Unified Information Access for the 21ST Century: A Project of the California State University

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Introduction

In 1994 the twenty-two libraries of the California State University produced a comprehensive strategic plan to prepare for the educational and information environments anticipated for the 21st Century. That plan, titled *Transforming CSU Libraries for the 21st Century*[1], identified as its first and foremost strategy a system of linking and integrating for easy access the full range of information resources available in all the CSU and other libraries as well as resources of the Internet. CSU libraries were facing frozen or declining budgets combined with prodigious increases in the rate of publication and in access methods to the expanding information cosmos. A new and innovative use of technology was seen as necessary to leverage the size of the CSU and its resources in order to continue to meet the information needs of students and faculty.

The Unified Information Access System (UIAS) initiative that arose from this strategic planning responds to a vision for the 21st Century that assumes that CSU students and faculty will interact with each other and with information using pervasive technology that enables every student and every faculty member to access, retrieve, display, and manipulate a vast array of recorded knowledge and information. The barriers of space—physical location of student, faculty member, or information—are expected to disappear, as well as the barrier of time.

Conceptualizing the UIAS

While our vision for UIAS was well developed in general terms, a great deal of work lay ahead in defining unified information access and determining its feasibility given the state of available technology in CSU libraries and the library automation industry. A consulting firm, RMG Consultants Inc., was retained in early 1995 with the charge to develop functional requirements of the UIAS, conduct an environmental scan of both CSU libraries and the industry, and develop recommended strategies for achieving unified information access. A

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particularly thorny concern was the use among CSU libraries of integrated library systems from several different vendors; a single system-wide vendor solution was not an option.

The consultants submitted their report[2] in October 1995. That report concluded, based on discussions with vendors and examination of CSU automated library systems, that UIAS was indeed feasible and attainable within CSU budgetary constraints. The report contained a proposed architecture for the UIAS and outlined a Request for Proposals process as an implementation strategy.

In developing their report the consultants also worked with CSU librarians to refine the desired outcomes of the UIAS project. That process yielded a vision of the UIAS as a dynamic and comprehensive tool for student access to information resources, for resource sharing among libraries, and for guidance and instruction in navigating the complexities of the expanding information environment. The UIAS is conceived as a single, easy to use, integrated, and coherent computer-based user interface which provides direct online access to or delivery of:

• print resources described in CSU Libraries' Online Public Access Catalogs and described in catalogs of libraries beyond CSU;

• print resources described in other bibliographic/abstract databases such as periodical indices;

• digital resources, including text, image, video, and multi-media;

• Internet-based resources including those on the World-Wide Web;

• guidance in the use and evaluation of information resources including access to self-paced information competence instruction.

The UIAS is dynamic both in its ability to respond to the rapidly changing information environment and in its ability to respond to the needs of the individual student. Students and faculty access the UIAS via a standard Web browser such as Netscape Navigator or Internet Explorer. The browser client software is linked by the UIAS gateway server on each campus to the library's patron data-file. This linkage not only provides authorization for users accessing licensed databases, but will also permit librarians to customize the interface for different categories of users. A faculty member, for example, can be presented a sequence of screens entirely different from one designed for a lower division undergraduate.

In summary, the desired outcome of the UIAS project is the creation of a powerful information access and educational tool that can meet the academic information needs of CSU students and faculty, a tool that is available anytime and any place.

Selecting the Development Partner

Our consultants had determined the feasibility of the UIAS and had developed an implementation strategy. Through a formal Request for Information (RFI) process conducted in the spring and summer of 1995, they had also discovered a high degree of interest in our project among library automation companies. Many of these companies had already identified Web-based access to integrated information resources as directions for development; our proposed project was seen as timely and felicitous.

The RFI determined that a number of vendor-proposed solutions met CSU's needs and had the ability to accommodate the diversity of CSU integrated library systems and to permit the incorporation of various systems and services. Interested vendors included Ameritech Library Services, OCLC, Innovative Interfaces, and several others. Many of the vendors regarded the UIAS project as the most advanced of its type, showing the way for other libraries. Some vendors suggested an ongoing partnership with CSU to develop their own solutions further to meet the needs of CSU even better than could be accomplished with their off-the-shelf systems and services.

It remained for CSU to identify a partner or partners with whom to contract to build the UIAS. Working with the consultants, we developed in early 1996 a Request for Proposals[3] for the UIAS. The RFP described the current CSU environment, detailed general system concept and the functional requirements of the UIAS, and set forth a process for proposal evaluation and vendor selection. It was written to serve as the basis for the ultimate contract for the system.

We were careful in the RFP not to prescribe a specific technical solution to providing unified access; rather, the document itemized a comprehensive set of requirements set within a broad technology framework conceived during the RFI process. We wanted to give the vendor community the opportunity to exercise its own creativity in proposing a design for the UIAS.

There were two significant areas of risk to the CSU in issuing the RFP. The first concerned the potential

infeasibility of achieving the project's admittedly ambitious vision at all, either due to vendors' misunderstanding of the concept of UIAS or their ultimate conclusion that the system's objectives were unattainable. The second area of risk concerned cost. System-wide funds available for the project were limited; there was a distinct possibility that none of the vendors' proposals would be within budget. Both areas of risk were lessened somewhat by the groundwork laid during the RFI process, but they nevertheless remained sources of worry.

The RFP resulted in ten proposals; taken as a group, their quality was such that we concluded that at least our concern for the project's feasibility was unfounded. From the ten proposals, five were selected to proceed to a second phase of evaluation. Phase two of the evaluation involved confidential discussions with each vendor, pilot testing of features available in each vendor's system, and refinement of cost estimates based on the combination of hardware and software proposed. The last stage in the selection of a partner to work with the CSU in the development of the UIAS was the submission of a "Best and Final" offer by the five vendors included in the final round of the RFP process.

Selection of the winning vendor, Ameritech Library Services, was based on its submission of a "best value" solution to achieving the UIAS. Criteria included total system life cycle costing, maintenance and on-going support, technical excellence and state-of-the-art solution, vendor's performance, and system performance warranties. Following a period of contract negotiations, CSU and Ameritech signed a contract for development of the UIAS in June 1997. The name "Pharos" was selected as the new name for the system in its public manifestation.

The Architecture of Pharos

Pharos is created by the interoperation of the following systems:
• 23 Pharos Gateway Servers—one located at each of the twenty-two CSU libraries;
• the Union Catalog/Z39.50 server—located at the Chancellor's office;
• 4CNET—California State University's Wide Area Network;
• the twenty-two CSU libraries' local integrated library system (ILS) Z39.50 servers;
• other California academic and public library Z39.50 servers;

• the Internet;
• commercially operated Z39.50/HTTP servers providing access to indexing, abstracting, and full-text resources.

The Pharos Gateway Server is comprised of:
• IBM IntelliStation;
• MS NT 4.0 SP4;
• Apache Server 1.3.2 (HTTP);
• Ameritech WebPAC 1.35 with bibengine 1.35 (Multi-threaded version 3, Z39.50 Client);
• Ameritech RSS (ISO 10161 Protocol Server)
• MS SQL Server 6.5;
• Ameritech Remote Patron Authentication (RPA) Server.

The Pharos Union Catalog is comprised of:
• IBM RS6000—S70;
• AIX 4.3;
• Sybase System 11;
• Ameritech Horizon 5.x;
•· InfoSphere—ProIndex.

Interoperation of Component Systems
Union Catalog
Because CSU libraries use integrated library systems from different vendors, the first step in developing Pharos was upgrading these local systems to include a Z39.50 V. 3 server. Building the union catalog was preceded by CSU's development of an algorithm that matches similar bibliographic records from the twenty-two library catalogs and then selects one of the matching records to be the *master record* retained in the union catalog. The program developed by Ameritech to implement this algorithm adds the local control number (LCN) to the master record from each of the matching CSU bibliographic records. The resulting MARC field in the Master Record is used to create a *Hook-to-Holdings*, which the Pharos Gateway Server resolves, using Z39.50, to dynamically retrieve the local call number and circulation status from each ILS. Holdings information is not stored in the Union Catalog. When fully operational, the union catalog will be updated on a daily basis with new, modified or deleted records from the 22 campus libraries.

The User's Perspective
To the user Pharos is a web site, or part of a web site, offered by the user's campus library. Pharos provides access to library information resources which can be

obtained online, in the user's library, or requested from other libraries and/or document suppliers. The user is offered the opportunity to simultaneously search a number of catalogs and databases likely to contain the information desired by the user. Through the design of the screens generating the Pharos user interface, a novice user can begin with a general *Quick Search* that is intended to provide results that would lead the user to more specific information. Experienced users of the system can navigate quickly to topical screens that provide Quick Searches in subject domains. Expert users have access to more sophisticated searching options in specific databases or *native* interfaces offered by information providers that allow for more precise searching.

Authentication/Authorization

Integral to Pharos is an authentication/authorization system that provides a mechanism for controlling user access to impacted resources and services.

When using licensed resources or requesting materials not owned by the local library, the remote user is prompted to provide an I.D. number and last name by the Remote Patron Authentication (RPA) Server. The RPA submits this information to the library's ILS which then validates this user against its patron database. Assuming the user entered the correct information, the user is authorized to use licensed resources (in the library or anywhere else in the world).

Intercampus Circulation/Interlibrary Loan/Document Delivery

If a user has searched for information in Pharos and located a record or citation for an item that is not locally/currently available, he or she is prompted to request the item. The user generates a request for this item and is prompted by the RPA to enter his or her user I.D. and last name. Assuming the user entered the correct information, he or she is authorized to submit a request. The request will contain information about the user provided by RPA and the patron database, and bibliographic information provided by the database in which the user located the desired item.

Ameritech's Resource Sharing System (RSS) web service submits the request to the MS SQL server database. Based on profiling decisions made by the local library, requests can be automatically routed to: 1) a short list of CSU libraries owning this item; 2) other libraries,

which the requesting library may have reciprocal borrowing agreements; 3) a document supply service contracted by CSU; and 4) national and international interlibrary loan services.

Users are able to check the status of their requests on the Pharos Website; doing so requires authentication by the RPA. The user is notified by an e-mail message when requested items are available. If the library chooses, the requested item can be delivered directly to the user.

Library Customization

Because each CSU library has its own gateway server, Pharos can be customized for each library in a number of ways. The library can select what combination of catalogs and commercial databases to offer in a broadcast search and can decide how to integrate Pharos with existing library web pages. The library can add a campus logo and other campus information sources and can create predefined searches and full-text hypertext links for faculty syllabi web pages, and web-based full-text course reserves. The Pharos Prototype Server can be reached at: http://pharos.calstate.edu:5080/

The Future of Pharos

Pharos is by design intended to be an expanding and evolving resource; as the educational, technological and information environments change, so will Pharos. The most significant area of refinement of Pharos that is planned for the immediate future is its customization for the user.

Pharos incorporates an important advance in library systems technology by linking the user interface to the patron database stored in each library's computer system. In addition to enabling authorization and authentication for resource sharing and access to licensed databases, this linkage permits the customization of Pharos to correspond to a variety of demographic characteristics of the user. The sequence of screens, branching options, help and guidance resources and search tools can be designed to accommodate the needs of faculty versus students, graduates versus undergraduates, residential versus distance learning students, and fine arts versus biology majors. Help screens, information competence tutorials, and pre-selected combinations of information resources can be packaged for lower division students, for example, while faculty can be presented

with screens designed for more advanced searching. It is even possible to customize the Pharos interface to the level of the individual by creating and storing a user's own Pharos web page that contains profile and search history information.

As the CSU continues to refine and expand Pharos, it will build on two related ongoing system-wide initiatives: the Academic Information Services Cooperative (AISC) and the Information Competence Project. The AISC provides the content for Pharos. It combines the collective purchasing power of twenty-two libraries to acquire a core collection of electronic bibliographic and full text resources available across the system. It also encompasses a system-wide program of document delivery (books and articles) and agreements for expedited borrowing from University of California libraries. A new and innovative project within this initiative is the Journal Access Core Collection[4] consisting of a customized electronic full-text database of selected journal titles most often subscribed to by CSU libraries.

Information Competence Project[5] addresses the problem of making sense of the increasingly complex information environment; it is a critical element in the success of Pharos. Seventeen multi-campus projects have been completed or are presently underway and include both general education and major-specific instructional programs. Several are in the form of Web-based modules that will be incorporated into Pharos. An information competence fellowship program and faculty workshops are also being developed.

Conclusion

The scope and complexity of the UIAS project has entailed a daunting array of challenges, both in its conception and execution as Pharos. Through close collaboration with Ameritech Library Services, we have succeeded in creating a service to our students and faculty that has enormous potential for delivery of information and educational resources tailored the needs of the individual. Pharos in its present manifestation as a gateway to knowledge is far from perfect or complete, but it offers a framework we can build upon and adapt to the information and educational environments of the 21st Century.

References

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2. RMG Consultants, Inc., "Strategies and Plans for a Unified Information Access System (UIAS) for the California State University" (October 1995).

3. The California State University, "Request for Proposals for a Unified Information Access System" (Long Beach, Calif.: CSU Office of the Chancellor, June 1996). Available at the UIAS project home page http://uias.calstate.edu/UIAS.html.

4. Rogers, Michael, "Infotech," *Library Journal* 15 February 1999: 107–9.

5. See CSU Information Competence Project home page at http://www.lib.calpoly.edu/infocomp/.