CAN/OLE: POINT DE RENCONTRE ENTRE L'UTILISATEUR ET LE SYSTÈME
(CAN/OLE: THE USER-SYSTEM INTERFACE)

Leo Grigaitis, Coordonnateur de CAN/OLE
Institut canadien de l'information scientifique et technique
Ottawa, Ontario. K1A 0S2

RÉSUMÉ

CAN/OLE (Canadian On-Line Enquiry) est un service de recherche documentaire en direct conçu et exploité par l'Institut canadien de l'information scientifique et technique (ICIST) et le Centre de calcul du Conseil national de recherches. Ce service permet la recherche rétrospective de grands fichiers bibliographiques dans tous les principaux domaines de la science et des techniques. Le réseau canadien des centres CAN/OLE comprend plus de 100 organismes du secteur public, de l'industrie et des universités. Le coordonnateur de CAN/OLE joue le rôle d'agent de liaison entre le système et ses utilisateurs. (CAN/OLE (Canadian On-Line Enquiry) is an on-line information retrieval system designed and operated by the Canada Institute for Scientific and Technical Information (CISTI) and the National Research Council Computation Centre, for the retrospective searching of large bibliographical reference files. The Canadian CAN/OLE Centre Network presently consists of over 100 organizations in government, industry and university. The CAN/OLE Coordinator's role is to link supporting systems and the ultimate user population.)

CAN/OLE

CAN/OLE est un service de documentation en direct qui donne accès à plus de trois millions de références tirées des services d'analyse et d'indexation. BIOSIS Previews, Chemical Abstracts Condensates, COMPENDEX (Engineering Index), INSPEC (Information Service in Physics, Electrotechnology, Computers and Control) et le Catalogue collectif des publications scientifiques dans les bibliothèques canadiennes.

BASES DE DONNÉES	AMPLEUR	NOMBRE TOTAL DE RÉFÉRENCES
1. Biological Abstracts Previews	janvier 1972-	991,000
2. Chemical Abstracts Condensates	juillet 1973-	853,000
3. Engineering Index	janvier 1970-	494,000
4. Information Service in Physics, Electrotechnology, Computers and Control	avril 1970-	758,000
5. Catalogue collectif des publications scientifiques dans les bibliothèques canadiennes		40,000 titres dans 250 bibliothèques

Tableau 1: DOMAINES COUVERTS EN FÉVRIER 1976

La gestion d'un service de recherche documentaire en direct est une opération très complexe qui exige la coopération de plusieurs services au sein de l'ICIST et du CNRC.

En général, le coordonnateur de CAN/OLE est responsable:

a) d'autoriser, de mettre sur pied et de coordonner les centres CAN/OLE;
b) de procéder à la formation des membres désignés des centres CAN/OLE et d'attribuer à chacun un code de début de message donnant accès au système;
c) de fournir la documentation pertinente comme les manuels et les outils bibliographiques destinés aux utilisateurs;
d) d'assurer le bon fonctionnement du service en concert avec le service d'analyse des systèmes;
d) de tenir les centres CAN/OLE au courant (1) des modifications du système d'exploitation, (2) des changements relevant des contrats de bail entre l'ICIST et les fournisseurs de bases de données et (3) des domaines couverts et des mises à jour des bases de données;
f) d'avertir le service d'analyse des systèmes des améliorations suggérées par les utilisateurs;
g) de répondre aux demandes de renseignements durant les heures normales de travail à Ottawa.

Nous allons examiner l'organigramme des services de l'ICIST afin de mieux expliquer l'exploitation du système de recherche documentaire automatisé.

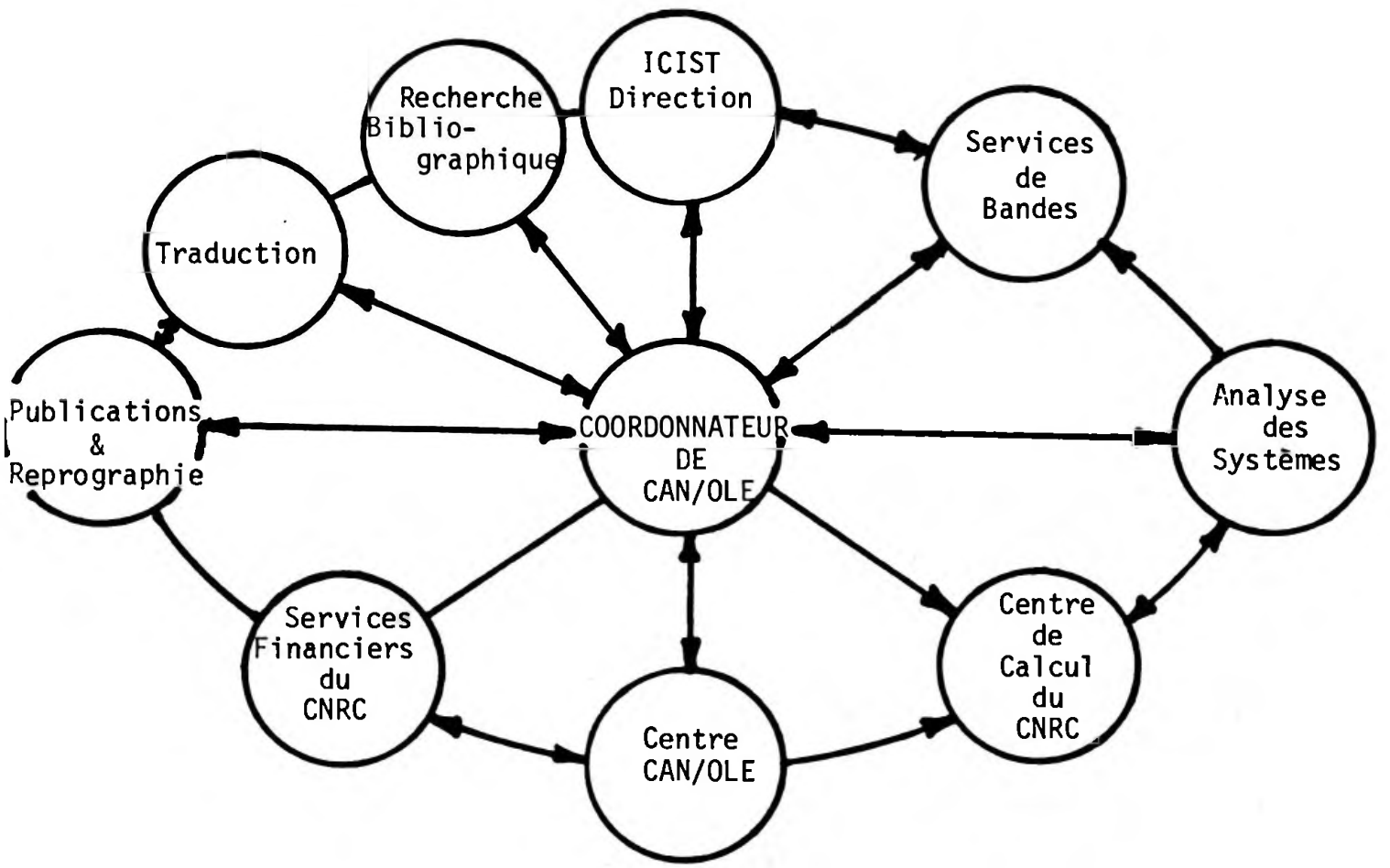


Tableau 2: Organigramme de CAN/OLE

A) LE CENTRE CAN/OLE

En premier lieu, jetons un coup d'oeil sur l'utilisateur. Le centre CAN/OLE se définit comme un organisme pouvant desservir plusieurs utilisateurs. En mars 1974, une limite de 15 centres avait été adoptée pour assurer un support technique et éducatif compatible avec les ressources du CNRC et de l'ICIST. Actuellement, tous les centres ont accès au système simultanément.

Alberta 2	Québec 9
Nouvelle-Ecosse 2	Saskatchewan 1
Ontario 24	Terre-Neuve 1
Ottawa 13	

Tableau 3: Répartition géographique des centres CAN/OLE

Ce tableau montre que 84,6% des centres CAN/OLE sont situés au Québec et en Ontario, dont 13 à Ottawa. Cette répartition semble refléter le coût élevé des communications dans les provinces de l'Ouest et dans les provinces maritimes. Le secteur public et les universités sont les plus grands utilisateurs du service, car un certain nombre de recherches est requis pour justifier la location d'un terminal (les frais s'élevant à au moins $120 par mois). Le petit utilisateur a le choix d'envoyer sa demande de renseignements aux Services de recherche documentaire unifiés de l'ICIST. Le tarif des recherches rétrospectives est de $20 la question et couvre, au besoin, les recherches manuelles et par ordinateur. Ainsi, plus de 30 recherches documentaires sont exécutées chaque mois.

Secteur public	16
Universités	13
Industrie et autres	9

Tableau 4: Réparition des centres CAN/OLE par genre d'organisme

Jusqu'à présent, assez peu de publicité a été faite sur la disponibilité de ce service par quelques centres CAN/OLE. Une enquête envoyée aux abonnés du service CAN/SDI a montré que 66% des gens qui ont répondu n'étaient pas au courant de l'existence d'un terminal CAN/OLE à l'intérieur même de leur organisme.

L'utilisateur compose le numéro du Centre de calcul du CNRC pour interroger les diverses bases de données en direct. Parfois, surtout s'il est un utilisateur non exercé, il s'adresse au coordonnateur de CAN/OLE pour apprendre si l'ordinateur fonctionne ou non, ou encore pour demander des conseils au sujet de la mise au point du terminal et de la façon d'interroger un fichier. De plus, il reçoit une facture mensuelle de la Direction des services financiers du CNRC, ce qui exige parfois des explications sur le mode de paiement, le nombre d'heures de connexion utilisées et les crédits s'il y a lieu.

B) LA DIRECTION DE L'ICIST

Tout le travail préparatif conduisant à l'établissement d'un centre CAN/OLE est fait par le coordonnateur, c'est-à-dire la correspondance, les démonstrations du système et l'envoi du contrat. La direction de l'ICIST tient le coordonnateur au courant de toutes les décisions qui ont été prises. De son côté, le coordonnateur de CAN/OLE indique à la direction quels endroits devraient faire partie d'un réseau de communications éventuel. Celui-ci servirait à égaliser les frais de transmission dans l'ensemble du Canada. De plus, il indique la préférence des utilisateurs quant aux nouvelles bases de données qui devraient être ajoutées au système.

C) SERVICES DE BANDES

Les Services de bandes sont abonnés à 14 bases de données, dont 4 seulement font partie de CAN/OLE. Les Services de bandes sont responsables de conclure les contrats de bail avec les fournisseurs et de payer les redevances. Ainsi, le BioSciences Information Service de Philadelphie reçoit des redevances de $15 par heure de connexion pour l'utilisation de sa base de données BIOSIS Previews. Ce montant est perçu par l'ICIST et envoyé au fournisseur de bandes. Les recettes de l'ICIST se limitent à $30 l'heure de connexion. La société Engineering Index demandait $400 en 1976 comme frais d'accès pour les tiers utilisateurs de sa base de données COMPENDEX, mais de dures négociations ont fait annuler ce régime.

Le coordonnateur doit avertir les utilisateurs par écrit de tout nouveau tarif 60 jours avant sa mise en vigueur. Les Services de bandes établissent des états de compte mensuels qui sont distriubés par l'entremise des Services financiers du CNRC.

L'acheminement des feuillets d'imprimante CAN/OLE se fait ici. Au début, on apposait les étiquettes-adresses sur les feuillets d'imprimante, mais puisqu'une trentaine de feuillets sont maintenant préparés chaque jour, l'utilisateur est prié d'inscrire son adresse au terminal.

D) ANALYSE DES SYSTÈMES

Le coordonnateur de CAN/OLE se réunit chaque semaine avec les membres du groupe d'analyse des systèmes, qui est responsable du logiciel de CAN/OLE, des statistiques d'utilisation et des mises à jour mensuelles des fichiers (Heilik 1976). Les entretiens portent ordinairement sur les plaintes des utilisateurs et sur les modifications du système. Ces entretiens ont permis de nombreuses améliorations, comme de meilleures réponses du système et des mises à jour mensuelles plutôt que trimestrielles. On a commencé à rédiger une troisième version du programme CAN/OLE, le coordonnateur représentant les utilisateurs.

Le coordonnateur est responsable des messages au terminal, ce qui lui permet de communiquer aux utilisateurs des renseignements sur les fichiers, et de leur expliquer les nouveautés du système.

Les réponses du système se sont améliorées depuis avril 1975. Une recherche moyenne dure 10 minutes, ce qui fait six communications par heure à moins de $7 la séance. Un utilisateur peut actuellement inscrire plus de cinquante commandes de recherche par heure, demander plus de trente combinaisons logiques (ET,OU) et faire imprimer plus de 300 références par heure de connexion.

E) CENTRE DE CALCUL DU CNRC

Le logiciel de CAN/OLE est exécuté sur deux ordinateurs IBM 360/67 et les fichiers sont rangés sur des disques à double densité IBM 3330 Le groupe d'analyse des systèmes est en communication continuelle avec le Centre de calcul.

F) DOCUMENTATION CAN/OLE

Afin de tenir les utilisateurs au courant des modifications du système, le coordonnateur prépare un bulletin mensuel, publié en anglais et en français avec la collaboration du service de traduction. Ce bulletin indique les changements du système, décrit les mises à jour et fournit des explications au sujet des commandes ou des bases de données.

Un manuel de l'utilisateur et d'autres documents utiles représentent également un aspect important de tout service de recherche documentaire. En mars paraissait la première édition française du Manuel de l'utilisateur de CAN/OLE, correspondant à la deuxième version anglaise publiée en même temps (Grigaitis 1976). Celle-ci a été préparée par un programmeur et un psychologue de l'Université de Toronto et il a fallu un an pour la mise au point du texte final. Il s'agit d'un manuel qui s'adresse avant tout aux utilisateurs.

Une des tâches les plus importantes du coordonnateur est la formation des utilisateurs, qui s'adresse à des membres choisis des différents centres CAN/OLE. Des séminaires mensuels sont offerts gratuitement à l'ICIST. On introduit les utilisateurs aux modalités de transmission et de fonctionnement des terminaux, aux commandes CAN/OLE et à l'orientation des différentes bases de données. Le nombre de séminaires s'est élevé à 18 en 1975 et le nombre de participants à 186. Trois séminaires se sont déroulés en français et six ont eu lieu à l'extérieur d'Ottawa.

De plus, avec l'aide du personnel du service de recherche bibliographique, le coordonnateur répond aux appels téléphoniques au sujet du fonctionnement du système. Lorsque celui-ci est en panne, les appels sont inévitables, bien que les utilisateurs puissent composer un numéro spécial qui leur indique l'état de l'ordinateur sous forme de message enregistré.

CONCLUSION

Le coordonnateur de CAN/OLE joue donc un role très complexe au point de recontre entre le système et les utilisateurs éventuels. Or un service qui s'adresse à des utilisateurs a justement besoin de ce genre de représentant.

RÉFÉRENCES BIBLIOGRAPHIQUES

HEILIK, James. "CAN/OLE: A Technical Description", dans Association canadienne des sciences de l'information. Quatrième conférence canadienne des sciences de l'information, London, Ontario, 11-14 mai 1976.

GRIGAITIS, Leo. Manuel de l'utilisateur (CAN/OLE). Institut canadien de l'information scientifique et technique. Ottawa, 1976. 170 p.

CAN/OLE: A TECHNICAL DESCRIPTION
(CAN/OLE: UNE DESCRIPTION)

James Heilik
Canada Institute for Scientific & Technical Information
Ottawa, Ontario
K1A 0S2

CAN/OLE is a national information retrieval system developed and maintained by the Canada Institute for Scientific and Technical Information (CISTI). This paper is a description of the system; its record and file lay-outs, access methods, programs, facilities, accounting, and some thoughts on its future development. (CAN/OLE est un système national de recherche documentaire mis au point et exploité par l'Institut canadien de l'information scientifique et technique (ICIST). Le présent exposé décrit le système CAN/OLE: la présentation des données et des fichiers, les méthodes d'accès, les programmes, les installations, la comptabilité et quelques réflexions sur l'avenir.

CAN/OLE (Canadian On-Line Enquiry) began in February 1973 as little more than an exercise for the CISTI programmers to learn something about on-line operations. In May 1976 it was providing access to over three million bibliographic records for some thirty six institutions across Canada. In building such a system, we have from time to time used others' ideas; we feel it is now our turn to repay the favor and share some of our ideas and techniques.

ANCHOR RECORDS

A CAN/OLE anchor record is a collection of data held together by some control information. This data is mostly bibliographic in nature, but does not have to be so (in one of our experimental data bases, there is financial data). Let us examine the component parts of the anchor record.

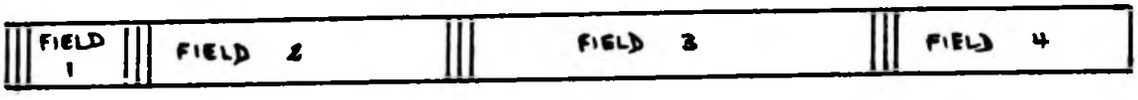
Fields

A field is a string of characters preceded by two bytes of control data. It represents an author, a title, or any other discrete piece of information.

Fields are of varying length. The first four bits of the control portion indicate which compression technique has been used on the field, and the remaining twelve bits give the length of the field in binary. Hence, a field may be encoded in any one of 16 ways, and have a maximum length of 4096 bytes (including the two byte control portion).

Text

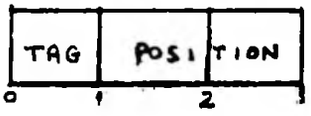
Text is a collection of fields concatenated together in any order.



For each data base, a unique set of fields is defined. Most of these are similar from one data base to another (authors, titles, etc.). Some data bases, however, supply information not available in others; subject codes, CODEN, language of publication. Not all possible fields need be present in the text. For example, an anonymous work will not have an author field.

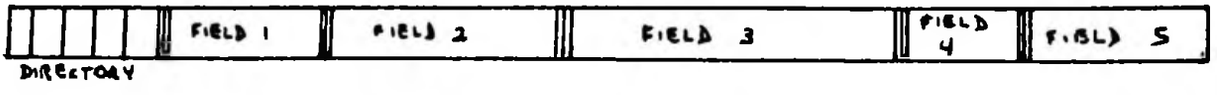
Directory

For each field in the text, we construct a three byte directory item or entry.



The first byte is an identifying tag for the field. Each field will have a unique tag, and so, a record will have a maximum of 255 fields. The second two bytes give in binary the starting position of a field relative to the front of the text. If a field does not exist in the text, there will be no corresponding directory entry for it.

Directory entries are sorted into ascending order by tag number, and concatenated together. The resultant string, the directory, is attached to the front of the text.



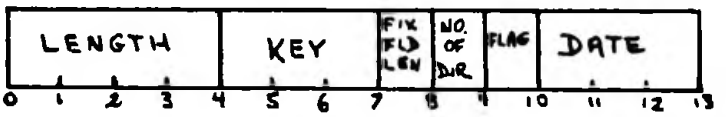
Fixed Field

Each field described above requires five bytes of overhead; three for the directory, and two for its control information. In cases where the data is always of fixed length, such as a language code, this overhead is not necessary, and indeed, wasteful. In fact, codes are often one byte long, yielding an overhead to data ratio of 5:1.

To overcome this inefficiency, all fixed length items of data in a given data base are gathered together in a predetermined order. They are then concatenated into a character string. The resultant string is called the fixed field, and it is attached to the front of the directory. There is only one fixed field in a record, and it can not exceed 256 bytes in length.

Leader

The foregoing has built up a record. The leader is what ties it together.



The leader is a fixed field of length thirteen. Bytes one to four contain the length of the record (including the leader), bytes five to seven contain the key about which more later, byte eight gives the length of the fixed field, byte nine gives the number of items in the directory, byte ten is the record status flag, and the remaining bytes contain a date stamp indicating when the record was created. The status flag and date stamp were intended for use in on-line updating, but since CAN/OLE does not have this facility, these four bytes will probably be deleted in order to save space.

A COMPLETE ANCHOR RECORD

FILES

The foregoing record forms the basis for the system files. A CAN/OLE file is a collection of records each having a unique key. There are three types of files in the system, but first a word about keys.

CAN/OLE uses an access method called VISAM (Virtual Indexed Sequential Access Method). VISAM is a facility of TSS[1] which allows the direct retrieval of an individual record. Each record in a file has a unique physical address on a disk; this address is analogous to the address of a family dwelling. In addition, each record has a unique key, which to follow our analogy, is equivalent to a family's name. The VISAM key is the name by which the system knows the record. In order to fetch a record, a program passes to TSS a key, TSS converts this key to a physical address on a disk, and reads the data found at that address. The process is similar to giving the post office a name, the latter converts it to a street address, and delivers mail to the house located at that address.

---

1. IBM's Time Sharing System

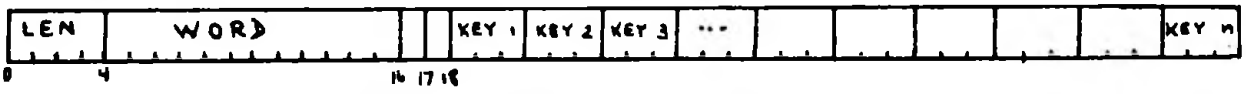
Anchor files

An anchor file is a collection of anchor records. From the description of the leader, we know that the anchor key is three bytes long. This key is a simple binary sequential number; as a record is added to an anchor file, it receives a number one higher than the one of the last record. Having a three byte key implies that an anchor file can have up to 16,777,216 records. The largest CAN/OLE file (BIOSIS) currently has under one million. The anchor files contain all the bibliographic data for which people will be searching.

Index files

CAN/OLE uses an inverted list technique, each data base having a number of index files. These indexes function like those in the back of a book; given a word, the index record for that word contains the anchor keys of all records containing that word.

Construction of an index proceeds as follows: when anchor records are created (added to the end of the anchor file), all non-trivial words from pre-specified fields are broken out, together with the key of the record from which these words came. This process results in a large file of words, each followed by a three byte key. We sort this file into alphabetical order, bringing together all like words. From these so called preindex records, we construct index records, an example of which is described below.



The first four bytes give the length of the index record, the next twelve contain the word in compressed form, and the following two bytes carry some control information. The control bytes are followed by a varying number of anchor keys in ascending order. We have in effect a word, followed by the anchor keys of all records containing that word.

The maximum length of an index record is 4000 bytes. If there are more keys for a word than will fit in this space we create new index records to pick up the overflow. Byte 17 is the record sequence number, and it is used in these overflow situations--the first record is always record zero, subsequent ones having the same word have incrementally higher sequence numbers. Byte 18 has two parts. The first bit is on if there is a following index record with the same word, off otherwise. The remaining seven bits give the length of the anchor key, which currently is three.

The above is a title index record. Other indexes vary in that the word length is not the same. For example, a CODEN is always five bytes long, so records in the CODEN index will have a word length of five rather than twelve as do title index records. Similarly, other indexes have word lengths suitable to themselves.

For each index file, we make the index word the key for that particular file. Thus, a title word is the key for a record in the title index file--let us call this key the index key to prevent confusion with the anchor key. In order to search for all records containing the word "information" in the title, the system converts "information" to a physical address in the title index file, and fetches all the anchor keys found there. Each of these anchor keys can in turn be converted to a physical address in the anchor file, and the records found in those locations will have the word "information" in their titles.

Although not currently used, there is an additional feature in OLE whereby actual data can be carried with the anchor keys in the index record. This associate information, as it is called, is intended for use with a proposed SELECT command--a command which allows the creation of subsets of retrieved records.

Auxiliary files

There are some fields which are present in every record, but whose contents take on only a limited set of values. To illustrate, the BIOSIS file has almost a million anchor records, but there are only about 7000 journal names in this file. In order to conserve space, we have removed journal names from the anchor files, and replaced them with a five character CODEN. A file of unabbreviated journal names was built, using the CODEN as the VISAM key for that file. When a person requests the display of a record, the appropriate journal name is automatically fetched from the journal file and inserted into this display. The net result is that anchor files carry coded information only in these cases, saving valuable storage space. The same technique may be used in similar situations.

PROGRAMS

To this point, we have only seen what records and files look like. What remains to be discussed are the programs which make this data accessible. These programs were designed as a general purpose information retrieval system which would be somewhat independent of data. For this reason, OLE programs do not access data directly, but through tables.

A table is an interface between a program and a file. It is similar in concept to Data Definition Language of Data Base Management systems. When a person asks, for example, to search through "title" fields, the search program checks in the data base tables to determine what precisely is meant by "title"--what file is it in, what is its maximum length, how is it compressed, where is it indexed, and so on. If this meaning should have to change for some reason, then the table entry can be altered with minimal impact on the programs.

CAN/OLE: A TECHNICAL DESCRIPTION

CAN/OLE was designed by R.A. Green of the National Research Council Computation Centre; programming was done by him and three programmers from CISTI. All programs are written in Assembler to enhance run time efficiency. There are four types of programs in the system: supervisor, enquire, update, and utilities.

Supervisors

There are two supervisor type programs which control the flow of work. The first is a facility of TSS called MTT (Multi Terminal Task). To TSS, MTT looks like a single batch job which sits in the computer forever. Its function is to communicate with the OLE terminals. The reason we do not allow terminals to talk to TSS directly is overhead. A TSS account may use to all non-privileged TSS facilities, and there is a fairly large amount of system overhead associated with such accounts (catalogs, libraries, etc.). An OLE account, on the other hand, needs only the OLE commands. MTT allows us to incur overhead as if there were only one TSS account; the OLE accounts subsequently have very little.

MTT provides the facility for sending and receiving messages to and from terminals. The program which uses this facility is the OLE Monitor, the second supervisor program. The Monitor in a sense directs traffic. It does the polling to see who has work pending, it shunts incoming user requests to the appropriate modules, and directs outgoing results to the right terminals. In fact, it is the interface between the OLE programs and the terminals (the latter being represented by MTT). The Monitor also records when people get on and off the system for accounting purposes.

Enquire

Enquire is the program which processes most of the commands a person would normally use. Each one of these has a separate entry point; the Monitor has a table of all valid entry points which it uses in determining to which piece of the program to go.

The facilities provided by Enquire are the normal ones associated with most information retrieval systems. One can connect to a data base, perform searches in the indexes, perform Boolean logic on the retrieved references (hits), display these hits, browse in an index, and review work already done.

In addition to the core Enquire commands, there exist facilities to give one's self tutorials at the terminal, build stored searches, explain messages, determine composition of file sizes, display the names of data bases available at any given time, as well as the names of the fields and indexes associated with any given data base. For details on what the commands look like to the user and how they work, contact the OLE Coordinator at CISTI.

There exist a number of other activities while Enquire is running. We keep a log of batch printouts being created, we produce accounting records and we avail ourselves of TSS facilities and privileged OLE commands to monitor and make adjustments to the system.

CAN/OLE commands issue messages of one sort or another. These may be informational as in the case of indicating the result of a search, or they may be error messages. All messages are stored in a message file, each with a unique identifying number. When a program wishes to send a message, it issues a number, and TSS displays the appropriate message. In fact, there are two message files, one in English and one in French. An OLE customer can choose the language of his dialogue with the system (if he chooses French, not only his messages, but also the commands will be in French--the same is true for English).

Update programs

Update is that non-glamorous behind-the-scenes activity without which nothing works. The function of these programs is to add new records to the files, and in some cases, to delete old records. There are basically four steps in the update procedure.

Firstly, records are added to the end of existing anchor files. We assign sequentially higher anchor keys to them while doing so. At the same time, we break out from each new record words destined for the indexes together with the keys of the record whence they came. Secondly, indexes are built from these preindex records. Thirdly, the new indexes are merged with the existing old ones. Finally, we create backup in case any of the files get destroyed.

Files currently reside on IBM double density 3330 disks (200 megabytes each). We do not allow any file to overflow a pack. When a pack gets full, the update routines delete the oldest records to make room for the new ones. A system change is taking place whereby an anchor file can be broken down into chronological pieces; that is, subfiles. The limitation then on file size will no longer be the pack, but the number of drives.

Utilities

Any system of fair size needs utilities. These are the programs that fix things, display things, move things, and so on. Some of the OLE utilities are supplied as part of TSS, others were written by our programmers.

The TSS utilities allow us to move files to and from various devices, dump files or pieces thereof in character or hexadecimal form, dynamically fix system violated files, and maintain the message files. The OLE utilities merge indexes of like attributes, remove specific records from any index or anchor file, gather statistical information about anchor files and count anchor keys per index record. From time to time, other utilities are written as they are needed.

ACCOUNTING

Government policy requires us to recover some of the costs of running our systems. Accordingly, most on-line OLE activities are counted. This includes connect time, number of searches, number of hits, number of logic commands, and so forth. Currently, charging is for connect time only, and in one instance, for number of hits displayed. Should the billing system have to change in the future, there is enough data being collected to do so without excessive difficulty.

In addition, the counts made provide the necessary statistics to monitor use of the system. This monitoring helps management pace the growth of CAN/OLE, and aids the programmers in detecting bottlenecks which require work.

FUTURE SYSTEM DIRECTIONS

When the system was initially conceived in 1973, we planned to have at least three major rewrites. The first effort was more in the nature of a feasibility study to demonstrate the usefulness and effectiveness of such a system. It consisted of a limited set of facilities working on a limited file made up of very limited records.

The second version is what exists now. It is an extensive generalization of the first, allowing for much more complex records and much larger files. But it also has limitations. Eventually, the files will be so large as to degrade response time. The number of terminals will increase and undoubtedly uncover problems in terminal management.

The systems group is planning for the third rewrite. Some of the changes envisioned include a radically different file structuring which will incorporate both indexed and sequential access methods. Learning capabilities may be built in so that if a sequence of events or a particular truncation is used often, these will automatically be remembered and not done again. A further possibility is the creation of indexes on demand rather than in advance--this concept would greatly ease the problem of file updates.

All these and other suggestions are at the talking stage at the time of writing. We anticipate work to begin this calendar year. Although we are pleased with the system's development thus far, we recognize that it must remain dynamic to keep pace with changing developments. This dynamism is not seen as only the correction of mistakes, but as an evolution which never ends.