Push Technology
at Argonne National Laboratory

Robert E. Noel
Technical Librarian
rnoel@anl.gov

Yvette Woell
Manager, Library Services
ywoell@anl.gov

Argonne National Laboratory
9700 S. Cass Avenue
Argonne, IL, 60439

March 1999

Abstract: Selective dissemination of information (SDI) services, also referred to as current awareness searches, are usually provided by periodically running computer programs (personal profiles) against a cumulative database or databases. This concept of "pushing" relevant content to users has long been integral to librarianship. Librarians traditionally turned to information companies to implement these searches for their users in business, academia, and the science community. This paper describes how a push technology was implemented on a large scale for scientists and engineers at Argonne National Laboratory, explains some of the challenges to designers/maintainers, and identifies the positive effects that SDI seems to be having on users. Argonne purchases the Institute for Scientific Information (ISI) *Current Contents* data (all subject areas except Humanities), and scientists no longer need to turn to outside companies for reliable SDI service. Argonne's database and its customized services are known as ACCESS (Argonne-University of Chicago Current Contents Electronic Search Service).

Key Words: BASISplus, BASIS, SDI, push technology, selective dissemination of information, FQM, personal information profile, *Current Contents*, TECHLIBplus, TECHLIB

Introduction

Argonne National Laboratory is a multidisciplinary research center that is operated by the University of Chicago for the U.S. Department of Energy. With more than 200 programs in basic and applied sciences, Argonne is one of the largest national laboratories.

The Argonne staff consists of more than 1,500 Ph.D. scientists and engineers, plus 3,000 technicians, graduate students, visiting faculty, and support staff. The Argonne Library System, a service of the Information and Publishing Division, provides access to scientific and technical literature in 10 on-site libraries and access to outside resources.

In 1994, the Argonne Library System introduced an electronic journal table of contents service. The goals of this service are as follows:

- To allow Argonne researchers to browse table of contents information from their offices without physically visiting the libraries.
- To facilitate searches for current information relating to an individual researcher's particular field of interest.
- To link journal indexing to the Argonne Library System electronic catalog.
- To automate and expedite requests from researchers for articles.

Development of ACCESS

The Argonne-University of Chicago Current Contents Electronic Search Service (ACCESS) brings to the users' desktops a complete database providing both retrospective searching and current awareness services. ACCESS uses data supplied by the Institute for Scientific Information (ISI) that is used in the creation of ISI's *Current Contents*[1] product. *Current Contents* is an attractive current awareness package for Argonne because it covers more than 6,000 journal titles in the sciences and social sciences and is international in scope. In 1995, librarians at the University of Minnesota (Jaguszewski 1995) compared the coverage and currency of four current awareness databases: CARL UnCover, ContentsFirst, Inside Information, and *Current Contents* on diskette. These authors identified the positive aspects of *Current Contents* that distinguish it from the other products as follows: (1) *Current Content* contains complete bibliographic information with scans and images of the entire journal issue, including letters, notes, and corrections. (2) It contains full, searchable English language abstracts. (3) It includes titles selected by evaluation of journal content and statistical analyses of the impact and use of material published; if a title has marginal value as determined by ISI's journal experts, it is dropped from *Current Contents*.

Some of the limitations of *Current Contents* pointed out in the University of Minnesota study (Jaguszewski 1995) resulted from distribution of the data on separate diskettes. Argonne overcomes many of these problems by purchasing comprehensive data. Thus, Argonne does not need to run the personal profiles repetitively against separate editions of the *Current Contents*

---

[1] *Current Contents* is a registered trademark of the Institute for Scientific Information.

database (Life Sciences, Engineering, Computing and Technology, etc.) and is not confined to searching journal titles by abbreviation only.

Argonne selected BASIS, a text-management software package produced by Information Dimensions, Inc. (IDI)[2], to provide the interface with *Current Contents* for three reasons: (1) IDI had already created a *Current Contents* interface, (2) computer professionals skilled in using the BASIS system were readily available at Argonne, and (3) TECHLIB, the library system used at Argonne, is a vertical application of BASIS and would thus readily accommodate a flow of data between the two products.

Two years after ACCESS was originally introduced, the Argonne Library System migrated to a UNIX environment (Dominiak 1993). At that time, Argonne elected to discontinue use of the IDI-supplied interface and create an interface that took advantage of the UNIX environment and was specific to local needs. A team of Argonne librarians and computer systems analysts designed a database to hold the *Current Contents* data and built a new interface by using the BASIS high-level language called FQM.

ACCESS presents a Web-based interface to access *Current Contents* data going back to 1994. The database is updated weekly, and users can search the data using a journal table of contents approach or a subject approach. All of the following fields are indexed and thus available for searching: author, article title, abstract, corporate source, journal title, *Current Contents* edition, key words, and ISI's KeyWords Plus. [3]

Argonne's journal holdings are matched against the ACCESS database thus allowing each record to indicate whether the journal is owned by the Argonne Library System. In 1997, the University of Chicago's journal holdings were also loaded, and ACCESS service was extended to faculty, students, and staff of the University. Now all users can determine if a journal is in the library collections at the University of Chicago and Argonne National Laboratory.

ACCESS and Push Technology

The Argonne Library System introduced "push technology" to ACCESS in 1994, when we allowed individual users to create personalized table of contents profiles. Users could select journal titles and receive the table of contents of each new issue via electronic mail. We referred to this new current awareness service as ETOC (Electronic Table of Contents). Various publishers' Web pages offer free delivery of journal tables of contents, but users must first identify the publishers of titles they want, locate their website, and then sign up, a tedious, time-consuming process. ACCESS is a more comprehensive, one-stop service. Each week the researcher automatically receives an electronic mail message containing the tables of contents of requested journals representing multiple publishers.

---

[2] Open Text Corporation purchased IDI in 1998.
[3] KeyWords Plus are words and phrases that frequently appear in the titles of the articles referenced but may not be found in the article itself.

In early 1996 we enhanced push technology in ACCESS by providing a key word-based current awareness service called KeyACCESS. This service matches subject-based user profiles against weekly updates. Librarians, in consultation with researchers, design interest profiles that are run automatically against each week's new data. Results are delivered via electronic mail the next day. The enhancements made at Argonne National Laboratory have changed the role of the librarian from that of a distributor of information (Wert 1987) to an information enabler.

Push technology describes an established way of coping with a torrent of information. The term was popularized in 1995 by the Massachusetts Institute of Technology's Media-Lab Director, Nicholas Negroponte (Safire 1997), when he suggested that push technology was a Web phenomenon whereby salesmen could hawk products and services on the basis of individual consumers' descriptions of needs. Others have cast a more positive spin on the phrase by saying that push technologies provide "personalized delivery of information," (Safire 1997) saving users from the hassles of foraging for information on their own. It is within that service-oriented context that Argonne transformed its previous current awareness offerings into the Laboratory-wide push technology called KeyACCESS.

Setting up KeyACCESS searches requires some knowledge of FQM, the BASIS high-level language. Despite the additional training effort, we decided to train each of Argonne's ten reference librarians rather than concentrating responsibility for creating profiles with one or two individuals. We did this to take advantage of each librarian's unique subject specialties and to achieve more exact, in-depth searches. To assist the ten librarians initially, we created and made available a template for accessing, editing, modifying, copying, or deleting searches. Because the librarians were not familiar with BASIS FIND commands, they decided to use the comment field to translate the FIND command into the more familiar DIALOG syntax. This was a good way to share ideas on designing complex Boolean searches. Figure 1 is a sample search for three terms. The "phrase any" connector enables the search to find any article that contains any of the three words listed. Within BASIS, the comma functions as "or," and the ampersand is "and." This style of searching is common; it contains one or a few words or phrases and keeps the user informed as new articles are published on the topic(s). Identical results would occur with the BASIS connector INC and the words separated by commas.

Figure 1. KeyACCESS Search for Three Words

```
+------------------------------ SDI Profile ----------------------------------+|
| Profile: 7           Title: micromechanical or micromachin*                 |
| Patron ID: B00000     Email Addr: ahuja@qmgate.anl.gov                      |
| Library: 212                          Abstract? Y                           |
|                                                                             |
| FIND journal,article WHERE journal.ga JOIN article.ga AND                   |
| article.words phrase any words                                              |
| 'micromechanical micromachin* microfabricat*                               |
|                                                                             |
|                                                                             |
|                                                                             |
| Comment: s micromechanical or micromachin? or microfabricat?               |
|                                                                             |
| Add Date: 04/29/96 Add UID: DOMINIAK Rev Date: 07/16/96 Rev UID: RNOEL     |
|+---------------------------------------------------------------------------+
Action   > (Add,Delete,Exit,Find,Help,Match,Print,Replace,Show,>,<,?)
Member#  11     of 93 for Set 1   (For Delete, Replace and Show)
```

Figure 2, which is a more complex search, illustrates FQM's flexibility and precision. Librarians usually opt to run searches against the full record (all fields).

Figure 2. More Complex KeyACCESS Search

```
+------------------------------- SDI Profile --------------------------------+|
| Profile: 194        Title: Brillouin Scattering                           |
| Patron ID: B00111    Email Addr: test@anl.gov                             |
|  Library: 223                        Abstract? Y                          |
| FIND journal,article WHERE journal.ga JOIN article.ga AND                 |
| (article.words PH ALL WORDS                                              |
| 'elastic propert*','elastic pressure*','sound velocity'                  |
| AND article.words PH ALL WORDS 'high temperature*','high                 |
| pressure*','superlattice*','thin film*') OR (article.words PH ALL WORDS  |
| 'elastic propert*','elastic pressure*','sound velocity' AND              |
| article.words INC 'irradiation','amorphous','glass','glasses','glassy') OR|
| (article.words PH ALL WORDS 'brillouin scattering' AND NOT article.words PH|
| ALL WORDS 'amplif*','stimulat*','phase conjugat*')                       |
|                                                                          |
|Comment:                                                                  |
|                                                                          |
| Add Date: 06/19/96 Add UID: LLI    Rev Date: 07/05/96 Rev UID: LLI       |
|+-------------------------------------------------------------------------+
Action   > (Add,Delete,Exit,Find,Help,Match,Print,Replace,Show,>,<,?)
Member#  28     of 29 for Set 1   (For Delete, Replace and Show)
```

Measuring the Success of ACCESS

How well does Argonne's ACCESS system do what it is designed to do, and is the system serving scientists and the institution better than outside commercial sources? According to Yan (Yan 1994) a current awareness service should do the following:

1. Allow a rich class of queries as profiles, unlike Netnews.
2. Evaluate profiles continuously and notify the user as soon as a relevant document arrives, not periodically.
3. Scale to a very large number of profiles and a large volume of new documents.
4. Distribute the documents to subscribers efficiently and reliably.

ACCESS meets the first requirement. The index structure for ACCESS allows for a variety of gathering techniques. Users are not limited to key word/key phrase Boolean searches that scan only titles and abstracts. For example, a profile can be designed to find any new articles on synchrotron radiation by ten noteworthy physicists, or to find any new article on ceramics from Oak Ridge National Laboratory. The KeyACCESS search can include any combination of bibliographic fields, as well as Boolean combinations of full or truncated key words and phrases. Proximity connectors and phrase searching are also available (e.g., find "steam generators" within four words of "fracture" or "tubing"). Phrase searching is unique and a key advantage of the BASIS software.

ACCESS runs profiles against new data once a week, which does not completely satisfy the second requirement but this is more frequent than many commercial databases available through DIALOG and STN International.[4]

The third requirement, to "scale to a very large number of profiles and a large volume of new documents," is not explicitly defined, but ACCESS can accommodate several hundred users over a short period of time. The number of new tables of contents scanned each week varies; on average, new data from 600-800 new journal issues are on the weekly tapes. For 1998, a total of 899,631 articles were added to the ACCESS system. This averages out to 17,300 articles per week. During that same period more than 600 KeyACCESS searches and 1600 Table of Contents searches were processed weekly. This number is expected to increase now that the KeyACCESS service is available to faculty, staff, and students at the University of Chicago.

Regarding the fourth requirement, ACCESS does distribute documents to users efficiently and reliably. "A *document* consists of a collection of *words*. The set of words that can appear in documents form the vocabulary. . . ." (Yan 1994). Again, ACCESS meets this requirement in that the results are automatically sent to the subscriber's electronic mailbox, with no waiting period between the filtering and the delivery.

While ACCESS has suffered few failures and problems in its delivery of SDI results as documents (a set of bibliographic citations and abstracts), a more fundamental issue is how well Argonne's libraries deliver actual documents (articles from journals) selected by users in response to SDI results. If the user cannot expect a relatively short turnaround time between her request for an article (solely as a result of receiving an SDI result) and delivery of that article, the SDI could be more of a frustrating enticement than a value-added information service.

Service Enhancements

Argonne librarians regularly solicit feedback from scientists and engineers on the KeyACCESS service and because of that feedback have gradually modified the service. ACCESS was originally available only via telnet but in 1996, at the request of users, we made it available through the Web as well. We introduced a major enhancement in January 1998, when KeyACCESS results began to include a Web address linking each SDI article citation delivered with a request form. Now, the scientist viewing the SDI results can immediately block the Web address, copy it into the Web browser, and be prompted to complete a request form to receive a photocopy of the specific article.

In February 1998, the Argonne Library System, operating under fair use guidelines, began to supply photocopies of requested articles in lieu of circulating the entire issue or volume to the user. Scientists now can review the current awareness reports in their office, request individual articles electronically, and devote time to research rather than traveling to the library for the purpose of photocopying articles. The libraries no longer merely house journals, but they have become both notification centers and photocopy-and-delivery centers for scientists.

---

[4] ISI is considering alternate methods for delivering data in a more timely manner; for example, transmitting data by file transfer protocol (FTP) might make daily alerts feasible.

Outcomes of the KeyACCESS Service

Library staff expected the circulation statistics for new journals to increase after the KeyACCESS service became available at Argonne. A study comparing circulation in earlier years with 1996 data revealed, however, that the number of times a new journal was requested or checked out to a user had remained relatively stable, despite the new SDI capability.[5] This finding confirmed that most scientific staff, once notified of a relevant article by SDI, continued to walk to the library, browse the article, and copy it when desired.

Over time, the number of requests for photocopied articles began to increase as more and more KeyACCESS profiles were created. This increase coincided with the inclusion in January 1998 of a Web address linking each SDI article citation delivered with a request form.

Over the last two years, user behavior has changed noticeably because of the availability of KeyACCESS. These behavioral changes have caused changes in daily library operations. In the past, we routed new journal issues to multiple libraries to let users browse new issues for relevant material. The growth in use of ACCESS and a decrease in library personnel contributed to the decision to discontinue this practice. New journal issues now remain in their "home" libraries. With routing discontinued, library support staff can rapidly respond to user requests for specific articles; articles are photocopied and mailed out daily. Not only did this change get new information into scientists' hands quickly, but it kept new journals from being "in transit" or "checked out" when they are needed most. Observations about the two methods of information distribution (electronic mailing of SDI results versus routing issues to libraries) are summarized in Table 1.

Table 1. Advantages and Disadvantages of Using SDI Profiles versus Routing of Journal Issues

Using SDI Profiles		Routing Journal Issue	
Pros	Cons	Pros	Cons
Provides immediate results to multiple users.	Delivers only bibliographic information.	Makes all article information available; allows easy scanning and evaluation of content.	Limits availability to one user at a time.
Reduces overall burden on library staff.	Requires librarians to learn new SDI syntax, then identify and correct errors in profile design.	Preserves status quo; users expect and rely on existing system.	Requires daily attention with uncertain benefits to users.
Exponentially increases amount of information scanned for relevancy.	Has rigid key word/key phrase limitations; cannot interpret information.	Allows users to evaluate and interpret information directly, with no prejudgments about relevancy; allows serendipitous finds.	Presents users with super-abundance of new information.
Allows users to append or attach results to existing private bibliographic databases.			Puts new journals in the mail instead of on display for use.
Delivers information to user.			Requires user to go to information.

---

[5] We defined an issue as "new" during the first 60 days of its availability in the library.

Our library collection management activities have also benefited from the activities surrounding ACCESS. Librarians regularly review the journal titles (not subscribed to by Argonne) that are selected by researchers for table of contents profiles. We monitor interlibrary loan and document delivery requests resulting from KeyACCESS and ETOC searches and evaluate the journal titles for future subscription. To capture more of the in-library usage of journals, we installed scanners next to the photocopiers in the libraries to collect the unique bar code number associated with each journal issue. The information improves the librarians' monitoring of journal usage and offers additional metrics when evaluating titles for renewal.

Conclusion

Usage of the ACCESS database continues to grow with more than 800 interactive database search sessions each month. In addition, the number of user profiles has increased by a factor of six in less than three years. KeyACCESS searches have grown from 50 users with 90 profiles in May 1996 to 306 users with 755 profiles as of March 1999. This is in addition to the more than 1700 ETOC subscriptions.

Argonne's push technology continues to attract new users and existing users consistently give positive comments about its usefulness. A recent pilot survey asked a portion of users to rank the overall value of their KeyACCESS searches. On a scale of 1-5 (1 being useless, 5 invaluable), user "satisfaction" averaged 3.6. Although the ACCESS information cannot replace more targeted or comprehensive files, it nevertheless is both cost-effective and beneficial to users. Companies and other national laboratories can make similar enhancements to BASIS systems to become more self-sufficient at information distribution.

Acknowledgments

References:

Dominiak, R. 1993. "Moving BASISplus and TECHLIBplus from VAX/VMS to UNIX," CONF-9311152-1, IDEA Annual Meeting, November 1993.

Jaguszewski, JM; Kempf, JL 1995. "Four Current Awareness Databases: Coverage and Currency Compared," **DATABASE**, February/March, p. 36.

Safire, W, 1997. "Push Has Come to Shove," **New York Times® Magazine Ondisc**, June 8, Section 6, p. 24.

Wert, LM 1987. **Encyclopedia of Physical Science and Technology**, from glossary preceding *Scientific Information Services* article, Vol. 12, p. 450.

Yan, TW; Garcia-Molina, H 1994. "Index Structures for Selective Dissemination of Information under the Boolean Model," **ACM Transactions on Database Systems**, Vol. 19, June 2, pp. 332-364.