DEVELOPING A CDS/ISIS-BASED ONLINE CATALOGUING AND INFORMATION RETRIEVAL INTERFACES FOR USE IN SMALL LIBRARIES

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ABSTRACT

Describes the development of ONLIS, a customised user interface for computerised MARC cataloguing and information retrieval targeted for use in small libraries and information centres. Micro CDS/ISIS Ver. 3.07 software package and its built-in Pascal language were used for the design process and development. The design philosophy centres on the development of a very user-friendly and simple interface, capable of mimicking the salient features of contemporary commercial library package, yet easy to implement and maintain in a small library environment requiring little or no technical expertise. The system incorporates many new features and comprises two main components, namely (a) data entry and file maintenance and (b) information retrieval. A security system is incorporated into the former environment to ensure data integrity and regulate important file maintenance tasks. While the system is ready for immediate implementation in libraries, modifications and enhancements are currently undertaken to make it a truly reliable product. Some degree of user training in MARC and cataloguing using AACR2 is necessary to get the maximum benefits from the system.

Keywords: Micro CDS/ISIS; Automated cataloguing; MARC; Online retrieval system; Computerised user interface; Small libraries; School libraries; Automated library system; ONLIS.

INTRODUCTION

Library automation has definitely made headways among libraries in Malaysia. However, this is evident mainly among the large libraries, which include the National Library of Malaysia, the university and special libraries, as well as some of the large state public library systems. By and large, library automation has yet to make inroads into the many public library systems and the majority of smaller libraries, including school libraries. In an age when information technology and computer networking are making great impact, and many small libraries and information centres have acquired the capability to access other libraries through the Internet, it is ironic that most of these libraries themselves are not yet automated. There

are many reasons for this state of affair, perhaps the main one is that automation is generally assumed to be an expensive venture that only large libraries can afford. Other impediments could be the lack of computer hardware and knowledge of suitable software to use, or the lack of trained personnel to implement automation plans.

Purchasing and implementing a commercial turnkey library system may be one solution. There are some good microcomputer-based packages in the market with enough sophisticated features capable of managing a collection size of 25,000 items or more, which is more than sufficient to meet the requirements of most small libraries. However, it is difficult to envisage that many libraries would have the financial resources to realise this. Some of the more technologically advanced libraries have used off-the-shelf database management system (DBMS) like Microsoft Access and Borland's dBase (Beiser, 1991) to manage electronic catalogues in their libraries. Often, these packages are not the most suitable to handle textual databases like a library catalogue. Their highly structured and fixed field formats, make the handling of bibliographic information of variable length rather cumbersome, and often result in considerable wastage of disk storage. Such packages are more suitable for applications having well structured numerical and tabulated data, and where most of the fields are not empty, and are more or less of equal length.

This paper discusses the development of the application interfaces for creating a machine-readable catalogue and information retrieval capability using Micro CDS/ISIS version 3.07 (hereafter referred to as CDS/ISIS). The software is widely distributed all over the world to libraries and information centres by Unesco. The core programs of CDS/ISIS are distributed in one diskette. Its size belies the powerful features that make it a suitable software for use in libraries and document centres. Also, its ability to handle variable field format, makes it more preferable to other commercial DBMS packages. Other features include its powerful search engine, flexible display and printing capabilities. CDS/ ISIS has wide application as an indexing tool but its flexibility to allow users to create additional program modules, has extended its use to library automation applications like cataloguing, circulation and information retrieval. This is because CDS/ISIS comes with a built-in Pascal language of its own to allow local customisation and development of user applications and interfaces. Many such customised applications have been reported in the literature (Nieuwenhuysen, 1991) including the IDIN system for creating a bibliographic database, based on the Common Communication Format (CCF) (Di Lauro, 1988). It has also been used to implement UNIMARC (Cabral, 1989; Hopkinson, 1994). Some good interfaces have also been developed to complement the information retrieval capability in CDS/ISIS (Heurisko, 1993; Treloar, 1995).

OBJECTIVES

The application described here is called ONLIS, an apt acronym for Online

Library Information System. Two main reasons lead to its development. Firstly, it was developed to make available to small libraries a package capabilible of creating machine-readable catalogues based on the standard MARC format, together with an information retrieval capability, at low cost and with minimal hardware. This is part of an on-going effort to explore, develop and offer consultancy services on automated library systems suitable for use in small libraries and information centres in the country. Secondly, ONLIS is intended to give hands-on and real system exposure on the use of automated MARC cataloguing and online information retrieval, to the postgraduate students of the library and information science programme conducted by the Faculty of Computer Science and Information Technology.

It is true that the ONLIS interfaces were developed keeping the small libraries in mind. Nevertheless, the rationale to adopt the MARC record format for automated cataloguing, was to emphasise the need to use a standardised data format to facilitate both the exchange of data between libraries, as well as to ensure data compatibility should the library opt to use another automated library system in future. The MARC format can be considered to be the *de facto* bibliographic format adopted for use in almost all the installed automated library systems in the country. In line with the adoption of MARC as the bibliographic standard, CDS/ISIS makes a good match as the database management system of choice to develop the interfaces for ONLIS. It is

useful for creating bibliographic records whose structure can be very similar to the MARC format. Also, it can accommodate up to 200 fields, more than sufficient to cater for the 167 fields declared for the ONLIS system. The large number of fields to manipulate in a MARC record also make good sense to use CDS/ISIS to accommodate the variable field length in a bibliographic record.

The automated library systems available today reflect products that have undergone tremendous changes through the years. Many outstanding features have been incorporated. It was felt that in the development of ONLIS, the small libraries should be provided with a system that incorporates the 'look-and-feel' and other salient features of these contemporary library packages, while still able to operate on a relatively unsophisticated microcomputer with a character-based video monitor.

SYSTEM DESIGN

To achieve ease of use and high level of user-friendliness, it was decided that the front-end interfaces developed for ONLIS would do away completely with the screen interfaces offered by CDS/ISIS. All the working modules of ONLIS was coded from scratch using the built-in CDS/ISIS Pascal language, a subset of the standard Pascal. This will allow the flexibility to include more user-friendly features as the need arises. The coding approach used was bottom-up, where lower-level modules were completed first leaving the high-level modules as

skeletons. This has the advantage of being able to test some of the modules while others are being coded. The system comprises 6 modules based on their functionalities. Altogether, 19 programs were written comprising 18 menu exits programs and one format exit program (Figure 1).

ONLIS is a separate system that can be started up directly or can be called up from the main CDS/ISIS menu. The latter is accomplished by removing Parameter 9 from the SYSPAR.PAR file. Parameter 9 is an initial autotyped character string which normally represents the option code and can be selected from the main CDS/ISIS menu at startup. In ONLIS option code 'W' is assigned. It is automatically typed each time the system starts to launch the customised application. The main CDS/ISIS menu is thus not presented to the user.

DEVELOPMENT OF ONLIS INTERFACES

The development of ONLIS can be divided into both the functional and non-functional requirements:

Functional requirements

1. Data entry system
2. Master file maintenance
3. Miscellaneous file maintenance
4. Utilities
5. Index searching
6. Keyword searching

Non-functional requirements

1. Access security
2. Storage management
3. Good response time in searches
4. User training

Interface Design Considerations

The overall design strategy emphasised the development of a system with simple interfaces, yet possessing good functionality. The system should be DOS-based, able to run on an IBM or IBM compatible 286 hardware, easy to install, use, and maintain even by the non-technical users with minimal training. For its wide acceptance and easy distribution, the core applications must continue to be small in size and be distributable in one diskette.

The user interfaces created are still essentially character-based. The menu screens are created using the CDS/ISIS menu editor. The opening screen in ONLIS is very simple and uncluttered (Figure 2). It displays an option menu indicating the two very important components of the system, namely cataloguing including file maintenance, and information retrieval. This was done to present one environment in which a security system has been built in, and another environment (information retrieval) where unhindered user access is permitted.

ONLIS retains the menu-driven feature of CDS/ISIS, but each screen is designed to make it less cluttered and more user-friendly. An option menu screen presents
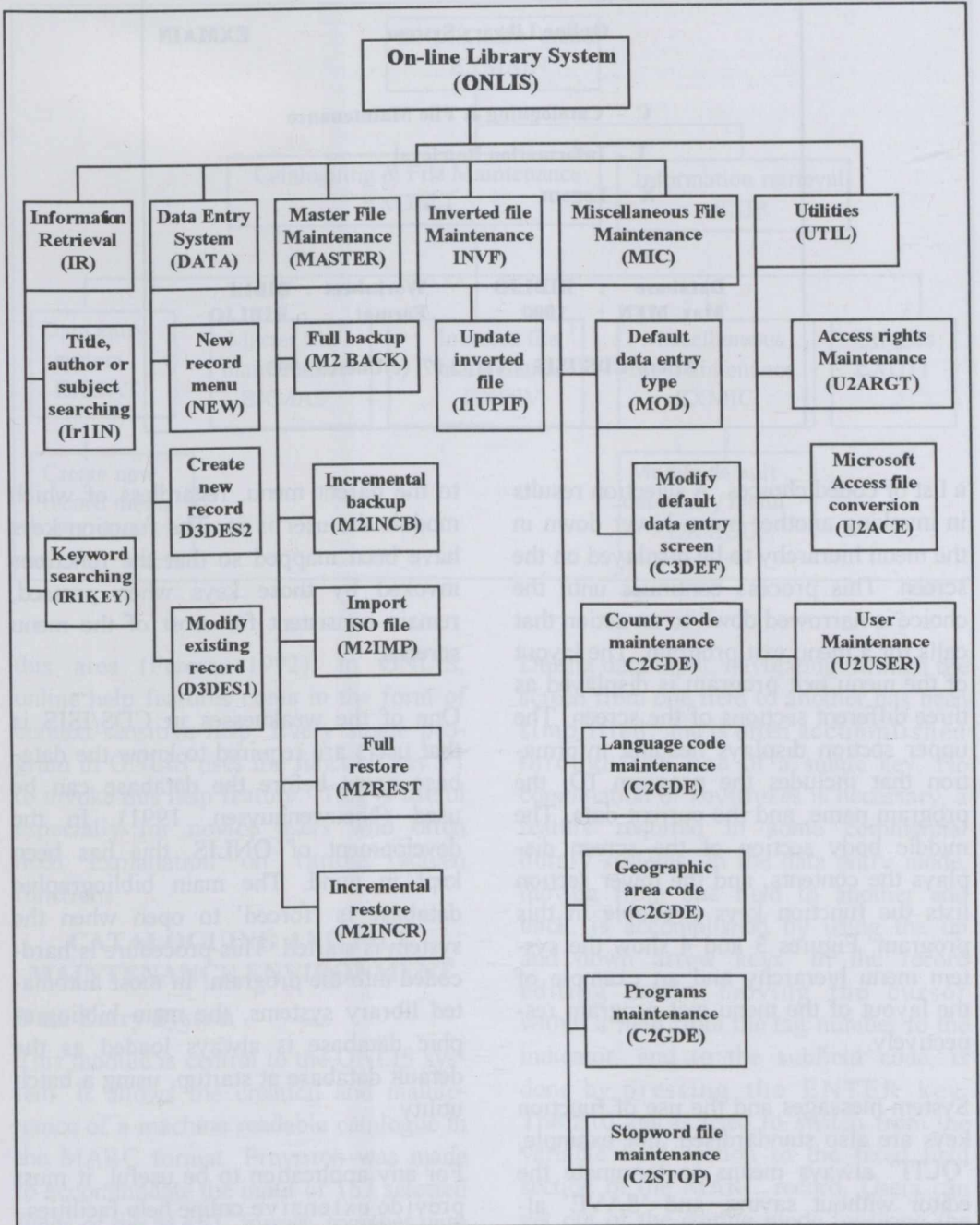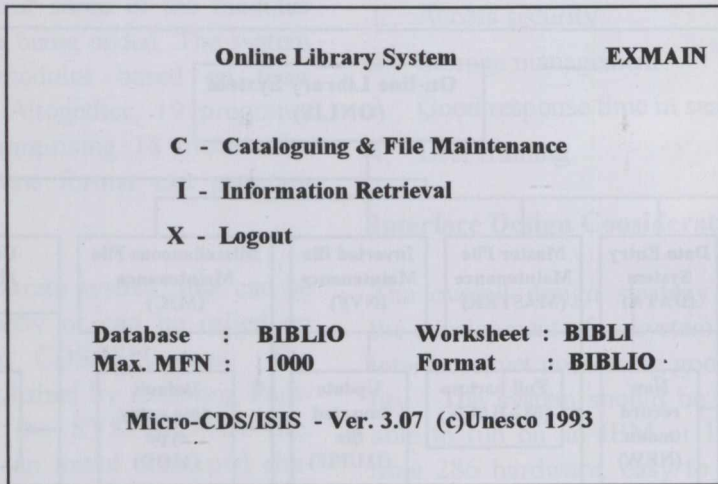
Figure 1 : ONLIS Structure Chart

Figure 2: Opening Screen of ONLIS

```
┌─────────────────────────────────────────────────┐
│                                                   │
│       Online Library System          EXMAIN       │
│                                                   │
│                                                   │
│       C - Cataloguing & File Maintenance          │
│                                                   │
│       I - Information Retrieval                    │
│                                                   │
│       X - Logout                                   │
│                                                   │
│                                                   │
│    Database  :  BIBLIO      Worksheet : BIBLI      │
│    Max. MFN  :  1000        Format    : BIBLIO     │
│                                                   │
│     Micro-CDS/ISIS - Ver. 3.07  (c)Unesco 1993     │
│                                                   │
└─────────────────────────────────────────────────┘
```

a list of coded choices. A selection results in invoking another menu lower down in the menu hierarchy to be displayed on the screen. This process continues until the choice is narrowed down to an action that calls for a menu exit program. The layout of the menu exit program is displayed as three different sections of the screen. The upper section displays heading information that includes the program ID, the program name, and the current date. The middle body section of the screen displays the contents, and the lower section lists the function keys available in this program. Figures 3 and 4 show the system menu hierarchy and an example of the layout of the menu exit program respectively.

System messages and the use of function keys are also standardised. For example, 'QUIT' always means to terminate the editor without saving, and 'SAVE' always means to save a record and return to the parent menu, regardless of which module the user is in. The function keys have been mapped so that the functions invoked by those keys when pressed, remain consistent for most of the menu screens.

One of the weaknesses in CDS/ISIS is that users are required to know the database name before the database can be used (Nieuwenhuysen, 1991). In the development of ONLIS, this has been kept in mind. The main bibliographic database is 'forced' to open when the system is started. This procedure is hard-coded into the program. In most automated library systems, the main bibliographic database is always loaded as the default database at startup, using a batch utility.

For any application to be useful, it must provide extensive online help facilities. CDS/ISIS has been notably lacking in

Figure 3: ONLIS Menu Hierarchy
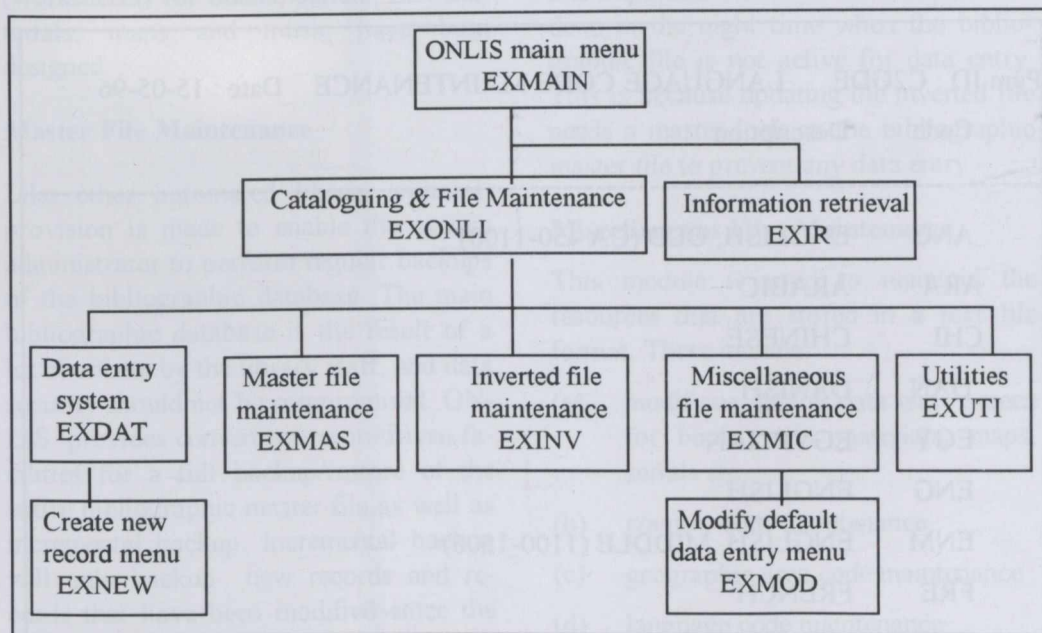
this area (Perera, 1992). In ONLIS, online help features come in the form of context-sensitive help. Every single program in ONLIS uses the function key F1 to invoke this help feature. This is useful especially for novice users who often need explanation on various screen functions.

CATALOGUING AND FILE MAINTENANCE ENVIRONMENT

Data Entry System

This module is central to the ONLIS system. It allows the creation and maintenance of a machine readable catalogue in the MARC format. Provision was made to accommodate the input of 167 selected fields of the MARC format, together with their relevant indicators and subfields.

During data input, navigating through the screen from one field to another has been simplified, and is often accomplished through the use of a single key. No combination of keystrokes is necessary, a feature required in some commercial library systems. In the data entry mode, moving from one field to another and back, is accomplished by using the up and down arrow keys. In the record editing mode, moving the cursor within a field from the tag number to the indicator, and to the subfield code, is done by pressing the ENTER key. The F10 key is used to switch from the variable field section to the fixed field section of the MARC record. Users can get out of the editing mode by using the ESC key. In CDS/ISIS, this is not possi-

Figure 4: Example of a Menu Exit Program (Language Code Maintenance)

```
Pgm ID : C2GDE    LANGUAGE CODE MAINTENANCE    Date : 15-05-96
     Code        Description
-----------------------------------------------------------------------

     ANG         ENGLISH, OLD (CA 450-1100)

     ARA         ARABIC

     CHI         CHINESE

     DAN         DANISH

     EGY         EGYPTIAN

     ENG         ENGLISH

     ENM         ENGLISH, MIDDLE (1100-1500)

     FRE         FRENCH

     FRM         FRENCH, MIDDLE (CA. 1400-1600)

     FRO         FRENCH, OLD (CA. 842-1400)

     GEM         GERMANIC (OTHER)

     GER         GERMAN

     HIN         HINDI
-----------------------------------------------------------------------

    F1-Help      F2-Add      F4-Delete   F5-Edit   F6-Save    F7-Quit

    ↑-Prv        ↓-Next      PgUp        PgDown    Home-First End-Last
```

ble, and the user would have to move through all the fields before quitting the editing mode.

Built into the system is a validity checking feature to verify the tags including repeatable tags, indicators, and permitted subfields, for all the fields. Additional validation check is performed on the

place of publication, country and language codes in tag 8 (fixed field), and also on tag 20 (ISBN), tag 22 (ISSN), tag 41 (language code), tag 43 (geographic area code), and tag 44 (country code), in the variable field section of the MARC record. To facilitate input by the novice users and to ensure higher produc-

tivity in data entry, data entry screens (worksheets) for books, serials, mix materials, maps and music have been designed.

Master File Maintenance

Like other automated library systems, provision is made to enable the system administrator to perform regular backups of the bibliographic database. The main bibliographic database is the result of a lot of efforts by the library staff, and data security should not be compromised. ON-LIS provides convenient menu-driven facilities for a full backup/restore of the entire bibliographic master file as well as incremental backup. Incremental backup will only backup new records and records that have been modified since the last backup date. Tag 5 (date and time of latest transaction) is compared with the backup date. If the date is the same or one day before the backup date, all the fields in that record will be extracted and written to a text file. For incremental restore, it will restore records from incremental backup file into the bibliographic master file. This added facility is provided besides the normal backup utility provided by CDS/ISIS because it takes less time to do a backup, and thus encourages more frequent backup of the database.

Inverted File Maintenance

This function is obvious to all users of CDS/ISIS who wish to take advantage of its powerful keyword search capability. In ONLIS, updating the inverted file invokes the same CDS/ISIS built-in utility program. Deferred execution of this important task is recommended to be done in the night time when the bibliographic file is not active for data entry. This is because updating the inverted file needs a master lock on the bibliographic master file to prevent any data entry.

Miscellaneous Files Maintenance

This module is used to maintain the resources that are stored in a text file format. These include:

(a)   modifying default data entry screen for books, mix materials, maps, serials etc.

(b)   country code maintenance.

(c)   geographic area code maintenance

(d)   language code maintenance

(e)   stopword file maintenance

(f)   program maintenance.

The default data entry screens for books, mix materials, maps, serials, and music are stored as different text files. It is possible to customise these screens further to suit the needs of any particular library for input of bibliographic records. Figure 5 shows a partial example of the default data entry screen for books.

The geographic area code, country code and language code files, maintain a list of the valid codes used in USMARC. All these sequential files can be updated and amended as necessary. Validation checks on these codes are carried out during data entry. An error message will appear if an invalid code that is not stored in the text files, is inputted.

Figure 5: Partial Default Data Entry Screen for Books

```
┌─────────────────────────────────────────────────────────────────────────┐
│ Pgm ID  : D3DES1      MASTER FILE MAINTENANCE          Date  : 10-08-96   │
│ New : Book                  Entered : 10/08/96         Modified : 10/08/96│
│ Typ:a  Bib l:m  Enc l:   Desc:  Datetpy:   Date1:  Date2:  Ctry:  Lang:   │
│ Mod:  Catsr:   Illus:             Targeta:  Form:   Con:   Gvt:   Conf:   │
│ Fes:   Index:   Fict:             Biogra:                                 │
│  Tag  In  Content of Field                                                │
│ ----------------+----1----+----2----+----3----+----4----+----5----+----6----+----7- │
│    001       12                                                           │
│    010       ^a                                                           │
│    020       ^a                                                           │
│    040       ^FSKTM                                                       │
│    041       ^a                                                           │
│    043       ^a                                                           │
│    050       ^a                                                           │
│    090       ^a                                                           │
│    100  10   ^a                                                           │
│    111  20   ^a                                                           │
│    130  00   ^a                                                           │
│    245  10   ^a ^b / ^c                                                   │
│    255       ^a                                                           │
│    260       ^a ^b ^c                                                     │
│    300       ^a ^b ^c cm.                                                 │
│    350       ^a                                                           │
│    440       ^a ^v                                                        │
│    490       ^a ^v                                                        │
│ ----------------+----1----+----2----+----3----+----4----+----5----+----6----+----7- │
│ F1-Help   F2-Add after   F3-Add before   F4-Delete fld   F5-Edit fld  F6-Save │
│ F7-Quit   F8-Prt rec    F9-Del rec     Home-First   End-Last   F10-Switch │
└─────────────────────────────────────────────────────────────────────────┘
```

The stopword file maintains a list of non-significant words which will be ignored when creating or rebuilding the inverted file. Words are stored in upper case and in ascending alphabetical order.

Program maintenance involves controlling a list of available programs in ON-LIS which are used to assign access rights to authorised users.

Utilities

A mixture of functions are included in this module. Among them figures the facility to convert a database file created using Microsoft Access into the ONLIS

MARC-compatible format. Microsoft Access was chosen because it is a popular software currently, and thus likely to be used as a preferred DBMS package by small libraries to automate their catalogues. The other popular DBMS package that is also widely used is Borland's dBase IIIPlus or dBase IV.

The conversion program is in fact a generic conversion program in that, irrespec-tive of any DBMS package is used, it will convert the data from those formats to the ONLIS MARC format. However, this program demands that the structure of the original source database must have a list of 17 fields for input in the specified order (Table 1). Also, the original data-base file containing the records must first be converted into a text file using the native file export facility that comes with the source database management system.

Table 1: Required Microsoft Access File Structure

No	Field	Associated to tag
1	Record type	First character position of tag 999
2	Bibliographic level	Second character position of tag 999
3	Title	245 subfield a
4	Main author	100 subfield a
5	Second author	700 subfield a
6	Third author	700 subfield a
7	Language code	36-38 character position of tag 8
8	Place of publication	260 subfield a
9	Name of publisher	260 subfield b
10	Date of publication	260 subfield c
11	ISBN	20 subfield a
12	ISSN	22 subfield a
13	Local call number	90 subfield a
14	General note	500 subfield a
15	Subject entry 1	650 subfield a
16	Subject entry 2	650 subfield a
17	Record creation date	1-6 character position of tag 8

In the final conversion, the name of the converted text file, and the text and field delimiters used, must be specified.

Specifying data input in a definite field sequence is useful because it allows conversion of data from any relational database management system, be it Microsoft Access, dBase, or any other as long as the data was input in the specified order, regardless of the field names and their lengths.

System Security

All *bona fide* users must log in to be able to perform all the functions in the data entry and file maintenance environment. Two levels of security are implemented for access to all the restricted functions. The first level requires a user identification or ID and password for access. The second level is enforced through the granting of access rights to various functions specified in the user's security record. Using this combination of user ID and access rights privileges, the system administrator is able to control access to the various programs.

When creating a new user, a user ID and a password is assigned the same value as the user ID. For security reasons, the user ID is not editable since it is a unique or a primary key. Users are allowed a maximum of 3 attempts to login, after which the system will terminate. The onus is on the users to change their passwords frequently to prevent misuse of their privileges by others. Password change can be done by using the change password utility. Changing of password

requires that the new password be keyed in twice for verification. The password is encrypted before storing into a database file. Encryption in ONLIS is enforced by using substitution and transposition. The substitution technique substitutes an original character by another character. Transposition technique transposes the position of characters in the password. The encryption technique used is simple, but effective enough for non-high security system like ONLIS.

The security record contains a user's access rights. The rights or privileges to perform a certain function is implemented through the use of a matrix (Figure 6). The lines in the matrix indicate the functions within a program, whilst the columns in the matrix indicate the nature of the privileges allowed for the relevant function. There are four types of access rights or privileges associated with each function - *Add, Delete, Edit and Read*. *Add* allows the user to add a new record, *Delete* allows deletion, *Edit* allows record modification and *Read* restricts the user to display/browse the data only. Entering a Y (YES) or N (NO) where a given line and a column meet, will determine the nature of a user's privilege to perform the function. The program also maintains a ranking for users. A ranking is associated with a different combination of access rights to a function for each user or a group of users. Ranking can also be created for different groups of staff performing specific tasks, like data entry or code maintenance only.

The security system is necessary because as in most library automated systems,

Figure 6: User Security Record Matrix

Pgm ID: U2ARGT	ACCESS RIGHTS MAINTENANCE			Date: 05-08-96
Rank : 1				
Description : rank1				

Pgm ID	Description	Add	Delete	Edit	Read
C2GDE	MISCEL. FILE MAINTENANCE	Y	Y	Y	Y
C2STOP	STOP WORD FILE MAINTENANCE	Y	Y	Y	Y
C3DEF	DEFAULT DATA ENTRY SCREEN	Y	Y	Y	Y
DEDES1	MASTER FILE MAINT. - BOOK	Y	Y	Y	Y
D3DES2	MASTER FILE MAINT. - MIX MAT.	Y	Y	Y	Y
I1UPIF	GENERATE INVERTED FILE	Y	Y	Y	Y
M2BACK	FULL BACKUP MASTER FILE	Y	Y	Y	Y
M2IMP	IMPORT EXTERNAL FILE	Y	Y	Y	Y
M2INCB	INCREMENTAL BACKUP MASTER FILE	Y	Y	Y	Y
M2INCR	INCREMENTAL RESTORE MASTER FILE	Y	Y	Y	Y
M2REST	FULL RESTORE MASTER FILE	Y	Y	Y	Y
U2ACE	MICROSOFT ACCESS FILE CONVERT	Y	Y	Y	Y
U2ARGT	ACCESS RIGHTS MAINTENANCE	Y	Y	Y	Y
U2USER	USER MAINTENANCE	Y	Y	Y	Y

F1 - Help	F2 - Add	F4 - Delete	F5 - Edit	F6 - Save	F7 - Quit
↑ - Prv pgm	↓ - Next pgm	Home - First pgm		End - Last pgm	

data entry and the various file maintenance tasks, are restricted access functions. Access rights are granted only to those authorised personnel who are involved in the tasks of creating or updating the bibliographic database and other essential files.

PRINTED OUTPUT

ONLIS provides printing of a bibliographic record in MARC format for the purpose of verifying the contents of the record. This is possible only in the data entry mode. The record is printed in co-

lumnar format, and shows the tag number, indicators, subfield codes together with the contents of the fields. The tags are all sorted in ascending order according to the MARC tag numbers.

BIBLIOGRAPHIC RECORD IMPORT

ONLIS also possesses the capability to import bibliographic records in MARC or ISO 2709 formats from other bibliographic utilities like OCLC, the Library of Congress and others. During the testing of the package, one hundred MARC records were successfully downloaded from Bibliofile CD-ROM database and imported into the ONLIS system. The program to import records in ISO 2709 or MARC compatible formats, makes use of the CDS/ISIS import facility. The source records are exported from the source database and written into a text file using an export utility program usually provided by the source database management system. The ONLIS import program processes and appends the imported records that are in a text format onto the ONLIS database.

Unlike CDS/ISIS, ONLIS import capability provides validation on the ISBN and ISSN numbers. It checks for duplicate ISBN or ISSN numbers against those existing in the ONLIS database. When a duplicate number is detected, the user is prompted whether to reject the imported record or merge it to an existing record. If the latter option is chosen, the system will proceed to read in the 'imported' record. Merging means overwriting the contents of an existing record with that of an imported record. However, in ONLIS, an additional feature has been provided to allow the data contents of tags 40 (Cataloguing source), 90 (Local call number) and 500 (General notes) to be retained during merging. For many libraries this is very useful, because the data elements of the tags concerned, reflect important local cataloguing notes and additional information.

For tags (fields) that are not defined in MARC or ONLIS Field Definition Table (FDT) for that matter, those fields will be dropped during the import process. In comparison, CDS/ISIS will proceed to import all the fields, including the undefined imported tags. From the above comparison, it can be seen that records imported using the CDS/ISIS import program, must be manually checked for duplicate records and edited to amend "imported" undeclared tags.

To prevent unpredictable errors, the system will limit import to a maximum of 100 records at any one time. Once file import has started, the process will proceed until it is completed. Putting a limit on the maximum number of records, will allow any errors to be rectified quickly without the need to wait until the end of the whole import process, which may take some time, if the imported file is large in size.

INFORMATION RETRIEVAL ENVIRONMENT

Author, Title and Subject Index Searching

This module provides for the traditional mode of searching in the library environ-

ment. Like in most commercial automated library systems, index searching, or sometimes referred to as left-to-right searching, allows users to query a database for an item for which either the actual title, or the author or the subject, is known. CDS/ISIS indexing options allow building an index to implement this mode of searching. This capability is useful to users who are new to automated catalogues, because it gives them the familiar card catalogue mode of searching. Librarians also use this search method to determine whether an item exists in the collection before actual data entry is done.

Currently, only the contents of tags 100 (Main entry - personal name), 245 (Title statement), 650 (Topical subject entry) and 700 (Added entry - personal name) are indexed for this mode of searching. Thus, search prefix qualifiers for a title search (ti=), for an author search (au=), and for a subject search (su=), are provided. A search string entered using any one of these search prefix qualifiers will be evaluated from left to right to look for a match against the index. A match will retrieve from the database, a hit list of titles where the titles, or authors or subjects match the search string exactly. Typing the line number for an item given in the hit list, gives the short display format of the item. ONLIS provides three display formats -- title, short and full. The default or title display format, displays a one line title of the retrieved item, the short format displays a record information in one screen/page, with each line limited to a maximum of 60 characters. Only the first occurring subject field is displayed. The full display format

gives fuller information of a record that includes all the subject headings. The contents may be displayed in more than one screen. Right truncation is assumed in this mode of searching without the need for any truncation symbol or wildcard character. This means that a title, subject or author search string need not be typed in full.

New searches can be started at any time at the search prompt. A very useful feature in this module is the ability to recall unlimited previous search expressions by using the up arrow ($\uparrow$) and down arrow ($\downarrow$) keys. This is akin to the feature available in some, but not all commercial library packages.

Keyword Searching

Keyword searching offers one of the most powerful capabilities in any electronic textual database. In most commercial automated library retrieval systems, keyword searching has always been provided as a separate module to offer a more sophisticated and advanced searching capability. CDS/ISIS system of inverted file and its accompanying free-text searching capability is a strong point of this package, and ONLIS keyword searching module takes full advantage of it.

While the philosophy of ONLIS has been to keep its use simple, nevertheless, it has been appropriately developed to provide keyword searching to expose users, even in small libraries, to the prevalent contemporary mode of searching for information in the electronic catalogues and in most online databases. With the availa-

bility of inter-networking and access to many other information resources outside of one's libraries, many systems assume knowledge of keyword searching, including knowledge in the use of boolean operators. Users who frequently accessed libraries and other information sources on the Internet and the World Wide Web, have experienced this.

A keyword search will search the terms indexed in the inverted file and extract all records containing a word or words that match the keywords entered regardless of the position of those words in the records. Right truncation of terms is also allowed through the use of a right truncation symbol. As the record format is structured according to the MARC standard, it is also possible to limit the search for keyword(s) to selected fields, through the use of search prefix qualifiers as in the index searching discussed above. Search prefixes have been introduced to make searching more intuitive. For example, search prefix qualifiers for title (ti=), author (au=), subject (su=), ISBN (bn=), ISSN (sn=) etc. are provided for the purpose. In ONLIS, however, fields for this limit search, are confined to the fields most likely to be used to query the bibliographic database in cataloguing or information retrieval. The rationale not to make all the MARC fields searchable was to control the size of the inverted file to make it easier to maintain, as well as to conserve disk storage space.

Boolean and proximity searching are available in this module. Symbols are used to represent the search operators as in CDS/ISIS. However, the symbols available are clearly indicated at the bottom status section of the keyword search screen (Figure 7). Any combination of searching using boolean operators including the use of keywords within parentheses for nesting, is also possible to alter the order of evaluation of the search statement as in the following example:

ti=computer ^ (monthly + software + games)

Proximity searching includes both *near* and *adjacency* searching. However, a search on a term in relation to its physical position to another term, should not be more than two words of each other.

Recalling previous search expressions is also possible in this module through the use of the up (↑) and down (↓) arrow keys. However, recall is limited to 40 previous search expressions. There is only one display format in this keyword searching module, that is the full display format mentioned earlier.

TRAINING

ONLIS was designed to be simple and intuitive in its use. However, some degree of training will have to be provided to derive the fullest benefit from it. Training in the MARC format as well as cataloguing using the Anglo American Cataloguing Rules, 2nd revised edition (AACR2R), will be necessary. System and file maintenance should not pose any big problem, as most of these tasks are menu-driven.

ENHANCEMENT

ONLIS was successfully developed, on a part-time basis, in less than six months.

Figure 7: Keyword Searching Screen

ONLIS	ONLINE LIBRARY SYSTEM		Date : 05-14-96
	KEYWORD SEARCHING		

Your search :

No. of records :

*	:AND	!	:Adjacent	%	:Adjacent	ti	:title
+	:OR	!!	:At most 1 word	%%	:Exactly 1 word	au	:author
^	:NOT	!!!	:At most 2 words	%%%	:Exactly 2 words	su	:subject
↑	:Prv srch	↓	:Next srch				

F1-Help   F2-More   F4-Next rcd   F5-Prv rcd   F7-Exit

Even though it is ready for implementation, further testing and enhancement will be necessary to make it into a truly reliable product. These enhancements, which involve only minor modifications and changes to the programs, have already started. A separate welcome screen will be included. This screen will appear after the mandatory Unesco CDS/ISIS copyright message screen.

In data entry mode, look-up table for browsing of geographic area code, country code and others, will be incorporated. For instance, a user doing data entry, wishing to look up a valid country code, should be able to call up the sequential text file containing the codes, browse through the file contents, select the appropriate code and get it "pasted" on the data entry worksheet. This will facilitate data entry and increase productivity as well as maintain quality of input data. In information retrieval, the display capa-

bility will be enhanced to allow users more flexibility to choose the format of display of records from a hit list. This means that a full display is possible after the title display through the use of a single key. Sort and save capabilities for search results for subsequent use or off-line printing, will also be incorporated. A menu-driven export capability will be built in to allow the export of the bibliographic master file or selected records in an ISO 2709 format. This is not a problematic undertaking, as CDS/ISIS has already provided for this capability.

DISCUSSION

ONLIS was developed to be a 'poor man's' solution to get a start in library automation. It is aimed at the small libraries and document centres. Thus, a readily available and free database management package like CDS/ISIS was selected to develop the interfaces. More importantly, it does not require powerful

hardware to run. ONLIS can be installed to run satisfactorily on a relatively old and 'slow' microcomputer. In fact, testing was done on a IBM compatible 286 microcomputer, a system available, perhaps, in most small libraries.There is no costly maintenance to worry about. No system or technical personnel is generally needed to maintain the system. Librarians with some training on the general features and use of CDS/ISIS as well as sufficient knowledge of MARC cataloguing, can manage and maintain the system adequately.

The use of ONLIS will provide small libraries intending to start on automation, with a relatively cheap and easy method to build up an electronic catalogue from scratch, or from an existing manual catalogue. Building an electronic catalogue is the essential first step in any planning to implement an automated library system. MARC was chosen as the standard bibliographic record format. In the library environment, this is important. A lot of time and energy can be saved, if it can be impressed upon libraries intending to automate, to create their machine-readable catalogue based on the MARC format. It would also help to dispel the idea that adopting standards like the MARC standard, is only for the large libraries which have the means to implement large integrated library systems. The MARC format was designed as a standard to facilitate bibliographic data exchange. This remains true today as it was when it was first used, in fact more so today when information technology permeates every aspect of our society.

There is a constant need to access various forms of electronic data, and the field will be more ordered, if standards are adhered to. Standardising on MARC will allow even small libraries, lacking in trained cataloguers, to import bibliographic data in the same format from other sources. This will help libraries to convert or build up their electronic catalogues quickly. On a long term, bibliographic records created in the MARC format ensures high data compatibility to be easily uploaded and integrated into most commercial library systems, should they be adopted for use in the future.

CONCLUSION

CDS/ISIS is indeed a very powerful text handling system that is suitable for managing bibliographic data used in libraries. Its flexibility in allowing customisation of programs has seen its use extended successfully to library automation applications. There is no doubt that it is able to meet the immediate needs of libraries and information centres, big and small, in their quests to bring information technology and library automation into their organisations. Despite its main use as an indexing tool, there has been successful reports on its use for various aspects of library automation.

In Malaysia, a total of 157 libraries and various documentation centres have been registered as CDS/ISIS users with the National Library, which is the distribution centre for the software in the country. It can be assumed that some might have customised interfaces for in-

house use, but by and large, the majority use it in its native form, based on the feedback and the types of problems channeled to the National Library. The development of ONLIS has once again proven it to be a very good piece of software that allows itself to be customised to incorporate many of the contemporary features found in many of the commercial library packages. It offers small libraries an opportunity to use a simple automated system that comes with 'big system' flavours. It is hoped that its development will encourage other users within the country to report on similar or related efforts.

Powerful as it is, CDS/ISIS has not been used to its full potential by libraries who do not have the necessary programming expertise to undertake any customisation. The prerequisites to make such customisation, is knowledge of the Pascal programming language. Only then can a true synergy exists between the end-user and CDS/ISIS.

There are many aspects of CDS/ISIS which sometimes make even the die-hard user look for a better alternative user interface. Perhaps users are now looking forward to the release of the Windows version which is reported to be in beta testing. Whatever the evolution of the software is going to be, it pays to bear in mind to retain the basic philosophy of CDS/ISIS where its power and efficiency as an indexing and information retrieval tool, and not its looks, should be the over-riding consideration, and should not be compromised for the sake of contemporary windowing or graphical features. In short, the developer of CDS/ISIS must not forsake the needs of its loyal users, who may range from the very small to the large libraries. It is understandable why in the face of many Windows-based DBMS packages, CDS/ISIS has not been quick to jump on the bandwagon, and this augurs well for the future. However, it must also continue to enhance and encourage development of applications suitable for the DOS environment. In areas where enhancements are strongly needed, changes made should not require more hardware and software resources than is necessary to implement. In a similar note, even though it is now possible to install CDS/ISIS in a network environment (Unesco, 1992), ONLIS was developed as a standalone system, on the premise that the great majority of small libraries that will use this system, are not likely to be linked up in any form of local area network (LAN).

CDS/ISIS and all applications customised from it, must remain the 'small library' software, requiring unsophisticated hardware, easy to install and costs little to maintain. This will ensure that it remains within the capability of all libraries, irrespective of their sizes, financial capability, and the availability or non-availability of trained information technology personnel.

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