processing**

  This feature was the top vote getter on the 1986 SASware Ballot® for SYSTEM 2000 software. All I/O processing for SAVE and RESTORE has been segmented into a subtask and changed to QSAM routines. This provides the full benefit of a faster I/O path and can reduce elapsed time by over 40% in some cases.

  New processing is invoked when the software discovers a DDNAME ending with an S for SAVE/RESTORE, or K for KEEP/APPLY. Although internal processing remains the same for KEEP and APPLY, use of the new DDNAMEs will allow flexibility by letting more than one KEEP or APPLY be in progress in a Multi-User environment. Processing for SAVE and RESTORE has been greatly modified.

  Like KEEP and APPLY, the use of the new DDNAMEs will allow multiple SAVE and RESTORE commands to be in progress.

  This feature will maintain compatibility with prior releases by utilizing new DDNAMEs for the recovery files TAPES2K and KEEPFILE. Users wishing to use files created prior to Release 11.6, or who would rather continue using processing prior to Release 11.6 as a standard, may do so by continuing to use the old DDNAMEs.

- **Tuning Tools**

  Again, this feature was one of the top two for the 1986 ballot. It was difficult defining a "tuning tool." The result was a feature with several components.

  First, SYSTEM 2000 software was modified to capture enough information about its performance to provide useful statistics. This required that data be added to the Accounting and Diagnostic logs as records or fields. Once this information was added, reports were considered. Because flexibility was a major issue, all of the reports were created using base SAS procedures. The SAS programs gather all of the information from various sources into a common record format for reporting. The detailed records are then summarized into historical files for more general monthly, quarterly or annual reports.

  Reports come in two basic flavors; one concerning overall performance of SYSTEM 2000 software, and another concerning specific job or job types within the system. The result was over 12 reports which span the general overview to the detailed exception. Each report can be tailored to provide or flag information about user-defined exceptions.

  Finally, each report has a companion graphics (or bar chart) output to represent information pictorially. The graphs allow you to review the output and determine if more detailed reports need to be run concerning specific time periods or jobs.

  These new data collection capabilities, along with new reports and graphs, allow you greater flexibility in understanding SYSTEM 2000 software use in your shop. You can now make more informed decisions on how to fine tune Multi-User software for your job mix.

- **DYNAMIC Where-clause in PLEX**

  Besides allowing you to dynamically create a where-clause at run time, this feature satisfies two other user requests. It allows you to specify constants and variables in a PLEX where-clause, and it makes all ACCESS where-clause syntax available to the PLEX processor (specifically, the CONTAINS syntax).

  The implementation method is similar to the CDC and Unisys implementation in order to provide compatibility across systems. Essentially, you construct a true ACCESS where-clause in some PLEX storage location and identify this location to the where-clause. This allows you to modify the value of the storage area and receive totally different output from a where-clause.
• **New Item Types**

This feature addresses a long-standing user request to provide floating-point and undefined (HEX) data types. This feature implements these data types for all processors except REPORT.

Both single and double precision floating-point numbers are allowed. Any input format is accepted for a floating-point number, but this release restricts output to scientific notation. Also, scientific notation is accepted for non-floating-point numbers as long as SYSTEM 2000 software can convert the scientific notation into a decimal or integer that “fits” within the component as defined in the data base.

UNDEFINED data consists of any binary bit pattern allowed in IBM. However, the field cannot overflow. Input format is CHARACTER. The UNDEFINED item type will be used primarily in PLEX applications. If non-printable, non-terminal oriented characters are desired for input from an end user terminal, the user must use an editor capable of creating these characters.

• **Extended Buffer Manager**

The Extended Buffer Manager (XBUF) feature was implemented to satisfy one major user problem, but solves a number of other performance situations as well. The dual-logging feature of XBUF allows you to define additional external data base files, which are written to in addition to the “live” data base files. When established on disk, these “dual” files protect against losing file 1 or file 7 and then not being able to use recovery.

Because dual-logging can be implemented for ANY data base file, you can define these additional “files” as buffers in XA memory. This provides two benefits. It achieves VSCR (Virtual Storage Constraint Relief), and provides a fast-path to data.

VSCR is achieved in that you no longer need to define large pools of buffers. Rather, only enough pools need to be defined as required to support active users and data bases. Additional pools, intended to ensure data base pages will be in memory, do not need to be defined. Instead, these “pools” are defined as DUAL LOG DATA BASE FILES. When the dual-log is defined as memory within an XA system, it is allocated above the 16M line.

The paging algorithm used in dual-logging is more efficient than the POOL paging algorithm. If you define significant external files in XA memory, time will be saved because many real time I/Os will be avoided in exchange for an efficient page fetch.

• **Format Performance Enhancements**

A QSAM process similar to that used by SAVE/RESTORE was implemented to reduce the I/O path call. The most significant improvement comes from formatting data base extents after RESTORE processing is complete. Savings of more than 70% of elapsed time were observed during our testing.

• **Enhanced Console Support**

This feature applies only to SYSTEM 2000 Multi-User software. A SEND command has been added to the system which supports ten additional display commands. These new commands allow you various levels of detail on resources such as thread utilization, pool utilization and allocation, buffer utilization, data base accesses, user accesses, data base statistics, local holds, and job queues.

Armed with this new information, you can determine the cause of performance degradation, lockout situations, and other SYSTEM 2000 Multi-User performance issues. Enhanced console support can be used hand-in-hand with the tuning tools feature to provide you with real time information for controlling the SYSTEM 2000 environment.

• **New Logic Symbols**

SYSTEM 2000 Release 11.6 allows the end user to enter six new symbols as equivalences to character representation of unary and binary logical operators in order to make where-clause syntax more versatile. The new operators and their equivalences are as follows:
These operators are available only as logical where-clause operators and are not available for use in the action clause, such as:

\[ CH \ C3 = 123* \ \text{WH} \ C1 = 1: \]

An equal statement in the action statement indicates that the expression which follows is a numeric function to be involved in the action process, where an EQ would mean a data assignment.

- **COPY TREE Command**

The COPY TREE command is almost identical to the MOVE TREE command, which was available in Release 11.5. While MOVE TREE moves the object tree to a different location within the data base, COPY TREE creates a new tree at the specified location, but leaves the object tree at its existing location.

- **New Distribution Format**

Beginning with Release 11.6, SYSTEM 2000 software will be distributed as a SAS product, in SAS distribution format. Very little will change in what you need to know to install the product; for instance, installation naming conventions, SVC numbers, and installation options will not change. The big difference will be that users of SAS and SYSTEM 2000 software will have the ability to make all of the SAS installation options available. They will not have to be respecified when SYSTEM 2000 software is installed, and vice versa when SAS software is installed.

We look forward to making the job of SYSTEM 2000 installation easier and more flexible starting with Release 11.6.

- **DYNAMIC Where-clause Support in QueX Software**

This feature allows the same powerful where-clause currently used in SCF. Specifically, you can text search with CONTAINS syntax, and use the by-clause, HAS operator and the unary operators EXISTS and FAILS.

- **Secondary Features**

- **Scratch Pad Format Rules**

Release 11.6 allows you to specify a parm of PAD=YES and then utilizes existing information about the PAD. Even better, this release allows you to omit any PADnn parameter at all; and, if the DD statement for a S2KPADnn statement exists, the software treats it as if a PADnn=YES statement was specified.

Finally, if you need to specify large PADS, a utility, PADCALC, is provided. PADCALC takes S2KPARMS, execution parameters, and S2KPADnn information and creates a display showing how much space is on the PAD, what the default block size of the PAD is, and what the default PADnn=x/y parameter is. In addition, the display includes all of the information from the parms file concerning PADS. With this information, you can make a much more informed decision on PAD size.

- **Command Stacking for TSO CLISTS**

SYSTEM 2000 Release 11.6 allows you to execute SYS2KTPI as a command processor instead of a called program. When executed as a command processor, the software takes advantage of a TSO feature that allows you to enter command processor data within the CLIST.

One possible use of this feature is to create CLISTS that automatically sign a user onto a data base, thus eliminating the need for that user to know a password. This provides flexibility and security in that the user now has the full capabilities of TSP and SPF to control the access of data bases in ACCESS mode. The following is an example of how this can be accomplished.
• **TSO and Batch Multi-User Console**

With SYSTEM 2000 Release 11.6, you can establish batch job streams and TSO sessions as full-function alternate consoles for issuing SYSTEM 2000 Multi-User commands. This feature evolved out of the need to capture information provided by the enhanced console feature for review and consolidation by the user. Along with the new commands, you can now control his Multi-User environment from a TSO session.

• **DUMPACTIVE Parm for ACTUTIL**

Many sites using the Multi-User Accounting Log feature like to clear the Accounting Logs at least once each evening in order to provide daily accounting information. SYSTEM 2000 Release 11.5 and earlier releases required operator intervention when attempting to clear the active Accounting Log even if Multi-User was not currently active.

A new execution parameter is provided for the ACTUTIL accounting program in Release 11.6 which allows you to indicate that the utility should dump the active log without requesting operator confirmation.

• **EXIT as the First Command**

This is an old favorite request among users. SYSTEM 2000 Release 11.6 no longer requires that the USER command be issued in order to exit the system. While in a SYSTEM 2000 session, you can issue the EXIT command to terminate the session even if you have not been identified with a USER command.

• **DESCRIBE/AUTH,DEFINE/ Command Option**

SYSTEM 2000 Release 11.6 allows you to issue a DESCRIBE command with format options of AUTHorities in addition to the existing format option of DEFINE. Each component described contains the current password level of access authority. This information can help you determine what you can update without attempting the update and getting the subsequent error.

• **DESCRIBE RECORD Command**

SYSTEM 2000 Release 11.6 allows you to issue a DESCRIBE RECORD command, which displays all elements within the tree identified. The syntax allows you to specify any component within the data base. The software identifies the parent schema record if the component used was not a schema record name. All security guidelines and rules have been followed so that a secondary password holder only sees components authorized for that password.

• **CANCEL Logic**

The CANCEL logic of SYSTEM 2000 Multi-User software is enhanced to allow cancellation of all users with a particular job name (such as CICSPROD). For example, if the CICS system crashes, any number of terminals could be left active in Multi-User. Previously, a modify command was necessary for each terminal left hanging. With Release 11.6, the command ‘CANCEL JOB=CICSPROD,’ cancels all terminals logged on via the TP monitor executing as jobname CICSPROD.

• **DUMP Option**

Release 11.6 introduces a new console modify command, DUMP. The command causes SYSTEM 2000 software to generate a SNAP dump. Other than a slight delay while the SNAP is being generated, there is no effect on other processing. This allows you to provide a dump when the system is acting abnormally without terminating Multi-User software. Additionally, the DUMP option can cancel logic of an individual job.

• **CICS S20P Enhancements**

An enhancement to the CICS interface allows the supplied console interface program, S20P, to leave the original transaction request on the screen when it
is redisplayed. With this feature, you can enter the new enhanced console commands and then just press the ENTER key in order to get an updated display.

**QUEST as a Valid Command**

SYSTEM 2000 releases prior to 11.5 referred to the standard non-PLEX access to data bases as ACCESS. Future SYSTEM 2000 documentation will refer to this process as QUEST. With Release 11.6, either ACCESS or QUEST will attach the user to the ACCESS processor of the Self-Contained Facility.

**ESTAE Processing**

Beginning with Release 11.5, all STAE macros are changed to ESTAE macros. ESTAE has several advantages that enhances SYSTEM 2000 recovery. For single user PLEX programs, SYSTEM 2000 software will percolate to the next level STAE or ESTAE routine when an abend occurs. This will allow the COBOL or PL/I STAE to get control after SYSTEM 2000 software has done its clean up work. For Multi-User dependent job, an ESTAE can trap various abends that a STAE could not such as operator cancel (222), output lines exceeded (722), CPU time exceeded (322) and other x22 abends so that Multi-User software can be informed that the job has been terminated.

**SYSTEM 2000® Product Status on CDC**

Although no new SYSTEM 2000 releases are planned for CDC, a Release 4.0A field fix distribution containing numerous source fixes, and more importantly supports the CYBER 180/990 mainframe, was released for all NOS sites. The field fix distribution has proven very stable. We have implemented support for the CYBER 180/990 to aid you in your anticipated transition to NOS/VE, clearly Control Data Corporation’s direction in the future.

**SYSTEM 2000® Product Status on Unisys**

A Release 4.0A field fix distribution was also released for the Unisys version of SYSTEM 2000 software, addressing several problems in recovery. The speed with which most customers tested and applied the fixes was evidence to its stability and the widespread use of the recovery feature.

SYSTEM 2000 Release 5.0 for Unisys machines is currently undergoing Quality Assurance testing; limited customer testing should begin sometime in April. For those of you who are interested in becoming a test site, please contact Dale Reeves at the Institute in Austin.

Release 5.0 contains new features, as well as internal changes, which improve performance, correct certain Multi-User error conditions, reduce the investigation time on other Multi-User problems, and replace fielddata calls to OS-1100 with ASCII calls.

New features include:

- COPY TREE command
- Improved cursor control in Screen Writer™
- RETRieve FIRST n times option in Screen Writer.

We are looking at other features as well.

Improvements to the SYSTEM 2000 overlay process, implemented for PLEX users, should increase performance considerably, particularly if the application uses immediate mode updates. QueX and Screen Writer update transactions will benefit from this enhancement as well. Our performance testing has revealed improvements of up to 50% in certain cases, with the average around 15%.

Substantial changes were made to the Multi-User error-trapping routines to provide informative messages when Multi-User errors occur, to recover automatically from certain errors that previously resulted in the DBA having to reload the common banks, and to allow for faster investigation of other types of problems.

Last but not least, we have continued to stay ahead of Unisys’ plans to eliminate fielddata support by phasing out all possible fielddata calls to OS-1100. The current changes are the most ambitious to date and require extensive Quality Assurance testing to ensure stability and correct functioning. Of course, SYSTEM 2000 data have been and will remain isolated from any Unisys
changes to OS-1100. All in all, it has been a very positive year for the Unisys version of SYSTEM 2000 software.

**SYSTEM 2000® Publications Update**

During the last year, SYSTEM 2000 publications have focused on the needs of the experienced SAS software user who is using the SYSTEM 2000 product for the first time. Three new books, SYSTEM 2000 Software Sampler, the Quick Reference Guide, and the SYSTEM 2000 Introductory Guide for SAS Users have all been well-received.

The Software Sampler is designed to be used with the sampler tape. You can log on to the sample application on the tape, a SALES data base, and by following along in the sampler booklet, you can perform many of the functions SYSTEM 2000 software has to offer. The Quick Reference Guide contains descriptions, syntax, and usage rules for all SYSTEM 2000 interactive commands. Designed for quick access to the information needed, it is small and color coded to help you find information quickly. The SYSTEM 2000 Introductory Guide for SAS Users is perhaps the most innovative publication in this series. It walks you through SYSTEM 2000 concepts and shows you how to quickly and easily create a SYSTEM 2000 data file and load it with data from your SAS data set. It also provides clear, up-to-date documentation for the FSEDIT interface to SYSTEM 2000 software, as well as the QUEST, S2K, and S2KLOAD procedures.

**Summary**

This year has been extremely productive for the Institute. We believe the enhancements to SYSTEM 2000 software make it more usable and powerful than ever before. Our continuing efforts to integrate SYSTEM 2000 software with the SAS System have provided new capabilities that are very powerful, allowing you more freedom in creating applications.

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