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CDS/ISIS: UNESCO'S INFORMATION RETRIEVAL PACKAGE FOR MICROCOMPUTERS AND THE VAX MINICOMPUTER

Introduction

Mini-micro CDS/ISIS is one of the most widely used information retrieval packages in the world. In India, where it is freely distributed by the Department of Scientific and Industrial Research, there are thought to be several thousand users. In the United Kingdom it is used by libraries as different as the British Library of Development Studies, the International Maritime Organization, the Marine Biological Association, and the Tate Gallery. Museums and archives are using the package to record their collections; library schools are using it in their teaching programs. The Natural Resources Institute, a U.K. government agency providing assistance to developing countries, is using it for the SPAAR (Special Programme for African Agricultural Research) database. In Portugal, the national library is using it for distribution to libraries in the country to promote automation and to enable those libraries to contribute records to the national library system, which is mounted on a Geac minicomputer.

The History of CDS/ISIS

CDS/ISIS, or ISIS as it was called then, first appeared in 1964. It was conceived for the processing of abstracts of documents and developed for the central library and documentation branch of the International Labour Office (ILO), a specialized agency of the United Nations with its headquarters in Geneva. It was also adapted for library and documentation services and was used for other in-house operations. It was known as ISIS (Integrated Set of Information Systems).

The system was devised for IBM mainframe computers. It was written in IBM 360 Assembler language for IBM's DOS operating system. At first it was a batch program, but online access was available later from terminals attached to a mainframe.

ILO made the package available to other U.N. agencies and not-for-profit organizations around the world. In the meantime, it was adapted to run under the later IBM OS operating system. UNESCO, whose remit included support and coordination of library and information systems through its UNISIST program (later absorbed into the General Information Programme—PGI), was one of the agencies that made extensive use of it and began to develop it in 1975. In 1978, the ILO ceased to use ISIS and turned instead to MINISIS. This was a package developed by the International Development Research Centre (IDRC) in Ottawa to be "functionally compatible" with ISIS, but that would run only on a Hewlett Packard 3000 Series minicomputer. At that time, minicomputers were being developed and were eminently suited to a department of an organization rather than for the organization in its entirety. Libraries often suffered when they shared a mainframe system with administrative departments, since they would receive low priority (e.g. after payroll and the paying of invoices). Very few libraries could afford to have their own mainframe computer, but the evolution of minicomputers changed that. In London, the Borough of Camden library service introduced a minicomputer system in 1975 as part of the authority's policy of devolving computing to departments, but this was not very successful. Nevertheless, libraries in Europe and North America began to obtain their own minicomputers for their cataloguing and library housekeeping. MINISIS was one such system.

ILO decided to take advantage of the availability of this minicomputer system and so ceased to use ISIS. It handed over the responsibility for the maintenance of the package to UNESCO, who renamed it CDS/ISIS and has maintained it since then (CDS being the Computerized Documentation Service, which was the department in UNESCO responsible for ISIS).

In 1981, microcomputers were appearing and the database on your desktop was in sight. The staff of UNIBID, the UNISIST International Centre for Bibliographic Descriptions, based at the British Library in London, as working on behalf of UNESCO on the UNISIST reference manual (*J*). The staff thought that it would be an interesting pilot project to develop a data entry program to run on a microcomputer that could feed in data to a mainframe in order to test the UNISIST reference manual. On hearing of this, Dr. Walter Koch, the director of the Institut fuer Maschinelle Dokumentation in Graz, Austria, offered a package that his institute was developing, a relational database system called IV + V. Moreover, this would be a complete informa-

tion retrieval system. It was agreed that the package would be made available free of charge to organizations in developing countries. At a meeting in 1983 held in Graz, UNESCO endorsed this package and made plans for a number of test sites, including HABITAT, Nairobi, and the Institute for Public Enterprises in Developing Countries in Ljubljana, Slovenia (2).

Unfortunately the package was not a success. It had been developed by people who were mathematicians and the state of the art in information retrieval packages was primitive. Screens had to be designed by filling in a form on the screen, but the actual layout and attributes of the fields on the screen were not visible until the forms had been compiled. Additionally, anyone setting up the package had to be aware of relational database theory. Due to management changes in the organization at the University of Graz that controlled the research institute, development work was greatly reduced and the transition to a more user-friendly approach never came. These were, of course, the early days of this kind of system, and relational databases had not been applied to bibliographic systems with any degree of success.

UNESCO was determined to find a solution to satisfy the great interest for an information retrieval package that had been sparked off in developing countries by the promise of IV+V. The staff looking after the mainframe version of ISIS, led by Mr. Giampaolo Del Bigio, developed a microcomputer package for MS-DOS computers (IBM personal computers and compatibles); the Wang microcomputer, which was UNESCO's standard microcomputer at that time; and the VAX minicomputer manufactured by Digital Equipment Corporation (DEC). Only the MS-DOS and VAX versions are still supported; most versions are released simultaneously for each.

This package was released in 1985. It was called officially CDS/ISIS Mini-Micro Version but is usually called CDS/ISIS or ISIS. In Latin America, where the minicomputer package MINISIS is prevalent, it is always called Micro-ISIS, in contrast with MINISIS, which is often confused with it and sometimes referred to as Mini-ISIS.

The package consisted in effect of five programs that were run separately, but that acted on the same database. One program included data entry and information retrieval and the others corresponded to the other options on the main menu of later versions: sorting and printing, database definition, master file services, and system utility services.

In 1988 version 2.0 was released. It was little more than an amalgamation of the different programs into one but with the addition of Pascal programming. This was a key addition very much in the ISIS tradition to provide both an interface and tools for the user to develop the program further by writing programs to be run in conjunction with the main program.

The next public release was version 2.3, which included improvements in the speed of the indexing and in the space used by the indexes. This was achieved in part by setting up two indexes, one for short terms and one for long terms. At the same time the package was made more resilient; hitherto a database could be irreparably corrupted if a power failure occurred while a record was being entered. The database then had to be restored from the previous backup. This changed because in version 2.3 the files containing a database are closed after each record is modified or added.

A further feature from this version on is SYSPAR.PAR, a system parameter file. The program looks for this as soon as it is loaded. It allows sets of files used by the

program to be placed in different directories. It allows the program to be set to start at any menu or to automatically load a particular database. It also allows a Pascal program to be loaded and run before the program itself.

The following is a sample SYSPAR.PAR file, the one set up automatically by the CDS/ISIS installation program:

```
1=c:\isis\prog\  
2=c:\isis\menu\  
3=c:\isis\msg\  
4=c:\isis\work\  
5=c:\isis\data\
```

The numbered parameters indicate that subdirectories of the directory ISIS are used to store Pascal programs, menu files, message databases, and the files relating to databases. Temporary files and any data output by the program are created in the "work" subdirectory.

Along with SYSPAR.PAR, it is possible to set up a parameter file for each database so that the separate files that make up the database can be allocated to different directories or devices. The initial reason for the introduction of this feature was to enable CD/ISIS to be used as the search software for CD-ROM databases. CD-ROM is a read-only device and CDS/ISIS requires that certain files should be capable of being written to. These files have to be placed on the hard disk of the computer (they can be copied from a CD-ROM); the large files containing the data and indexes remain on the CD-ROM.

The SYSPAR.PAR file also proved necessary for putting CDS/ISIS onto a network, and version 3.0 was released in 1992 as a "network sensitive" version. Under version 2.3 it was possible to run the software on a network, by specifying certain parameters of SYSPAR.PAR as being network drives. However, a network allows multiuser access, and files could be corrupted if two users tried to make changes to the same database at the same time. At best, a problem could arise if two users tried to update the same record. This problem has been overcome since the release of version 3.0 with the introduction of record locking and database locking. When a record is accessed for updating (or creation) a bit in the cross-reference file is set to indicate that that record is being updated and no other user can access it for modification. However, other users can read the record, assuming that the record already existed when they accessed that database and had not been very recently created. If parameter 14 is set to 1, a database will be locked completely for data entry during master file backup or restoring, inverted file update, and when records are being imported in ISISXCH. Record locking and database locking have to be added to any Pascal programs that allow the modification of a database. If the system crashes (e.g. because of a power failure) while a record is opened for modification, that record will remain locked. There is, therefore, a facility added to the database definition services menu that enables the unlocking of records or databases.

At every stage in the development of ISIS, new Pascal routines and functions are added to the Pascal programming library. Version 3.04 and later versions, for example, included a function called USES which allows the writer of a Pascal program to specify

other programs called by that program. It was necessary because conflicts between programs in memory were being caused when one program called another. This was particularly the case with programs called to display one or more records if the display format included a specially-written Pascal program (known as a format exit).

In 1993, a beta-test version of the program for running under the UNIX operating system (UNIX System V versions 3 and 4) was made available to a number of organizations to test. When mounted, this version is indistinguishable to the end user at a workstation from the DOS version running on a network. It too comes with its own compiler for Pascal, and the source code of most Pascal programs written for the DOS version can be compiled under the UNIX operating system version.

In 1994, work was undertaken on a version designed to run under Microsoft Windows. A beta-test version of the search function was released in early 1995.

Aims of the Package

As mentioned earlier, UNESCO's intention in developing CDS/ISIS was to benefit developing countries in which library and information services had no easy and affordable access to software. Additionally, consonant with the aims of the PGI, the division of UNESCO at which the package is now maintained, it promotes the exchange of information between different sectors in countries that may be at varying levels of development. From the introduction of the microcomputer version, it has been seen as a tool to use alongside exchange formats, (work done by UNESCO in this field was reported in the *Encyclopedia of Library and Information Science*, vol. 48, in the article "UNESCO Common Communication Format," pp. 353-366.) Although the mainframe version was originally seen as a system for isolated systems, it was provided with an interface to enable data to be exported and imported on tapes structured according to ISO standard 2709 (3), the standard (equivalent to American National Standards Institute standard Z39.2) that lays down the record structure of MARC. The microcomputer and minicomputer versions implemented this standard from the start.

Despite recent cuts in funding in UNESCO, caused primarily by the withdrawal of the United States and United Kingdom from membership, the promotion and development of the package still goes on; the twenty-sixth session of the general conference strongly supported further development of the package (4).

Main Features

CDS/ISIS is a menu-driven system. The main menu is displayed when the program is run, and from this menu other menus are reached by means of one key press. Some menus lead to worksheets on which the necessary data are entered to carry out a particular function; the most important worksheets are the data entry worksheets that are designed by the user. There are also worksheets for specifying the format and layout of printouts.

Caroline Moore, in her article on microcomputer software for library work *Encyclo-*

pedia of Library and Information Science, vol. 48, pp. 283–302, compares general database management systems with software for information retrieval particularly suited to library applications and with library housekeeping systems.

CDS/ISIS is a package that has been developed for bibliographic information; that is, information about documents such as books, journal articles, or conference proceedings. However, it has not been developed for library housekeeping applications, although Pascal programs can be written to provide these.

Technically speaking, the major differentiating feature of CDS/ISIS when compared with database management systems is its use of variable length text fields; this feature is accomplished by means of a directory similar to the one mentioned above. Data in database management systems are entered into fields. In many database management packages, such as dBase, the fields, at least those that are searchable, are of fixed length. It is easier to design a system in which fields are of fixed length, and for many applications that is no problem. For a personnel system, for example, the attributes of an individual in the system can be abbreviated to fit the space available, or codes can be used.

Bibliographic data tend to be treated differently from other kinds of data and with less recourse to abbreviation. Moreover, titles of books and other works that are contained in a bibliographic record may be of any length, from one word to many. As a result, a method has to be found of allowing variable length fields, which many database packages do not permit. This is done by means of a directory, which is also found in the ISO 2709 format and the MARC and other formats based on it. At the beginning of each record is a list of fields and pointers to the position of the data belonging to each field.

Another feature of bibliographic data is the need for repeatable fields. One book may have a number of authors. Each author needs to be of equal status. Many bibliographic databases implemented on general database management systems have one field for "authors"; all authors are entered in one field, but only the first is searchable. In CDS/ISIS, each attribute that has more than one value is entered in its own field. In other words, each field may be repeated—up to 999 times.

Bibliographic data may make extensive use of subfields. This facility is available in the ISO 2709 format and used by all MARC formats, and CDS/ISIS has implemented it, too. It is a very useful feature when a field is divided into different parts to be treated in different ways. An author's name may appear in the index as Smith, John, but sometimes it might be desirable to print it out as John Smith; for instance, when producing data in different reference styles.

Subfields enable the different parts of the name to be separately manipulated. They are designated by a single letter and when entering data in CDS/ISIS, you prefix this letter with a circumflex, $\hat{\cdot}$. Thus you might enter the name Marion Colledge as \hat{a} Colledge \hat{b} Marion. The system can treat both parts separately and may print them out in either order, place punctuation between the parts, capitalize one part, and so on. The exchange formats mentioned above include rules for the formulation of fields and subfields.

Critics of subfields say that they are difficult to enter, however, CDS/ISIS has a useful help facility that can display for any individual fields on a worksheet two lines of a help message at the foot of each page. Subfields are of great benefit to the

organization and manipulation of data. They enable repeated data elements to be associated correctly with other data elements. If forenames and surnames were entered in separate fields, the software would require a more complicated mechanism to associate each forename with the corresponding surname.

Although subfields are implemented, they are not completely compatible with their use in MARC. A subfield may not be repeated within one field, although it may appear in more than one occurrence of the same field. In MARC, subfields may be repeated indefinitely. In field 110 of MARC, to name but one field, a corporate body may have a number of subdivisions, all entered in subfield c (e.g., \$aGreat Britain\$cHouse of Commons\$cLibrary).

If you want to implement a field that is not normally repeatable according to the rules of MARC, for example, Imprint (^a Place of publication ^b Name of publisher ^aPlace of publication ^b Name of publisher ^c Date), you may do this by starting a new field before each repeat, indicated by a percent sign before the second ^a.

Note that these examples are following the U.K. MARC practice, which deviates from U.S. MARC practice in not entering punctuation at subfield boundaries. The appropriate punctuation is generated by the program, and CDS/ISIS is perfectly capable of doing this.

CDS/ISIS uses inverted files to enable faster searching of the database. An inverted file is just another name for an index. The expression refers to the fact that the records are turned inside out to bring different elements from the contents to the fore in a file.

It is possible to index each field in a number of ways using what are referred to as different indexing techniques: the complete field, each individual subfield, or each word. There are also two indexing techniques that index text enclosed by <...> or /.../. This flexibility in indexing is not normally found in database management systems.

In addition, it is possible to search for a string of data in any field or to search for fields with a numerical value greater than, less than, or equal to a particular value. You can also search for those records containing or lacking a particular field.

A further feature of the package is the flexibility of the screen and printed displays. This is achieved by a sophisticated algebra-like formatting language. The formatting language has been criticized for its complexity and unfriendliness, but there are ways of making this less complex for the only use for which it is absolutely necessary, screen displays. As far as other uses are concerned, the language serves a number of purposes in addition to its function of providing instructions for screen display and printout.

1. It is used to specify the rules for the extraction of data from the database records to go into the index.
2. It is used for the extraction of data for export to another database or for converting records to a MARC format if data have not been entered precisely according to the rules of MARC.
3. It is used as the basis of the search language to provide the package with a very powerful free text searching feature, including the searching on values mentioned above.

This formatting language gives users of CDS/ISIS a higher level of control over their data than is found in many commercial library automation packages.

In the following simplified example, using the tagging scheme of U.K. MARC, which requires punctuation to be generated by the program, field 100 (surname shifted to uppercase and forename ^h preceded by comma) will be followed by field 245 on a new line indented by four spaces. Field 260 is a repeatable field and is in parentheses to indicate this, and supplied punctuation is indicated as being repeatable by being enclosed between logical not (|) signs.

```
mhu,v100^a,mhl,"v100^h, ("v100^c")/c5,v245^a,"v245^b,"/v245^d,"/v245^e,"
;v245^f,"v245^i,".v245^j,"--d260,( | ; | +v260^a, | : | v260^b, | , | v260^c)
```

Another important feature, bearing in mind that the program is a UNESCO product, is the multilingual nature of the package. Text on menus and worksheets can be changed by the user. Message files are stored as databases and can be edited in the same way as other databases.

Technical Features

Each CDS/ISIS database includes a master file and cross-reference file. The master file contains the data, and the cross-reference file includes for each record, by sequential master file number, a pointer to where the data belonging to that record occur in the master file and indicates whether that record is used, unused, or deleted, whether it may need to have its entries in the inverted file updated, and, in version 3 on, whether the record is locked. Database records are numbered from 1 but the system also has in each database, invisible to the user, a record 0, which holds control information about the database, such as the next record number to be assigned to a new record and whether the database is a normal database or a message file.

Version 3 has incorporated features that make it function better in a multiaccess environment, either on a network or under a sophisticated usage of an operating system such as Microsoft Windows, in which it is possible to start the program, leave it in the middle, and start the program again so that it is running more than once simultaneously. The main features that make this possible are record locking and database locking. Record locking prevents more than one user from accessing a record to edit it. If it were possible for more than one user to edit a record at the same time, chaos could arise as editing is performed by copying the record into the local workstation, and the final version would be the version of the record that was completed last. Database locking prevents more than one user from accessing a database when certain functions are being performed, such as inverting the file. This is necessary because if a record was edited during a full inversion, it could result in a loss of integrity for the index being created, since the file inversion looks at each record a number of times during its operation.

Note that earlier versions may run on a network, but it is unwise to allow multiple access to data entry.

A version of the package has been produced (called ISISCD) that allows read only, and includes the facilities to search and retrieve and to sort and print from the database. This can be used on a multiuser system to prevent unauthorized editing of

the database. On a single-user system, it may be used as the means of access for people who are not permitted to make changes to the databases.

Description of Modules

The main menu comes up automatically when the program is run, and all the features of CDS/ISIS may be reached from here. The menu is reproduced in Fig. 1, and the choices are described in turn.

CHANGE DATABASE

If a database is already selected and it is required to select a new database, then C on the main menu allows a change. If a database has not been selected (generally on start-up), then any of the other options on the menu will force the user to select a database.

LANGUAGE SELECTION

CDS/ISIS is supplied with menus and worksheets in three languages—English, French, and Spanish—but other languages may be added to those or replace them. The default is English, but may be changed to any other language.

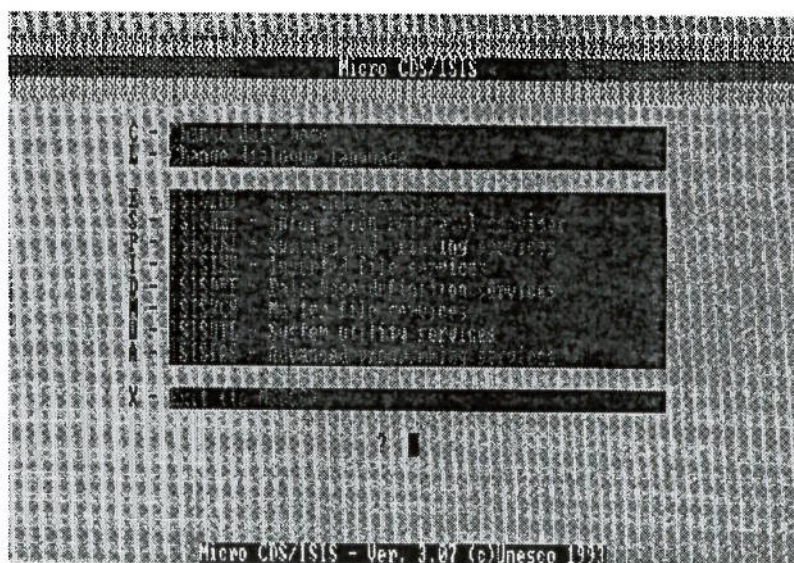


FIGURE 1. CDS/ISIS Main Menu.

DATA ENTRY SERVICES

Choosing this menu leads to options relating to creating new records or amending existing ones, by record number, the latest record modified, or a set of records by their content (e.g. every record containing the word *development* in the title). It is also possible to select different worksheets (assuming they have already been created).

INFORMATION RETRIEVAL SERVICES

Information retrieval services allow the selection of records on the basis of their content and permit their display. Search terms may be entered and combined with boolean logic (AND, OR, and AND NOT represented by * + and ^, respectively). Parentheses may be used to indicate precedence. If the user does not know what terms to search on there is a dictionary of indexed terms that can be consulted and a search may be made straight from there. When a set of records is found, the records may be displayed in a variety of formats; the formats are changed from this menu. An earlier search may be rerun or amended and rerun, or the user may be reminded of the searches already made. Searches may be saved for reuse in other functions. The system saves not the data but the record numbers so the saved searches can only be rerun on the same database for which they were intended and as long the record numbers have not been changed.

SORTING AND PRINTING SERVICES

One place in which the result of a search as mentioned above may be used is sorting and printing. Records selected in a previous search may be printed or a printout may be made by record number or of the whole database. The resulting printout may be in the order of the database or sorted into a different arrangement. It is possible to reorder a database in order to print it out in sorted form and create indexes to the sorted record numbers. Alternatively, a subset of a database may be sorted to create another database.

Sorting and printing involve the setting of different values, such as which fields to select for sorting and the length of the page. It is possible to create printing and sorting user worksheets; these can be called up by a given name for a particular job that has to be done repeatedly.

INVERTED FILE SERVICES

The inverted file in CDS/ISIS can be re-created or updated from the inverted file services menu. The inverted file may become corrupted or the rules for extracting the data from the records may be changed. Both of these require the use of full inversion. The file may also be updated. CDS/ISIS does not update the file when each new record is added or an existing record is edited; it does it when you leave the system or change database. Creating an inverted file from scratch (using full inversion) may

cause the system to run out of memory or disk space, therefore it is possible to invert the file in three separate stages, or the inverted file may be saved onto a floppy disk.

DATABASE DEFINITION SERVICES

Database definition services is the module by which the user creates a database, selecting and naming the fields and building its associated data entry worksheets, print formats, and field select table. One may there also create additional tables for selecting fields for sorting purposes or for converting between one MARC format and another, or between a format with nonstandard tags and a MARC format.

From this menu also the database may be reinitialized; this means the contents of the database may be wiped out (although its structure will remain intact), or it is possible to remove the inverted files and leave the data.

If you are on a network, you can unlock records or databases that have been locked and not subsequently unlocked. This can happen if there is a systems failure while a record or database is locked, since the program never reaches the point of unlocking it.

MASTER FILE SERVICES

Master file services would better be called backup services, since they consist of two methods of backing up the data or of copying them to another medium for whatever reason. Master file backup takes the master file and cross-reference file and converts them into one "backup" file (without touching the original), which may be on the hard disk or on one or more floppy disks. Master file restore uses the backup file to recreate the database (wiping out anything that is already there). Whenever records are edited, they do not remain in sequential order on the database, but backing up and restoring them "tidies" them up and makes access slightly, although probably imperceptibly, faster. Reorganize master file backs up and restores in one operation. Import external file takes a file formatted according to ISO 2709 and either adds the records to the existing database or replaces it. "Export CDS/ISIS file" creates an ISO 2709 file, but with a few features (briefly described below) that are not in accordance with the standard. This can be used to back up the whole database or a section of it. It can also be used for transferring records to other software packages, although it may be necessary to write a small program to make the output more standard, making a few changes to remove the carriage return after every eighty characters and converting the initial character of the subfield identifier from ` (circumflex) to the ASCII character with a value of 31. The file produced is an ASCII file and as such it can be printed out and read; the backup files and master files cannot be read without an appropriate system tool.

While exporting or importing, data may be transferred to different fields.

SYSTEM UTILITY SERVICES

Reference has already been made to the fact that the system permits a great deal of tailoring. A systems manager can, for example, translate all its menus, messages, and

worksheets into another language, and add a further language to the system without removing existing languages. Special worksheets can be set up to make sorting and printing out records in a particular way much easier. System utility services include the functions to create, edit, and print out worksheets and menus. One may also change the screen colors and print out the message file. But this is not the place to change the message file since, as mentioned above, it is a database and edited like any normal database.

ADVANCED PROGRAMMING SERVICES

Advanced programming services allow Pascal programs to be compiled and run. This is a very powerful feature.

If a user wishes to make CDS/ISIS do something that it normally cannot, such as making some mathematical calculation or validating the data in a particular field, then the package includes a Pascal compiler and facilities to write a program and interface it to the existing system.

The Pascal programming facility is unusual in an information retrieval package since it allows users adapt to the CDS/ISIS program to whatever extent they require.

The basic CDS/ISIS program itself is written in the high-level programming language Pascal. In Pascal it is possible to write a library of routines (called procedures and functions) that can be called on by further Pascal programs. UNESCO has made routines from this library available for anyone to use in programs that can be written to interface with the basic package. UNESCO also provides with the package a number of complete Pascal programs that can be added to the system as additions or alternatives but that are not covered by the main reference manual. Some other programs are included as tutorial examples to illustrate the use of Pascal. CDS/ISIS includes its own compiler to avoid the problem of finding a supplier of a commercial compiler who would allow it to be offered free of charge. A manual is available from distributors (see Manuals following References) that is essential if you want to write programs. It assumes a certain elementary understanding of Pascal, but for those with knowledge of computer languages this can be deduced from the sample programs that accompany the package and are printed in the manual.

There are three kinds of programs in CDS/ISIS: format exits that provide extra functions to complement the formatting language, menu exits that provide extra options for menus, and other kinds of programs that have to be run from the advanced programming services menu, or that may be run automatically from SYSPAR.PAR.

CDS/ISIS Pascal requires programs to be compiled. A program first has to be written in Pascal and the program file or source code file must have the extension PAS. It may then be compiled by typing C (for compile) from the advanced programming services menu. If there are any mistakes in the program that the computer can detect, it will print out the offending line with an arrow pointing to the error. The program listing itself with the errors marked is found in a file called by the name of the program with the extension LST. When the program is eventually correct, it will generate a file with the extension PCD (Pascal compiled).

SAMPLE PROGRAM

Here is a short sample program for demonstration purposes called DATE.PAS. It is very useful during data entry to have a means of adding today's date. This date is taken from the computer's system date.

```

Program DATE;

{ Puts the date in subfield a on function key F9 }

var dat,key,subflda: string;

Begin
  dat:=datestamp;
  subflda:=\' | chr(94) | 'a';
  key:=subflda | substr(dat,7,2) | substr(dat,1,2) | substr(dat,4,2);
  defkey(67,key);
end.

```

To avoid confusion, the name of the program should be the same as the file name without the extension. In fact, CDS/ISIS uses the file name rather than the name in the Program statement to call the program.

In Pascal, text in { ... } are comments and do not affect the operation of the program.

The program calls a CDS/ISIS Pascal routine DATESTAMP, which takes the system date and puts it in a variable, in this case "dat."

The system date is reorganized by the program into the date in the form required by the MARC 008 field (e.g., 950131 for 31 January 1995). The subfield marker 'a' is prefixed to it by '\' | chr(94) in the program. Since the circumflex character is a reserved character in CDS/ISIS, it is necessary to precede it by a backslash to indicate that the actual graphic character is required; the circumflex sign is an ASCII character with the decimal value of 94, in Pascal, *chr (94)*.

The date is placed on the function key F9. The program can be run automatically when you start up CDS/ISIS by including it in SYSPAR.PAR parameter 9. This autotypes text to the computer, in this case to run the program DATE.

Alternatively it can be run at any time from the advanced programming services option.

In CDS/ISIS it is possible to run programs from the menu. These are also called program exits, because they allow you to exit from the standard program and run a different program. They thus add or modify existing functions of the program. Examples are

- A menu option to display a list of the fields in a database, useful when making a text search, which requires the user to search in a particular field
- A menu option to display one record at a time on a fixed screen instead of the usual, where records follow each other on a scrolling screen
- A program to create display formats and worksheets when a new database is created
- A program to modify a record by selecting a field from a table by tag number rather than by the usual worksheet

Menu options to enable global edit (probably the feature that is most lacking from the basic package)

Programs to assist in the selection of worksheets, print formats, and databases, by listing the options in a window

A number of programs have been written by experienced users to make searching more user-friendly. Programs have been written to offer the person entering data each subfield, not just each field as in the normal worksheets, the subfields offered being taken from those entered in the help text on each field. This unfortunately requires a rewriting of the complete data entry services module. There do not appear to be any programs to validate the contents of a particular field against a thesaurus and print out any data as they are entered; programs have been written to validate incorrect entries, but these are batch programs and do not work interactively with the operator.

The other kind of Pascal program is a format exit to add facilities to the print formatting language, which, as stated above, is very flexible.

PROGRAMS CIRCULATED BY UNESCO

A number of programs are circulated by UNESCO and the distributors, but are not regarded as part of the basic package. Here is a description of two.

1. The THES program allows you to set up a thesaurus database and to enter terms into it along with their associated relationships. The program allows full thesaurus maintenance, but also allows the user to make a search and then use the terms found to search another database. This program allows two databases to be open in the same program (although not at the same time).
2. One of the most valid criticism of CDS/ISIS is that it is not easy to create a complete database. UNESCO had made setting up a database easier another way, by providing a Pascal program, NEWDB, which automatically creates a worksheet and print format.

OTHER SOURCES OF PROGRAMS

Users of CDS/ISIS all over the world are writing Pascal programs. Some are writing them for a specific purpose that might not be relevant to anyone else. Others are writing programs that would be useful to others. Some, particularly U.N. agencies, are making them freely available to others (and circulating the source code). Others are offering programs (usually large suites of programs) for a fee. Some have published listings of programs with floppy disks, either informally or as publications.

Availability of the Package and User Groups

CDS/ISIS is protected by copyright and is in no way shareware or in the public domain. It can be used legally only by licence holders. This licence is not as restrictive as some commercially produced software packages, in that multiple copying of the software is permitted within an institution that is a license holder. Nevertheless, the software should not be copied to persons or institutions that are not license holders.

When a license is once obtained, it is valid for all versions, so new versions may legally be obtained from any source.

Although UNESCO developed the CDS/ISIS package, it has appointed distributors throughout the world to assist in supplying it to those who wish to use it. These distributors are in many cases national focal points for the UNESCO PGI. News of distributors is published in PGI's *UNISIST Newsletter* (5), which is available from UNESCO.

As well as national distributors, there are distributors for organizations in specific sectors; these cover such areas as agricultural information and energy information. These distributors will also require the signing of a license before they can supply their customers with a copy of the software package.

Many user groups have been set up worldwide. These are also reported from time to time in the *UNISIST Newsletter* (5). Given that support from UNESCO is necessarily limited, participating in such a group is of great benefit to the user and provides a measure of security in the event of problems.

Specific Applications

Numerous special applications have been developed for CDS/ISIS. Here is a selection.

IDIN

The OECD Development Centre at the headquarters of the Organization for Economic and Cultural Development in Paris and the International Development Research Centre (IDRC) cooperated early on in developing applications for CDS/ISIS. The first, *IDIN Manual for the Creation and Management of a Bibliographic Database Using Micro-ISIS*, which includes a sample database on a diskette (6), was developed in 1988 and had a record structure based on the CCF.

In 1990 the same author produced for IDRC the *Manual for Preparing Records in Microcomputer-based Bibliographic Information Systems*, which was also available in French and included a diskette with a number of Pascal programs (7).

MULTILINGUAL THESAURUS OF OECD

The OECD, with assistance from the IDRC, had produced a multilingual thesaurus called the Macrothesaurus. The fourth edition was published in 1992 (8), and subsequently a version of this was produced as a CDS/ISIS database. This included a number of Pascal programs specially written to enable CDS/ISIS to support a multilingual thesaurus database.

NATIONAL LIBRARY OF PORTUGAL AND UNIMARC

The National Library of Portugal has used CDS/ISIS for distribution to libraries throughout Portugal to enable them to set up databases in the national standard

exchange format UNIMARC so that they can contribute records to the national union catalogue. They have also been active in promoting the package and have developed on behalf of the IFLA UBCIM Programme an implementation called UNIBASE, intended for distribution to organizations in countries without a national exchange format to promote the use of UNIMARC. UNIBASE includes only certain functions, such as retrieval and printing (9).

UDC

The Universal Decimal Classification Scheme is described in the *Encyclopedia of Library and Information Science* (vol. 32, pp. 125–146 1981). Buxton describes in "Computer Searching of UDC Numbers" (vol. 51, supplement 14, p. 145) some of the ways in which UDC numbers are treated by the software, particularly with reference to the complex punctuation of UDC.

UDC is now the responsibility of a consortium that includes the British Standards Institution (BSI) and the International Federation for Documentation (FID). The master file of the medium edition of UDC is now available under license from the UDC Consortium at the Hague as a CDS/ISIS database (10).

CD-ROM SEARCH ENGINE

The UNESCO Clearing House has published a CD-ROM that uses the software as its search engine. This gives access to twelve databases containing about 100,000 records of references to documents, institutions, and information services as well as two thesauri, the UNESCO thesaurus and the thesaurus of the International Bureau of Education. There is also a database of national distributors of CDS/ISIS. This CD-ROM is available from UNESCO sales agents and copies are available free to organizations in developing countries (11).

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5. *UNISIST Newsl.*, various issues.
6. A. Di Lauro, *IDIN Manual for the Creation and Management of a Bibliographic Database Using Micro-ISIS*, OECD, Paris, 1988 (includes diskette).
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8. *Macrothesaurus for Information Processing in the Field of Economic and Social Development*, 4th ed., OECD, Paris, 1991.
9. *UNIBASE: UNIMARC Demo Database: User Manual*, prepared by the Instituto da Biblioteca Nacional e do Livro, Portugal, for the IFLA UBCIM Programme, Frankfurt, 1994.
10. P. D. Strachan and F. M. H. Oomes, "The UDC Master Reference File." *Ext. and Correc. UDC*, 15, 19–28 (Sept. 1993).

11. *UNISIST Newsl.* 22 (1), 15 (1994).

MANUALS

The following documents are the manuals provided with the software:

Mini-micro CDS/ISIS Reference Manual (version 2.3), UNESCO, Paris, 1989.

Mini-micro CDS/ISIS: CDS/ISIS Pascal (version 2.3), UNESCO, Paris, 1989.

SOURCES OF PASCAL PROGRAMS

Astinfo Newsletter has a "Mini-Micro CDS/ISIS Corner," which includes Pascal programs.

IAALD Quarterly Bulletin contains a column "CDS/ISIS User-to-User" by Hugo Bessemer that includes Pascal programs from time to time.

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