Development of the Windows-Based CARL Cataloging Workstation at the University of Hawaii at Manoa Libraries

by Martha Chantiny

The contract between the University of Hawaii and CARL Systems, Inc. to acquire an Online Integrated Library Automation System for the University of Hawaii System was signed in late March 1990. The balance of that year was spent installing the mainframe computer equipment, loading and indexing the library's bibliographic database, and testing the converted data with the CARL software. The Public Access Catalog and Circulation modules began live operations in January 1991. Work did not begin on the cataloging specifications included in the contract until the basic system and the Serials and Acquisition modules were operational.

During the pre-contract negotiations between the University of Hawaii Libraries (UHM) and CARL Systems, Inc. (CARL), it became apparent that the existing dumb-terminal-based Bibliographic Maintenance module would not be adequate to serve the sophisticated cataloging needs of the University academic research library with extensive collections of materials in foreign languages and non-roman character sets. The University of Hawaii Library and CARL Systems, Inc. agreed to cooperatively develop a new cataloging module which would satisfy the contract requirements specified by UHM. This development work was to take place long distance, using electronic mail as a primary means of communicating between the collaborators.

Some of the requirements which were not met by the existing Maintenance module included:

- diacritics display on screen over or below the correct character and not before or after the character;
- support for Chinese/Japanese/Korean character sets (CJK) including the ability to input, display and search by CJK characters;
- MARC format information online with linked textual contents that can be displayed at any tag and indicator and at any element of the MARC leader and fixed fields during data entry or editing; and
- linked reference files such as the USMARC Code List for Languages, Countries, Geographic Areas, and so on.

During late 1990 and early 1991, the UHCARL system underwent a great deal of development at the UHM Library. Simultaneous updating and testing of new releases in the Circ, Serials/Acquisitions and PAC modules was underway. In addition, during this time period, the UHM Library was running dual computer operations. The former automated system, ALOHA, was still in use for original cataloging, data transfer and output, and as a cataloging utility by a number of community college libraries. The Systems Office was supporting two complete computer systems with extremely different operational requirements while learning how to utilize and manage the new Tandem equipment, operating system and CARL applications.
CARLterm/Workstation

The description of the CARLterm/workstation software which follows is based on the CARL implementation at UHM as of December 1992 and is not intended to reflect the full range of software features and functionality at CARL sites across the country.

Prior to the installation of CARLterm/workstation, online cataloging had been performed on dumb terminals using the Library's former automated system, ALOHA — and before that, on OCLC dumb terminals. Microcomputers were not widely used for standard technical-services type activities.

The CARLterm/workstation software runs on a standard 80386 DOS microcomputer with 4MB of RAM and a VGA color monitor. It is a Windows-based application and is intended to be used with a mouse. Before a cataloger even sits down at the workstation it is immediately obvious that it is very different from a dumb terminal.

The user must select an icon from the Windows desktop in order to begin using the CARLterm/workstation software. A pause of several seconds occurs as the program loads into memory and the main menu bar displays. Only the top line is highlighted or active at this point; the push-button icons in the second row are not yet active (see Figure 1). A sequence of keystrokes similar to those used on a terminal execute next in order to connect to the processes running the Tandem-side of the software. The option for Maintenance Workstation is selected from a Technical Services menu to launch the Tandem side of the program used with CARLterm/workstation (see Figure 1).

Once the workstation has connected to the Tandem, the Add, Modify, Move, Delete database operation icons on the main menu bar are highlighted and may be chosen by clicking on the icon, or typing in Alt- and the letter which is underlined in the Icon name. For example, Alt-Y selects the Modify operation (see Figure 2). At this point the user interface is dramatically different from that of the dumb terminal. There are more objects, colors and information on the screen that need to be considered.

After an operation is selected, the cataloger is presented with a Dialog Box in order to select the database in which the operation will be performed (see Figure 3). This is one of the features that distinguishes the workstation from the dumb terminal. It is possible to easily move back and forth between databases within an operation.
Once an operation and database are selected, the cataloger uses the same program functions as the terminal-based Bibliographic Maintenance. The Tandem-side of the program appears in the workstation window. At this point the Windows scrollbar obscures some of the data on the right-hand side of the display. To see all the information, the cataloger has to remember to use the Windows maximize feature to increase the display size of the window.

Once a bibliographic record is retrieved and selected by typing the same commands used in Bibliographic Maintenance, the MARC, Holdings, Display, Quit and Process command icons are highlighted (see Figure 4). To edit a bibliographic record, the MARC icon is selected and the information is loaded into the memory of the PC and a new window with editing options is displayed (see Figure 5). At this point the true power of the microcomputer, and the most radical differences in the functionality between the terminal and the microcomputer are apparent. The record can be edited with cut/copy/paste functions; full word-wrap occurs, and diacritics are easier to input and display immediately in their graphical form on the screen.

There is a rudimentary form of error checking available using the Check Tag command, and there are specialized close-up tag windows for the fixed fields (000, 007, 008 and 841). See Figure 6 for an example of the fixed field window for 008 input. The close-up tag windows for tags other than fixed fields currently include the same information available in the terminal-based Bibliographic Maintenance, but in a less obtrusive location at the bottom of the window (see Figure 7). In addition, the close-up window functionality may be used in the future to provide more extensive information about the tags, perhaps via links to MARC format files.

The handling of holdings (or item) conversion and editing is the other operation which differs considerably from the terminal-based Bibliographic Maintenance and makes use of the greater power of the microcomputer. Since all bibliographic and holdings information — except in rare cases — are loaded into the microcomputer's memory, it is possible to easily move back and forth among multiple holdings without having to backup through a series of menus and prompts. The options available under the Holdings command within the Holdings
Editor operation include New, Delete, Undelete, Next, Previous and the ability to go to a specific holdings record (see Figure 8).

Filing a record back to the Tandem is accomplished by clicking on the Process icon (see Figure 4) and is relatively straightforward. Leaving a record without saving changes is somewhat more confusing. There are both Done and Cancel options on the menus in most operations, and some menus also have Quit and Cancel; this inconsistency causes some confusion for the users.

The Development Process

In the early months of 1991, the Head of Cataloging at UHM met with CARL programmers at ALA to assemble the first specifications for the module which was to be developed. As early as March 15, 1991 the first electronic mail messages between the CARL programmer and the Head of Cataloging were exchanged concerning progress of the code.

In April 1991, the CARL programmer made a site visit to UHM in order to install the first release of the software which was to be known as CARLterm/workstation. This preliminary version was demonstrated for the staff of the Original Cataloging and Database Maintenance departments of UHM. The first sight of the Windows-based CARLterm/workstation software was jolting and perplexing to most of the staff and was met with skepticism and immediate requests for different or additional features. The lack of a print capability and anticipated problems with printing were immediate concerns.

After the first in-person introduction of the software, development continued primarily by exchange of electronic mail, phone calls, faxes and uploaded and downloaded electronic files. Although the CARL programmer remained perennially optimistic about the date upon which a final version would be released, another year passed before the software was deemed usable by UHM Library staff. The CARLterm/workstation development effort during 1991-92 was intense.

A simplified timeline of the debugging/release history is as follows:

**Early May 1991**

- The first transfer of updated code from CARL’s Tandem computer to UHM’s Tandem via the TCP/IP ftp protocol occurs. The code must then be transferred to each of the 12 PC workstations.
- This version of the software does not have the ability to change and save COM port settings. The version is also found to be incompatible with the “live” version of PAC, only the not-yet-released test version of PAC is usable with the CARLterm/workstation software.

**Mid-May 1991**

- The official release of version 1.0 is announced, however, not all of the features promised in that release are actually found to be functional. In
particular, the ability to save information to a PC-based temporary file does not work.

- Testing of version 1.0 involved so many INSPECTS (the "debug prompt" for CARL programs) that the Systems Office developed a procedure for purging all files of problem records before testing could be restarted. Luckily, the testing was taking place on a set of "scratch files" consisting of a copy of approximately 10,000 records from the Library’s live database.

- Fatal Runtime Error Messages followed by Unrecoverable Application Error messages became routine. By the end of May, the CARL programmer suggested that the steps leading up to these frequent error messages be logged and transmitted to him for study. The Systems Office documented a procedure and technique for capturing repeatable bugs and error conditions using the Windows "Recorder" feature. A procedure for uploading the resulting Macro file in binary format to the UHM Tandem for retrieval by the CARL programmer was also formulated.

**Early June 1991**

- Version 1.03 released. Explanations for causes of errors experienced during testing were received from CARL, unfortunately, they were cryptic at best. For example:

> "The problem on the PC platform became apparent when the re-indexing began, the new BIDs contained Ox14 (30), which was detected by the PC code which disassembled the packet into component tags. However, the PC did not check to see if the Ox14 was in the data of the tag, or in the 10 byte header..."

**Mid-June 1991**

- After several intermediate fixes, version 1.10 is released for testing. A day after the release of this version, both the primary and mirror of one Tandem hard drive failed and portions of the files used by the CARLterm/workstation program were wiped out by the crash. This was the only hardware failure experienced to date on UH-CARL and is something which is "never supposed to happen."

However, once version 1.10 was back online, it was clear that many extensive modifications to make the interface more friendly for real users were in place. The intense exchange of e-mail and Macros between the Systems Office and CARL over the last two months appeared to be bearing fruit.

![Figure 4. Command icons after record selection](image-url)
Late June 1991

- The de-installation of the Library’s old automated system was scheduled. Unfortunately, version 1.10 was still not considered usable for the production of original cataloging records on the UHCARL System. At this point, the UHM Associate University Librarian for Processing, Operations and Automation declared that “the distance/time difference is defeating us. During this alpha/pre-alpha stage, bugs from report to fix are taking up to three days. The software is really klunky, people are getting tired of the same bugs. . . . We do not believe that much can be accomplished long distance.”

- Version 1.11 released.

Early July 1991

- Version 1.12 released.

Mid-July 1991

- The UHM staff still described the CARLterm/workstation software as unable to “make the rudimentary functions work well enough to even explore the format issues.” Problems with slow response time of the Tandem mainframe and data transmission difficulties between the PC and Tandem platforms were rife.

  Reports of high levels of frustration among the cataloging staff testing the software and that it was “too confusing” were sent to CARL via electronic mail. Again the Associate University Librarian for Processing, Operations and Automation complained that long-distance debugging and the four-hour time difference were a problem and that the software was universally judged by staff to be cumbersome, slow and labor-intensive.

Early August 1991

- Version 1.15 released. To minimize the levels of frustration, testing is now limited to one staff person from the Database Maintenance department and one Systems Office staff member. All other cataloging production is being performed using the recently upgraded CARL Bibliographic Maintenance module on dumb terminals. With testing confined to two users most familiar with the CARLterm/workstation program, debugging and error testing achieves consistency and a more methodical structure.
CARL MARC Editor - Serials

Mid-August 1991

- Version 1.16 released.
- The de-installation of the old automated library system hardware finally takes place.

Early September 1991

- Version 1.20 released. Problems with the display of diacritics in conjunction with the Windows color scheme are encountered, but work continues with suggestions from the UHM testers for added status bar messages.
- Version 1.21 released. This version fixed the color problem and addressed many of the other suggestions and bug reports. Finally at this point, development work could focus more on esthetics rather than lengthy phone sessions between the Systems Office and CARL to debug this and other problems began to step up because the situations being encountered could not be duplicated in Colorado via the use of macros.

January 1992

- Version 1.3 scheduled for release, but postponed.

February 1992

- Version 1.30 re-scheduled for release in mid-February.

March 1992

- Version 1.30 STILL not released, promised for the end of March. UHM is requiring a fully on system level errors, IN­ SPECTS, major bugs or ba­ sic functionality.

- Version 1.22 released. More macro files and error reports are exchanged via electronic mail between the Systems Office and CARL.

Mid-September 1991

- Version 1.24 released. By October, testing is once again expanded to include several catalogers.

Early November 1991

- Basic cataloging using Book and Serial formats is declared functional.

December 1991

- With more catalogers using the CARLterm/workstation software to perform their daily work, increased problems with data transfer of edited records from the PC back to the Tandem become apparent.
implementable system on or before June 15th.

Early April 1992

- Version 1.30 released.
- A modified version of 1.30 released for wider but limited testing by more cataloging staff.

Late April 1992

- By the last week of April, virtually a new version a day is being transferred from Colorado to UHM.
- The CARLterm/workstation software is deemed safe and stable enough for use with live files, the same bibliographic records used by PAC and all other processing modules.

Early May 1992

- PC workstations running CARL-term/workstation software are put in place of ten dumb terminals which are removed from the original cataloging department. All original cataloging processing is shifted to the PC workstation.

Mid-May 1992

- Serious lobbying for printing capability ensues. It turns out that the rudimentary print capability contained in version 1.10 was removed from 1.30. It will be nearly 3 months before it is restored and adequate printing capability again exists.

As the June 15, 1992 date for delivery of a fully implementable system approaches, new fixes are again released on an almost daily basis. Unfortunately, as June turned to July, more problems and frequent Fatal Runtime Errors and Fatal Application Errors continue to appear.

Mid-August 1992

- At this point, only serious errors which stop overall production of original cataloging are reported to CARL and the cataloging staff have enough time and experience to start noticing discrepancies between the functionality of the CARLterm/workstation software and the dumb terminal-based Bibliographic Maintenance software.

Late September 1992

- After an upgrade to the Tandem computer and an adjustment to the memory usage of the CARLterm/workstation software — the software reaches stasis and stabilizes.

October 1992

- The CARLterm/workstation is released for tests at other CARL sites.
and the specifiers/testers at UHM because of the distance and time zone differences. In the early stages, vast differences in communication styles and language caused a slow rate of turn-around on major system problems and effort was needlessly expended on a misinterpretation.

Starting out with a departmental "mass test" probably contributed to the slow development process. This was attempted partly because everyone was optimistic at first that a "finished product" was just around the corner. When it became apparent that serious design and programming remained to be done and a small group of expert testers were used to debug and report problems, effort became more concentrated and less wasteful. As a result new code was produced more quickly.

As of December 1992, UHM still considers the CARLterm/workstation in development, although close to being an adequate "basic workstation." Several of the original contract requirements have not yet been realized, specifically the CJK requirements, linked text and help files issues.

The CARLterm/workstation has a number of advantages even over the improved Bibliographic Maintenance module:

- Diacritics display
- Long tag editing and full word-wrap capability
- Ability to cut and paste within a record and between records (as long as the cut doesn't include special characters)
- When editing one occurrence of a tag divided into multiple occurrences due to its large size (a CARL tag structure feature), the occurrences remain in order

**Conclusions**

On the whole, the development probably went as well as any Library programming project, but there were many additional frustrations between the programmer at CARL and the specifiers/testers at UHM because of the distance and time zone differences. In the early stages, vast differences in communication styles and language caused a slow rate of turn-around on major system problems and effort was needlessly expended on a misinterpretation.

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• 000/007/008/841 tags appear as formatted windows rather than a string of characters

• Alerts are provided when entering a long tag

• Ability to move records from a workfile to the live file or vice versa from the same pull down menu rather than having to step back to a menu selection

• Editing, adding, and moving between item records is faster

• Local customization of default elements included in close-up tags for 000/007/008/841 is possible

However, the CARLterm/workstation still has significant disadvantages, some of which are related to the fact that it is based on DOS 4.01 and Windows 3.0 and has not yet been updated to function with the faster DOS 5.0 and Windows 3.1 software. Current disadvantages include:

• It is significantly slower than a dumb terminal when displaying PAC screens primarily because of the character set used in order to display graphical diacritics.

• Use of the workstation requires becoming comfortable with a PC and DOS-based functions as well as eye-hand coordination to use the mouse.

• There is no integrated access to other processing modules (Serials Acquisitions, Circulation).

• It is not current with all the defaults/features of the terminal-based Bibliographic Maintenance module.

• The Windows scroll bar overlaps information on certain screens.

• Holdings for bibliographic records with very large numbers of linked items cannot be retrieved for editing due to memory buffer constraints on the size of records which can be manipulated. The PC software treats the bibliographic and holdings as one entity when it is selected and loaded into memory.

• Because there is no access to the full functionality of the Circulation module, records cannot be searched by barcode number.

UHM believes that the PC-based CARLterm/workstation is the only vehicle which will eventually be able to satisfy the multi-character and language requirements which constitute the majority of our original cataloging work. However, with recent improvements to the Bibliographic Maintenance module, it is not necessary to rely solely on the CARLterm/workstation to satisfy current cataloging and copy-cataloging production needs. If the CARLterm/workstation product is ever to be truly useful to large academic research library cataloging departments, it still needs to be made consistent with the Bibliographic Maintenance module and support easy access to the other CARL processing modules. In addition, it should be optimized for the current DOS and Windows versions and be made as fast as possible given the fact that two unlike systems — Tandem and PC — are communicating with each other.

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