

SAS Presentation Tools: Indiana University's Library Management Information System

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ABSTRACT

Indiana University maintains one of the largest research and academic collections in the world, holding over 6 million volumes in 45 libraries across the state. IU has automated the card catalog and many of the back-room business functions of a large library. Library staff and administrators need access to information about the usage and management of the collection generated by the automated system. IU and other large academic libraries have standardized on SAS® for simple statistical reporting, but SAS has more to offer.

At IU, we are developing a "library management information system," using a variety of SAS data presentation tools in a UNIX/AIX environment to provide statistical reports, ad-hoc queries, and high-resolution graphics. Front-end interfaces are tailored for occasional as well as "hardy" users and delivered statewide. Examples of point-and-click menus, and color graphics displayed with X-windows graphic terminal emulation software, are presented and discussed.

INTRODUCTION

The Indiana University Library Management Information System (LMIS) is a system for extracting, analyzing, and presenting data obtained from the Libraries' automated systems. Using SAS tools, we present statistical reports and graphics within an easy-to-use menuing environment.

LMIS produces a variety of standard SAS statistical reports to support daily operations. For example, the Library Circulation desks can use LMIS to determine when their busiest times of the day, week or year will be, to aid in staff scheduling. Other reports allow managers to determine which shelving locations have the most activity. Decisions to relocate materials can be based on such information.

LMIS can also be used to assist in strategic planning activities: Administrators can access the system to learn about the types of patrons that are using specific libraries. This information is invaluable in customizing the libraries collection based on patron interest. Of particular interest to administrators of a state-funded Library is the use of the facility by state residents who are not students or staff of the University.

When standard, pre-defined reports are not adequate, LMIS users can use SAS tools to design their own customized queries from the same database used by the standard reporting tools.

LMIS contains several years of data on various information areas. Two examples are circulation statistics and information about purchased materials. Multiple years of coverage allow the user to analyze historical trends and forecast future growth.

LMIS QUALITY GOALS

The LMIS is designed to be **easy-to-use**, **accurate**, and **flexible**. These are not just nice-sounding adjectives, but are the basis for measuring the success of the system.

Ease-of-use is addressed through the use of SAS windowing facilities. **Choice block menus** allow users to "point-and-click" on desired information areas. Context-sensitive **help lists** are built into each screen. When user input is required, **selection lists** allow the user to pick relevant choices without worrying about typing errors. Selection lists and **CBT entries** (computer-based training) also serve an additional function as online documentation. Generally, the most difficult part of using LMIS is remembering the user-ID and password at login time.

Accuracy: The data we analyze in LMIS comes from our mainframe-based automated card catalog. Multiple VSAM files must be queried, and data extracted through batch procedures,

in order to populate the LMIS database. Potential for error in this processing is high, and the LMIS reports are audited against existing mainframe reports to ensure accuracy.

Flexibility: LMIS is designed to be easily expandable. As different areas of information become available, new LMIS sub-menus are created, with the same navigational structure and "look and feel" of existing subsystems. Additional flexibility is available for more experienced users who need to design their own ad-hoc queries.

WHY SAS?

IU uses library automation software developed by NOTIS Systems, Inc. NOTIS provides automation support to a wide variety of libraries, with differing management reporting needs. Historically, the vendor has provided only the most basic "vanilla" management reports. Sites around the country have used SAS to develop custom reports on these complex VSAM files. By now, a wide range of production SAS code is available through networked list servers, for study and "borrowing" by developers.

SAS's string handling features make parsing the segmented, tagged data files as painless as possible (If you like SUBSTR, SCAN, and INDEX functions, take a look at our code sometime). The powerful statistical tools SAS provides are of course very useful. But SAS also offers many other features that make it attractive to developers.

Portability: In our application, we extract and summarize data on the mainframe, and then transport it to the UNIX/AIX environment for further analysis. We also have DEC/ULTRIX machines running the same version of SAS (6.07). Code ports are transparent. In fact, an entire LMIS subsystem (catalogs, libraries, and data sets) was ported to the ULTRIX environment and tested. Not a single line of SAS code was changed.

Rapid Prototyping: Standard SAS procedures (PROC PRINT, TABULATE, and MEANS) allow us to quickly develop new sample reports for users. During development, we can redesign screens "on the fly" and often have new screens ready for customer review the next day.

Graphics: With the SAS graphics editor, we can easily prepare and edit presentation-quality graphics. Again, SAS tools help here in developing initial graph mock-ups, which are then modified through the SAS program manager.

SAS TOOLS IN THE LMIS

SAS/AF®: This is an ideal front-end and screen development tool. SAS/AF and the associated SAS/SCL® (Screen Control Language) aid developers of Interactive SAS applications. SCL is powerful, flexible ... and has a long learning curve. SAS Institute instruction is a must for full use of SCL. LMIS takes advantage of advanced features of SCL such as extended tables and context-sensitive help screens.

SAS/SQL®: SAS's implementation of the ANSI standard query engine supported by numerous relational database vendors. With SQL, we can prepare quick and efficient "views" of the data sets. SQL allows us to define a subset of the database for purposes of reporting without promulgating redundant copies of existing data structures. We meet our quality goal of providing flexibility in data presentation, and also save data storage space.

SAS/GRAPH®: Graphic visualization of statistics. Simple graphics editor for developing presentation quality graphics. SAS graphs can be exported as graphics files for further editing in any of the "mass-market" graphics presentation products.

SAS/ASSIST®: Really just a very large SAS/AF application, which prompts users through development of ad-hoc queries. It is very useful to experienced SAS developers for prototyping and development of error-free reports and graphics. It is not the end-user tool we would like. Among other problems, use of ASSIST with our data requires a detailed knowledge of the data structures and physical variable names. This is more than we can expect from occasional users of a system.

WHERE WE'D LIKE TO GO WITH LMIS

SAS/ENGLISH®: We believe SAS/ENGLISH will go far towards meeting the need for a true end-user query development environment. Experienced database developers will be needed to set up a "knowledge base" (similar to a data dictionary). Users should then be able to construct their own queries with a minimum of hand-holding by programming staff.

SAS/CONNECT®: Ideally, we would store much of our source data on an appropriately-sized platform (our mainframe), and use SAS/CONNECT and SQL dataviews to construct virtual data sets on smaller machines equipped with SAS front-end presentation tools. In practice, this has been impractical up to now because of performance problems with CONNECT between MVS and UNIX platforms. SAS has promised that the new releases (6.08 and 6.09) rectify these performance problems, but we have yet to test this.

Ports to IBM OS/2®: SAS has always been a large, complex set of programs and never really found a fit in single-thread operating systems such as DOS and Macintosh OS. OS/2 has changed this for the low-cost desktop workstation. For academic users such as IU, SAS Institute has set up an extremely attractive pricing structure that basically equalizes the cost per desktop for UNIX or OS/2 users.

SAS/SQL: We plan to increase our use of SQL and dataviews. SQL is becoming a *lingua franca* for database developers and may have greater industry acceptance than any other syntax-based programming tool, including SAS itself. SQL is easy to learn (though limited in scope), and code developed with SQL is more maintainable by programmers coming from a variety of backgrounds. Many excellent articles on SAS/SQL have been published in various SAS Users' Groups proceedings.

A TOUR OF THE LMIS

Following is a brief tour of LMIS from a user's point of view. The illustrating figures are found at the end of this paper.

LMIS X-Windows Interface (Figure 1, 2):

LMIS provides two user interfaces, using either an ASCII character-based windows or a fully graphical X-windows OSF/MOTIF presentation.

X-windows is a technology developed quite a few years ago now (about last Saturday). It allows a remote user with a graphic terminal (or a workstation equipped with X-windows server software) to navigate through a UNIX host system with the same graphic tools familiar to consumers of many mass-market MS-Windows and Macintosh applications.

Shown here are two examples of "choice block" menus. Users can click on a selection with their mouse to quickly navigate through nested menus. LMIS uses a small subset of the many graphic objects available to SAS developers. Other objects used in LMIS are scroll bars and "radio buttons."

Standard ASCII interface for LMIS:

At IU, many of our targeted users are not Windows users. They may not have the correct type of workstation or the appropriate network drivers installed to support fully functional X-windows presentation delivered across a TCP-IP network. In addition, our support service suppliers (the campus computing centers) are not quite ready to "do Windows" yet, although popular demand is quickly overrunning the natural tendency of support organizations to go slow with provision of new services.

With these facts in mind, we have also implemented a standard ASCII character-based interface. Much of the functionality of the Windows interface is available in this interface. Although the mouse is not supported, all choice block menus and help facilities can be used without change. SAS saves development time by allowing both types of users to access the same application.

With implementation of SAS 6.09, we plan to provide graphic icons for our choice menus (such as those used in 6.07 in SAS/ASSIST)

A Selection Menu (Figure 3):

An example of an LMIS selection menu. In the X-windows interface, a user can type in valid codes or click on the highlighted buttons and pull up a list of valid libraries for which they would like to view statistics, as well as a range of dates they would like covered in the reports. ASCII users can use the tab and cursor keys to navigate and make selections on this menu.

Selection Help Lists (Figure 4):

Throughout the LMIS, we attempt to provide ease-of-use features. If the user doesn't remember the two character code of the library for which they wish statistics (or doesn't wish to type it in), they can "click" on the highlighted button and a help list of valid codes appears. A similar model is used for all selection lists. Note the scroll bars in this diagram (the list of Libraries is multi-page).

Online Queries/Reports (Figure 5):

Standard SAS procedures (such as PROC PRINT and FREQ) are used to produce online query/reports based on the user's selections. The above report shows simple counts of circulation activity at a library by hour of the day. But, the report is rather dry, even online in X-windows.

How about a graph?

X-Windows and SAS/GRAPH (Figure 6):

That's better!

A key advantage to X-windows (over a ASCII character-based interface) is the ability to display and edit high resolution graphics in a shared environment ... and in living color!

The "stacked vertical bar chart" is produced with PROC GCHART for the selected Library and date range. The graph displays the distribution of circulation activity by hour and day of week at a large circulation unit during the sample months of January and February. At a glance, LMIS users can see that Circulation activity peaked around 3-4 PM, with a smaller peak at 8 P.M. Such a graph can be a very persuasive tool when proposing front-line staffing changes.

Subgrouping by weekday produces the "stacked" effect. Friday seems to be especially busy at this library. To check that assumption, a companion "day by hour" graph is available. This alternative graphic view emphasizes the day of the week by making it the main grouping variable. The subgroup (stacking) variable is then the hour of the day.

SAS high-resolution graphs of this complexity really require color for full effect (hope you saw the presentation accompanying this paper). The graph can easily be printed to a Postscript Color Printer and a transparency or 35mm slide can be produced. Better yet, it can be exported to a stand-alone graphics presentation package, and used in an online presentation at your next SAS User's Group conference!

CONCLUSION

At the IU Libraries, our experience with SAS has been very positive. A system developer working with one or two other staff on an occasional basis can put together online reports, queries, and graphs, and present them in a sophisticated presentation package, using no other tools than those mentioned above, and in relatively little time.

Much of the time spent implementing LMIS has been in researching user needs and finding the right SAS tool or technique to meet those needs. From this point on, we expect LMIS development to proceed very swiftly.

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FOR MORE INFORMATION:

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Figure 1

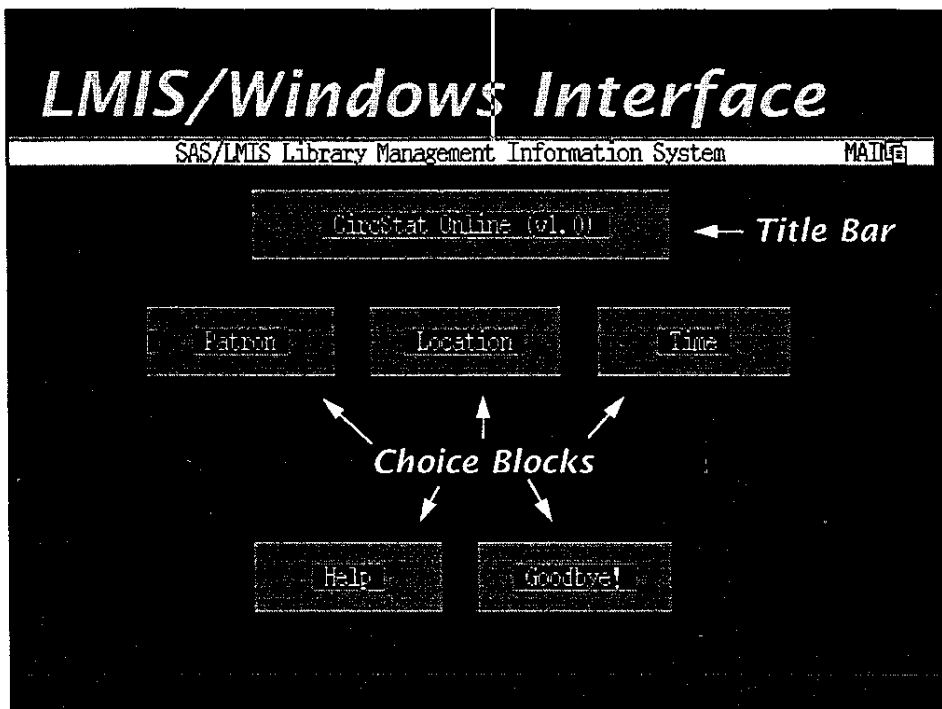


Figure 2

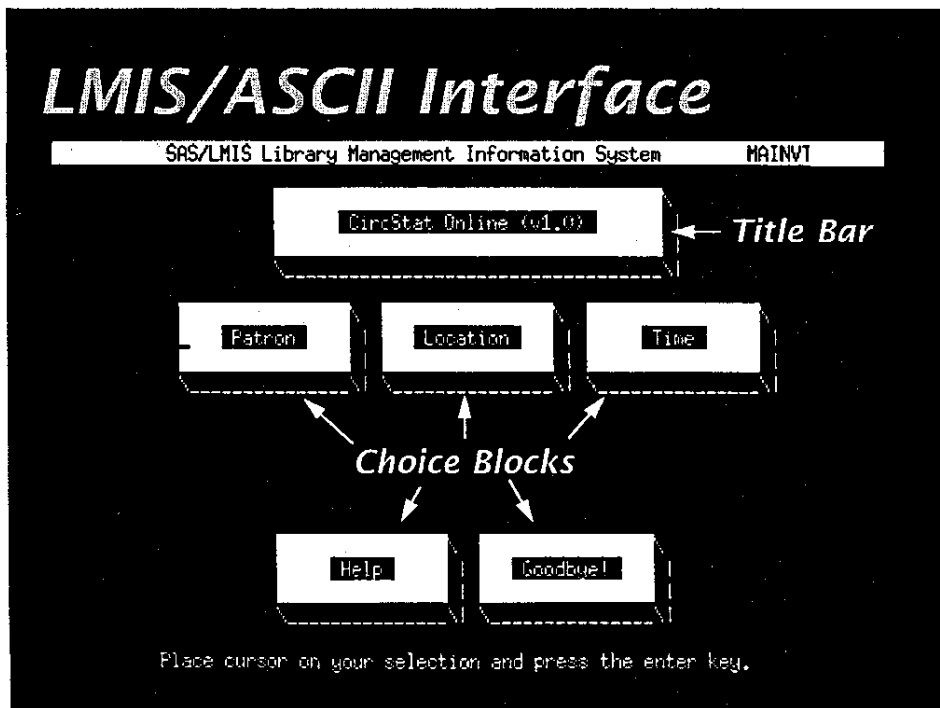


Figure 3

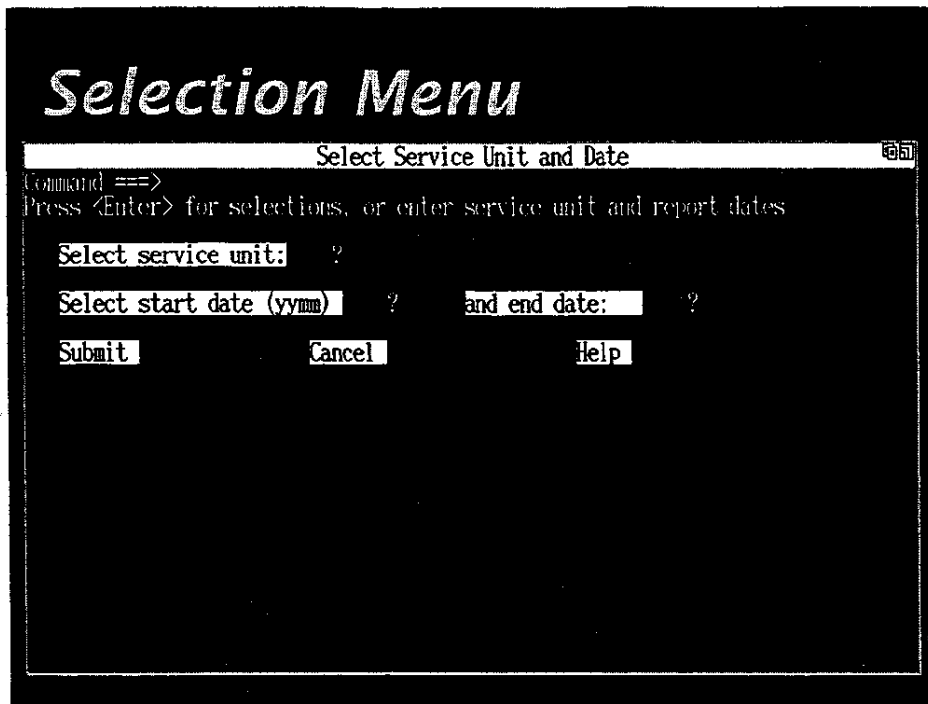


Figure 4

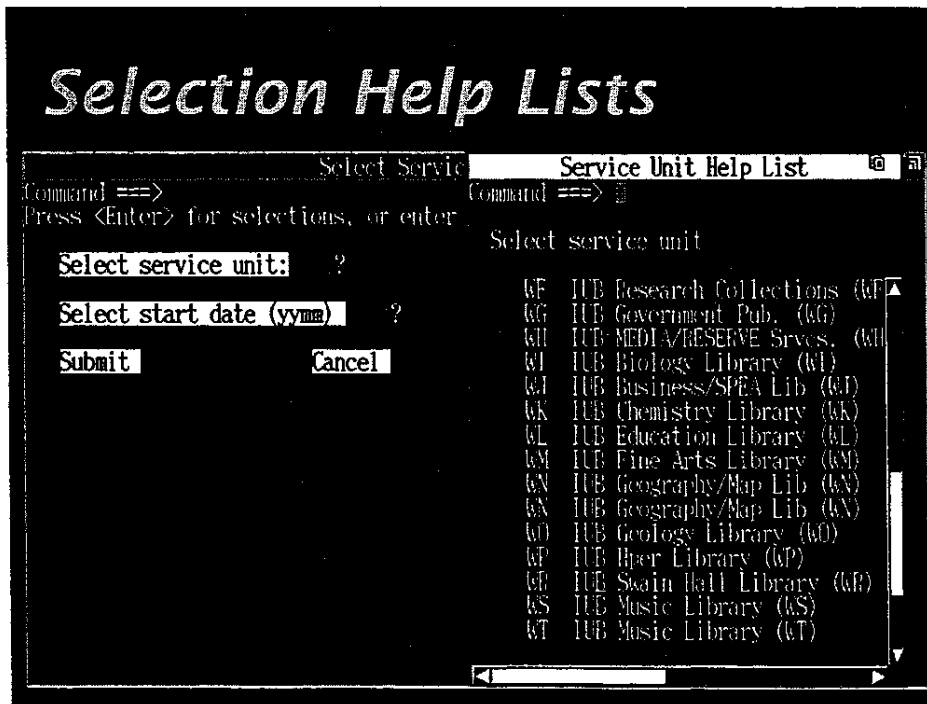


Figure 5

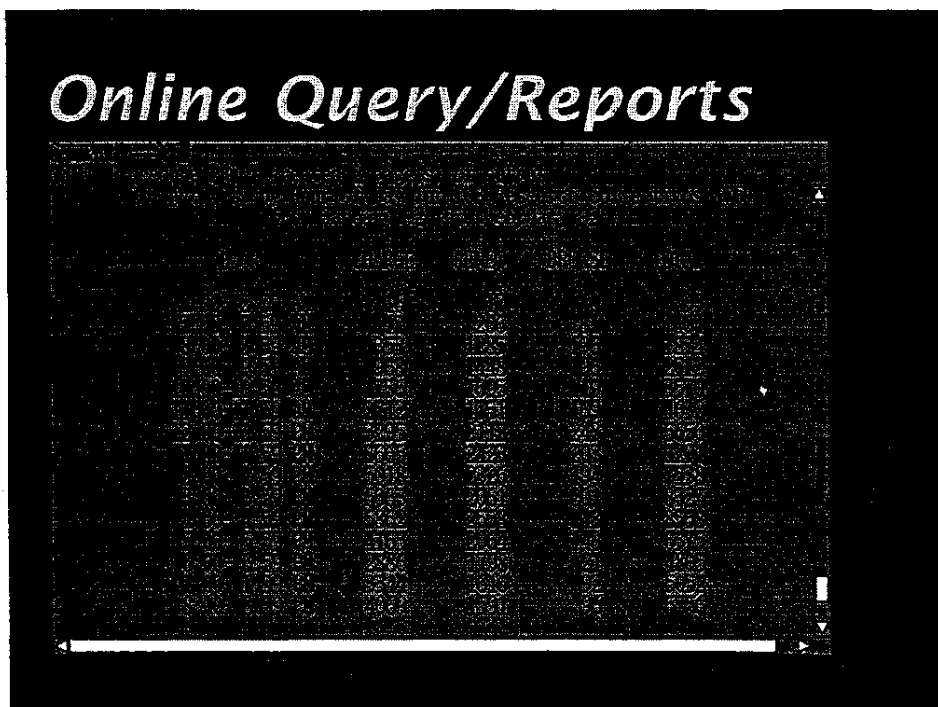


Figure 6

