THE IAMSLIC Z39.50 DISTRIBUTED LIBRARY: FACILITATING INTERNATIONAL RESOURCE SHARING THROUGH LINKED SYSTEMS AND SERVICES

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ABSTRACT: One of IAMSLIC's longstanding goals has been to facilitate the sharing of resources among member libraries around the world. A variety of strategies and projects have been developed over the years in support of this goal. The IAMSLIC Z39.50 Distributed Library is the result of a recent project that integrates several disparate systems for locating publications owned by potential lending libraries and incorporates a basic interlibrary loan module that streamlines the process of requesting materials. The system architecture is described, initial usage patterns and impacts are analyzed, and options for future development and participation are outlined.

KEYWORDS: IAMSLIC Z39.50 Distributed Library; Distributed Databases; Information Retrieval; Information Systems; Interlibrary Loans; Library Cooperation; Z39.50.

INTRODUCTION

The institutions with which member libraries of IAMSLIC are affiliated range in size and scope from well-funded, world-class oceanographic, aquatic and marine biology research centers to tiny, resource-poor facilities in developing countries; from specialized and governmental research units to comprehensive universities. The combined library resources of the several hundred member libraries constitute an astoundingly comprehensive collection of published resources on all aspects of marine and freshwater science. While the distribution of this valuable resource is decidedly uneven, all types of libraries have important materials to contribute. The smaller, resource-poor institutions need access to the expensive, mainstream research journals that are subscribed to by larger, better-funded libraries. Conversely, the local and regional research reports produced and collected by small institutions all over the world constitute a unique and valuable literature that is not otherwise obtainable.

Over the years, a number of initiatives have been undertaken to facilitate the identification and sharing of resources among IAMSLIC libraries. The Association has

worked actively with the editors and publisher of *Aquatic Sciences and Fisheries Abstracts* and the Food and Agricultural Organization of the United Nations to ensure that the indexing coverage of international publications is as comprehensive as possible. Thus, researchers can locate citations to articles, reports and papers on a very wide range of topics through the *ASFA* indexing and abstracting database. However, the researchers and their librarians or interlibrary loan staff still face the challenge of identifying where they can obtain copies of publications not owned by their institution's library.

In the early 1980s, three IAMSLIC librarians compiled and edited *MUSSEL: a union list of serials in marine science libraries* (Meadows et. al. 1984), a fairly exhaustive union list of the journals and serials held by marine science libraries published as a set of microfiche to serve as a finding aid for libraries to identify which other institutions had copies of particular journals and serials in their collections. In 1990, a pilot project was undertaken by the author and Dr. Joseph Wible of the Hopkins Marine Station Library to explore the feasibility of an Internet-accessible computerized version of a Union List of Marine and Aquatic Serials for libraries along the Pacific coast of North America (Watkins & Wible 1992). The goal was to eliminate the need for time-consuming editing and merging of holdings records for each journal or serial title through the use of retrieval software that employed fuzzy search algorithms against unstructured text files. The pilot was mostly successful, but difficult to maintain and update, so in 1997, it was moved to a web platform with simple forms for use by participating libraries to enter information about their serials. This somewhat cumbersome system was finally converted to a MySQL relational database with a web front end and the ability for libraries to add, edit and manage their own records easily. The number of contributing libraries has grown since this platform began to serve as a central source for verifying the ownership and availability of journals and serials at member libraries.

One of IAMSLIC's resource sharing goals has been to distribute the burden of interlibrary lending more equitably across all types and sizes of libraries. Understandably, the large research libraries tend to lend far more material than they borrow from others. Because the smaller IAMSLIC libraries have particularly been encouraged to participate in the Union List of Marine and Aquatic Serials, it serves to bring the unique publication series from those smaller institutions to a broader audience and makes them better able to reciprocate by supplying papers from those series. Similarly, the online library catalogs of larger libraries, especially those affiliated with universities, have long been accessible for searching over the Internet, while locating books in the collections of smaller libraries through their catalogs is still not possible in some parts of the world. In addition, since each library tends to have its own online catalog, a researcher, student or librarian must search them individually in many instances, hoping to locate a book s/he is interested in borrowing. In the United States, many libraries participate in the OCLC system that does provide for simultaneous searching of thousands of libraries' holdings, but even so, many specialized government libraries do not enter their records into OCLC or do not have access to it for interlibrary loan.

For most of the world and for most IAMSLIC libraries, there was until recently no unified way to search the holdings of many libraries at once. Fortunately, a project called the Coastal Information Library (Ball 2001) was developed by the Coastal Services Center Library of the U.S. National Oceanic and Atmospheric Administration (NOAA) using the Z39.50 system-to-system search protocol to enable the simultaneous searching of multiple IAMSLIC library catalogs (see Figure 1). Like the Union List of Serials, this system had the potential to greatly facilitate the process of identifying lending libraries for books and other types of publications.

For both journals and books, with the exception of libraries with access to systems such as OCLC, once an IAMSLIC library had identified an owning library from which it wished to request an item, there was no efficient way to submit that request. For instance, a librarian from Chile who needed ten articles on aquaculture had to send an email message with the citations to the IAMSLIC online discussion list, where it would be read by several hundred people, several dozen of whom might choose to spend the time to check to see if they have the journals in their collection. On an annual basis, the approximately 1,000 email requests sent to the list generated some 260,000 messages in the email inboxes of member libraries. While these email requests often resulted in copies of articles being supplied quite quickly, it was extremely inefficient and had caused many of the larger marine science libraries to stop participating in lending through this channel.

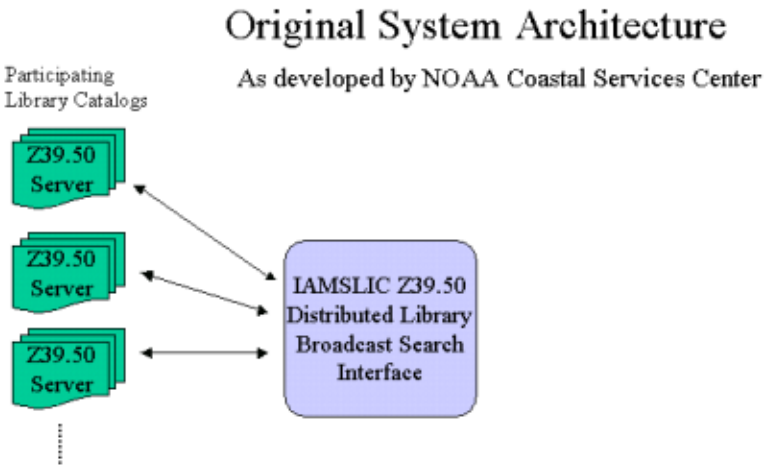

Figure 1 – Original System Architecture

DESIGNING THE IAMSLIC Z39.50 DISTRIBUTED LIBRARY

The development of the IAMSLIC Z39.50 Distributed Library was driven by the need to better integrate the several, disparate systems that were in place for locating publications owned by potential lending libraries, and to add a basic interlibrary loan module that would streamline the process of requesting materials. The initial work was carried out as a partnership between the author and the staff at the NOAA Coastal Services Center Library. The system architecture was designed to function and be managed in a distributed fashion, while appearing as an integrated whole to users. The search engine, the Union List of Marine and Aquatic Serials database, and the interlibrary loan (ILL) module operate independently, but would be able to capture and transmit database records between systems to generate ILL requests.

One of the first development challenges was to implement Z39.50 search capabilities for the Union List of Marine and Aquatic Serials database, which already had its own web-based search interface. It was not feasible to query the database directly in its native MySQL format via Z39.50 so an alternate strategy was developed. A standard query script was written in Perl that extracts all of the holdings records from the Union List database and formats the output using basic XML markup tags that correspond to MARC fields and subfield delimiters. An XML-to-MARC "crosswalk" (the MARC::XML module available from the CPAN Perl archive) is then used to convert the records from XML format into USMARC format. These MARC records are then indexed using the open-source Zebra Z39.50 server software from Index Data in Denmark and therefore become searchable via the Z39.50 broadcast search interface (see Figure 2).

A sample record tagged in the XML format appears below:

```
<record>
<field type="000">02652cas 2200229 a 4500</field>
<field type="001">ulist17</field>
<field type="003">UnionList</field>
<field type="005">20020115153755.7</field>
<field type="245" i1=" " i2=" ">
  <subfield type="a">Advances in Ecological Research</subfield>
</field>
<field type="500" i1=" " i2=" ">
  <subfield type="a">NOAA Beaufort Laboratory, Rice Library has: v. 1(1962)-
  </subfield>
</field>
</record>
```

The interlibrary loan module was developed at the CSU Monterey Bay Library using a copy of the IAMSLIC membership database as the source of contact information on each member library. A profile for each library was created that also includes information

about the library's capacity to transmit and receive documents in various formats, including the availability of Ariel® document delivery software (see Figure 3).

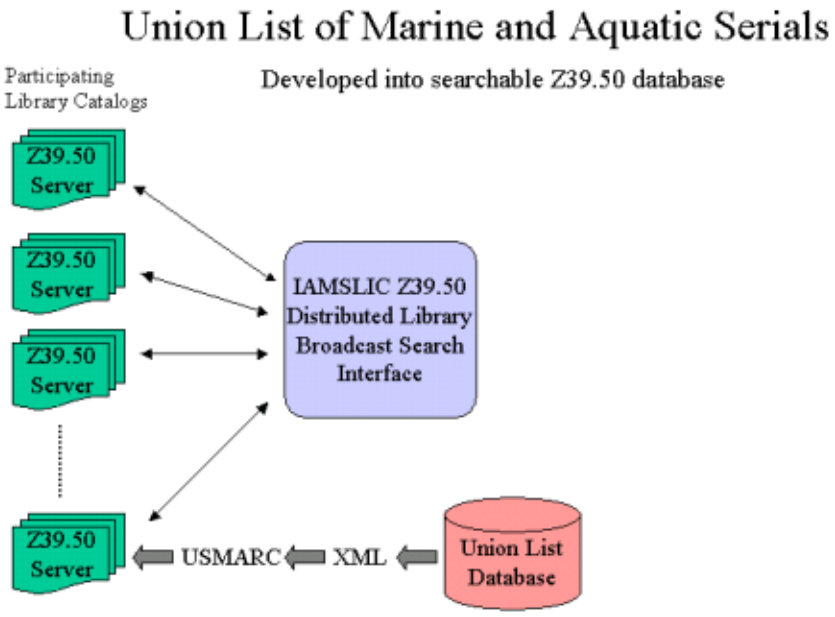

Figure 2 – Union List of Marine and Aquatic Serials

Authentication scripts were written to require an IAMSLIC user name and password to gain access to the ILL requesting module. The prototype ILL module was designed first to work with records from the Union List of Marine and Aquatic Serials database and went through a series of modifications after being tested by members of the Resource Sharing Committee and colleagues in the Cyamus Regional Group.

Next, a prototype version of the Z39.50 broadcast search system developed at the NOAA Coastal Services Center Library was modified so that individual bibliographic records could be captured from the results of a search and brought over into the ILL requesting module. This prototype was the first to carry the name IAMSLIC Z39.50 Distributed Library. During the testing phase, it was decided that a different Z39.50 broadcast search client would be required in order to enable consistent retrieval from the wide range of Z39.50 servers among the libraries. A new broadcast search interface was implemented using the PHP/YAZ open-source software package from Index Data. The PHP/YAZ interface was customized to offer added functionality, such as displaying active links to electronic full-text documents using the MARC 856 field.

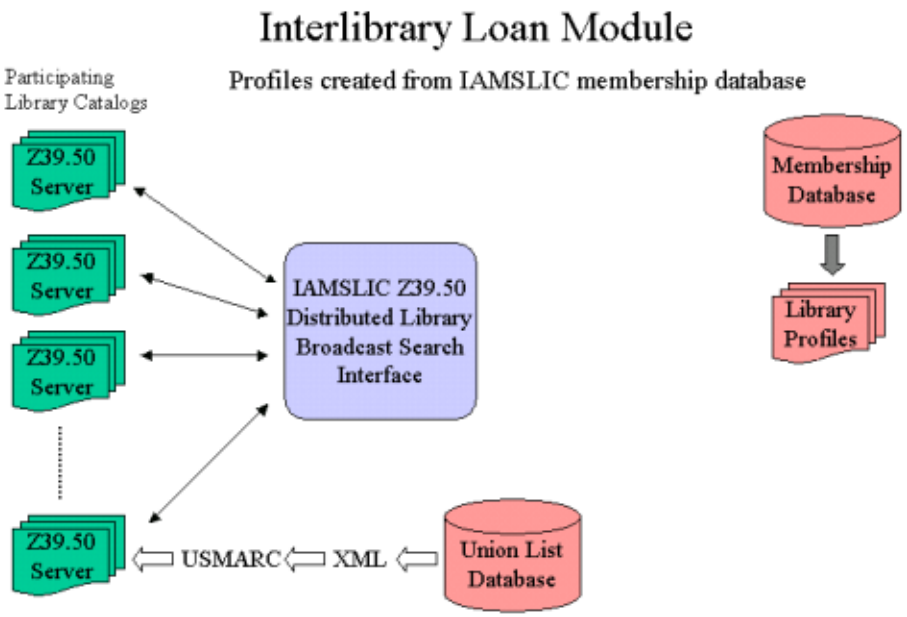

Figure 3 – Interlibrary Loan Module

All of the required elements were finally in place to implement the integrated search and request system as originally intended. Users can simultaneously search both the catalogs of dozens of IAMSLIC libraries and the periodical holdings represented in the Union List of Marine and Aquatic Serials, locate a bibliographic record for the item they are seeking, and initiate an interlibrary loan request for that item by authenticating themselves as a current IAMSLIC member (see Figure 4). The ILL module automatically retrieves and displays the necessary contact information about the library that owns the item, as well as similar information for the library submitting the request. The actual requests to borrow or obtain a copy of a publication are transmitted as email messages to both the owning library and the requesting library, after which the two parties are responsible for concluding the transaction.

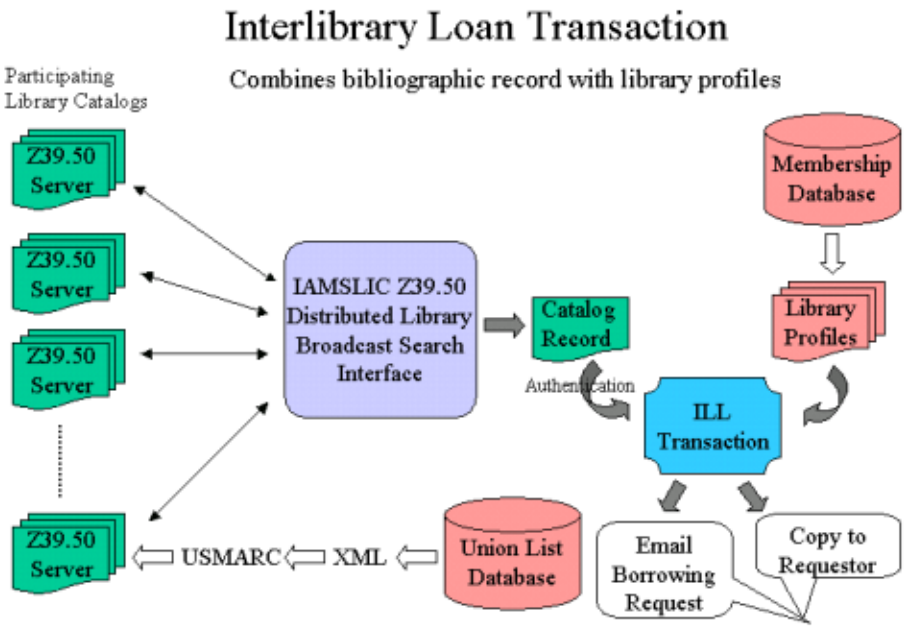

Figure 4 – Complete System Architecture and ILL Transaction Flowchart

INITIAL USAGE AND IMPACT

At the time the IAMSLIC conference was held, the Z39.50 Distributed Library had been in use in its production release for 10 weeks. There were 44 participating lending libraries as of October 2002 and 250 ILL requests had been generated, which equates to 25 per week, or approximately 1,300 requests per year. This is in keeping with the analysis done

annually by James Markham, who reported that about 1,000 ILL-related email messages were sent annually to the IAMSLIC discussion list in recent years. However, instead of propagating 260,000 email messages in the inboxes of IAMSLIC members each year, the 1,300 ILL requests generated by the Z39.50 Distributed Library will produce only 2,600 email messages and those messages will go only to the two parties involved in each transaction, not to the entire membership. Thus, the objective of streamlining the requesting process appears to have been met.

Another resource sharing goal was to distribute the lending load more evenly among IAMSLIC member libraries. ILL Requesting patterns over the first 10 weeks indicate that this goal is also being met. The initial 250 requests came from 31 different libraries and were distributed among 30 different lending libraries. The pattern of requests also demonstrates that the flow of materials is indeed helping to bring needed information resources across the digital divide. Figure 5 illustrates the geographic distribution of libraries that have requested documents to date.

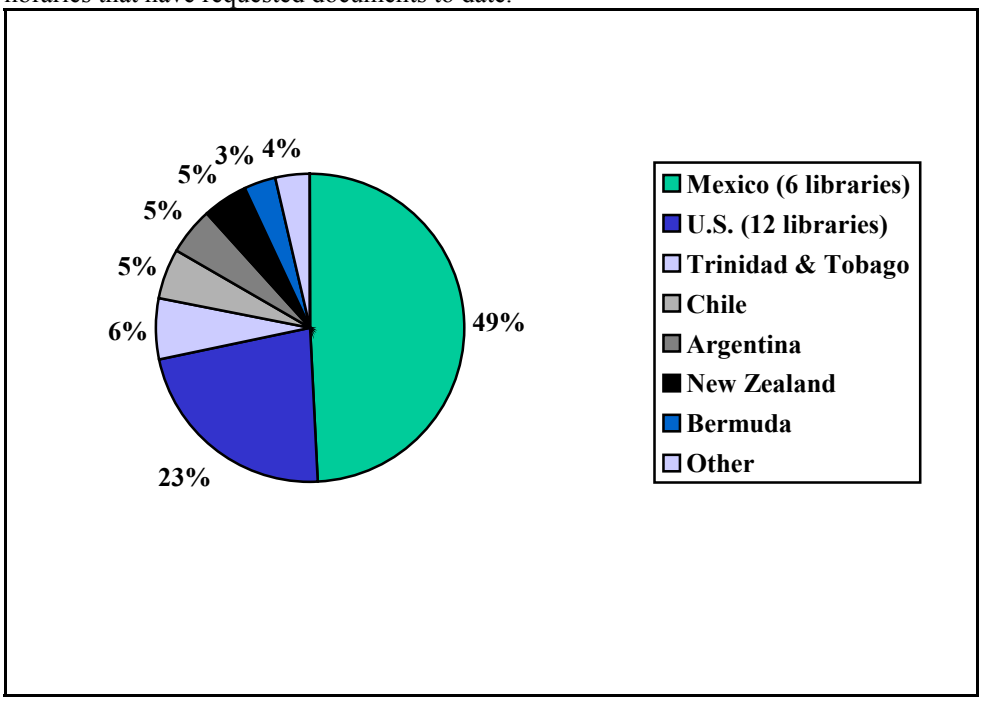

Figure 5 – Requests by Country

FUTURE ENHANCEMENTS

Based on feedback from IAMSLIC members, a number of enhancements to the IAMSLIC Z39.50 Distributed Library are being considered for future development:

- A guide to other key bibliographic resources and library catalogs that are not able to be searched via Z39.50, but serve as important locators for holdings of member libraries, systems such as WAVES for the Canadian Fisheries & Oceans libraries.
- Adding a set of links to the native OPAC interfaces at participating libraries to facilitate access to more detailed holdings and circulation status.
- Attempting to implement a second-level Z39.50 query that will retrieve and display detailed holdings where possible.
- Creating sub-categories of participating libraries by region, time zone, type, etc.
- Translating the search interface and help screens into Spanish and French.
- Exploring options for extracting, formatting and mounting catalog databases exported from CDS ISIS and other systems.

HOW TO PARTICIPATE

There are two primary avenues for member libraries to join the group of participating lending libraries in the IAMSLIC Z39.50 Distributed Library.

For libraries that have an online catalog with Z39.50 server capabilities, three items of information are needed in order for it to be searchable through the Z39.50 Distributed Library:

1. The catalog server's IP address or Internet name
   (e.g., 207.62.129.121 or voyager.csumb.edu)
2. The Z39.50 server port number for incoming queries
   (often port 210, but some vendor systems use other ports, such as 7090 for Endeavor, 2200 for SIRSI, etc.)
3. The internal database name for Z39.50 queries
   (each vendor uses a unique internal name for the library catalog database, such as Voyager, UNICORN, MARION, INNOPAC, etc. In many instances, the library may need to contact their system vendor to obtain the internal Z39.50 database name.)

Alternately, libraries are encouraged to add their periodical holdings to the Union List of Marine and Aquatic Serials database at http://library.csumb.edu/cyamus/unionlist/. They are especially encouraged to add records for unique serials that are not widely available elsewhere. Once a library has been set up in the Participants Area, it can add the library's serial holdings to existing records and can enter new serial titles not already in the Union List. As described above, records from the Union List are exported periodically and indexed for Z39.50 retrieval via the IAMSLIC Distributed Library.

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