Summary of Z39.50 Standard Implementation
WISCAT and WISCATILL

Background

The idea for a standard protocol to allow searching across different databases was first proposed in 1984 for use with bibliographic information. In 1989, the Z39.50 Maintenance Agency was formed and is administered by the Library of Congress. The standard has gone through a number of revisions and the latest approved version is Information Retrieval (Z39.50): Application Service Definition and protocol Specification, 1995, commonly referred to as version 3. The Library of Congress website contains a proposed revision issued in 2002. The URL is http://www.niso.org/standards/resources/Z39-50-200x.pdf. This standard has been adapted by both American National Standards Institute (ANSI) and the National Information Standards Organization (NISO).

Purpose of the Standard

The standard definition includes the following abstract:

"This standard specifies a client/server-based protocol for information retrieval. It specifies procedures and structures for a client to (a) search a database provided by a server, (b) retrieve database records identified by a search, (c) scan a term list, and (d) sort a result set. It also specifies access control, resource control, extended services, and a "help" facility. The protocol addresses communication between the client and server (which may reside on different computers); it does not address interaction between the client and the end-user."

In order to work correctly, both the client and server software, which may have been developed for different purposes by different vendors must have the full functionality specified by the standard.

Status of Implementation by the Division for Libraries, Technology, and Community Learning

In August, 2001, the Division signed a contract with Fretwell-Downing, Inc for an interlibrary loan management system which includes a gateway that can search multiple databases using the Z39.50 standard. Fretwell-Downing uses VDX/ZPortal software to provide the search and retrieval functionality specified in the Z39.50 standard. The Fretwell-Downing software implementation in Wisconsin is referred to as WISCATILL.

The WISCAT and WISCATILL implementation includes both client software which allows for searching multiple databases and displaying results and server software which allows the WISCAT union catalog to be searched using a Z39.50 client. In order to be

searched by the WISCATILL gateway, local libraries and public library systems must operate a Z39.50 server.
The current implementation is a hybrid that includes both a union catalog and experimentation with use of a gateway to search library and library system and library consortia catalogs.

Libraries and library systems which want to make their online catalogs available for searching via the WISCATILL Z39.50 gateway need to fill out a profile form and send the information to the Reference and Loan Library. The profile form is available at http://www.wiscat.lib.wi.us/standards.html.

The WISCAT website contains general information about Z39.50 Standard and some handouts that have been prepared by the Reference and Loan Library staff. The URL is http://www.wiscat.lib.wi.us/standards.html.

Currently, the WISCAT union catalog and the catalogs of 25 libraries, library systems and library consortia are available for searching using the WISCATILL gateway. Five public library systems are included among these catalogs (Northern Waters, Indianhead (BCLIC and MORE), OWLS/Nicolet, and Milwaukee County). In addition two public libraries (Brown County and Menomonee Falls) are included. Five other libraries or library systems have submitted profile information, but Reference and Loan Library staff has not yet succeeded in implementing search and retrieval processes. The majority of libraries listed on the gateway are academic libraries.

Since use of the gateway is still experimental and Fretwell-Downing will be implementing a new software release this winter, Division staff has not conducted full training sessions for all users. It will be necessary to install and test the new software prior to doing this.

The Z39.50 standard functionality is used by WISCATILL in several ways:

1. When a user creates an interlibrary loan request using a record found on the WISCAT union catalog or using a blank form, the request is transferred to WISCATILL. The Fretwell-Downing software automatically searches the catalogs set up on the gateway using the ISBN and LCCN number in an attempt to find a match. When a match is found in a library database, the library code is automatically added to the library codes found through WISCAT, and an interlibrary loan routing structure is set up in WISCATILL. The user creating the request does not have to search both the union catalog and the catalogs on the gateway separately to locate all available holdings for interlibrary loan purposes. The request is routed to libraries according to a predefined routing structure which takes into consideration geographic proximity, type of library, volume of lending, willingness to lend, and other factors.

2. Users who want to search one or more catalogs and view the bibliographic record result list can use the WISCATILL gateway to do this. The WISCAT union

catalog is one of the Z39.50 catalogs available for searching on the WISCATILL gateway. The WISCATILL software allows a user to conduct a simple (title only) or advanced search and displays retrieved records. Users may select a record, view the bibliographic and holdings information (sometimes including availability information), and create a request. Once a request is created using one of the bibliographic records found, the software will search the catalogs again to pick up additional holdings which are then incorporated into the interlibrary loan routing structure.

While the Z39.50 standard allows for the search, retrieval, and display of information from the databases on the gateway, it does not allow the end user to interact directly with any of the servers accessed. Therefore, although it is possible to see bibliographic and holdings information and in some cases to see if the item is currently available, it is not possible for the user to place a "hold" on the item. The interlibrary loan management software instead sends the request to libraries according to the configured interlibrary loan routing structure. The library can print a "pick slip", retrieve the item from the shelf, and respond that they are willing to lend the item (or not).

The Division staff has currently implemented VDX/ZPORTAL software version 2.2.7. Fretwell-Downing is preparing a new release (2.4) which may be available for implementation this winter. Based on our best understanding of reading vendor documentation, the new software will enhance the user's ability to work with results of Z39.50 searching and retrieval. Division staff have not yet seen or tested this software so our understanding may not be accurate or complete.

1. The user will be able to select and manage the display of the catalogs listed on the gateway. It will be easier to select among the catalogs for searching.
2. The user will be able to configure the way WISCATILL sorts results.
3. The user will be able to configure WISCATILL to allow some de-duplication of sort results.
4. The user will be able to search catalogs by media type as defined by the standard (if supported by the local vendor).
5. Software will able to check for library patron information in local library catalogs so that it can be used for authentication purposes.
6. Software will be able to check for availability information in holdings so that it can be used as part of the interlibrary loan routing.
7. Software will accommodate the parsing of volume and issue information for serials.

Issues related to implementation

Staff has identified several issues or technical problems related to implementation that require additional discussion, review, or program changes to allow for implementation.

General issues:

1. Need for the most recent information on holdings for resource sharing

The WISCAT union catalog is a static catalog and therefore can not always represent the most up-to-date holdings of libraries. At automation planning meetings, users requested that the Division explore making the catalog more up-to-date. Division staff attempted to first remedy this by adding OCLC archival tapes to the union catalog monthly. Division staff next attempted to build on the up-to-date nature of local library, system, or consortia catalogs by developing the Z39.50 gateway to allow for search, retrieval, display, and incorporation of titles and holdings into the interlibrary loan process.

Use of the Z30.50 technology has affected interlibrary loan in that using the most up-to-date information on titles and holdings owned by libraries results in requests being made for new titles which libraries may not want to loan.

2. Availability of public library catalogs

Public library systems have been slower than academic libraries to make their catalogs available for configuration on the Z39.50 gateway. In some cases, this appears to be related to concerns about the amount of additional traffic the local automated system will need to accommodate. In some cases, the Z39.50 server software has not yet been purchased or installed. In some cases, the vendor software may not yet be fully Z39.50 compliant. There is a need to explore what other reasons may be and determine if these represent barriers to further implementation.

3. Ambiguity of terms

Some of the terms used to describe and define the technology people want to have implemented are imprecise and not related to any specific standard. Examples include "linking", "virtual catalog" "digital library" and other terms. The concepts that are most important behind these terms need to be better defined to determine if vendors have this functionality and how it can be implemented. Experience with sharing materials within a catalog operated by a single vendor may not apply to solutions that require using more than one vendor system or automated systems that provide substantially different functions (such as circulation and loan of materials among a wide range of libraries that may not be a part of the circulation system). The purpose of standards is often to define how to make different systems communicate with each other.

Technical issues:

1. Vendor implementation of standards

Implementation is dependent on both Fretwell-Downing and the local library vendor fully implementing the standard. If Fretwell-Downing has implemented a portion of the

standard that the local library has not implemented, then the full search and retrieval mechanism will not work. For example, if the local library vendor does not allow for a search against the ISBN number, a record will not be found and the library code for any libraries potentially holding the items will not be automatically added to the interlibrary loan routing structure.

Division staff must first test each local Z39.50 host to determine if it is possible to connect to the local library catalog. Once an appropriate connection is made, then staff must configure the gateway to search the catalog and retrieve results. The configuration can only be successful if the local vendor offers the functionality to be configured. Local vendor implementation varies substantially, so all catalogs will not be searched using the same fields and data will not always be displayed in the same manner.

2. Incomplete standard definition

The output by the local automated system of availability information in a library holding statement is not a part of the Z39.50 record syntax. Therefore, Fretwell-Downing must develop and program a separate profile for each library. Sometimes availability information is not easy to locate in the records and extract through a program so that it can be displayed. Currently, the vendor has not been able to display availability information from the Voyager system, so this information is not displayed for any of the University of Wisconsin libraries.

3. Implementation problems with as yet unknown origins

The interaction with library catalogs that takes place as a part of the automatic searching process that places a library code in the interlibrary loan routing structure does not always happen without problems. The key problem that has occurred is that sometimes the automatic Z39.50 searching process stops the interlibrary loan management system software component that progresses interlibrary loan requests through the routing process. When this happens all requests in process are left in Idle status and the program must be restarted. Staff must periodically manipulate those catalogs in and out of the automatic searching process while various program changes are developed and tested. The vendor is still investigating what causes this problem.

4. Impact on local automated system availability and performance

The process of connecting to each catalog each time a search is conducted and results are retrieved does cause some transaction overhead against the local automated system. Each local library catalog must have a sufficient number of ports open to allow for ongoing Z39.50 access to the catalog. If all ports are busy, the process of connecting, searching, and retrieval cannot be completed. Due to local traffic on the catalog, the number of needed open ports may vary during the day.

5. Status of development of user interfaces

The user display of data for union catalogs is well understood and has been fully developed over many years. Many holdings can be attached to a single record. Sophisticated indexes can be built, and there are many ways the catalog can be searched. A great many decisions can be made prior to the use of the catalog which improves display of information. Many users are familiar and comfortable with the union catalog display.

The user interfaces available to display information after search and retrieval using a Z39.50 gateway are not so well understood and are still in the early stages of development. The Z39.50 gateway is being asked to make many of the decisions and compile data on the fly. This likely makes retrieval and display slower than in the union catalog. There are still many fewer access points for searching and retrieval of information.

6. Automated system performance

The current implementation is still in the early stages. Staff are creating configurations and determining problems and issues. The Z39.50 gateway has not undergone any full load and performance testing. It is not yet known whether or not it could handle the full load searching required to handle request creation that is now being done on the union catalog at this time. It is known that the functionality of searching the additional targets through the gateway has slowed the operation of the interlibrary loan management system operation. A great deal more work needs to be done in this area before a recommendation to move all activity to the gateway is made.

Interaction with other standards

Z39.50 is just one of a number of standards that interact to create a fully functional interlibrary loan management system and gateway for search and retrieval of multiple catalogs. Division staff would be willing to also provide information on the status of implementation of other standards if this information is desired. Other standards that define relevant functionality are:

Z39.2 Information Interchange Format (MARC)

Defines the fields and subfields that describe a bibliographic record. This standard is used to by both Auto-Graphics for production of the WISCAT union catalog and by Fretwell-Downing for the gateway.

ISO International Standard 10161-1 and 10151-2 (Information and documentation – Open Systems Interconnection – Interlibrary loan application Protocol Specification - Part 1 and Part 2.)

Fretwell-Downing uses this standard to define the functionality of the WISCATILL interlibrary loan management system. This standard also defines how different interlibrary loan management systems can exchange data making it possible to include requests that originated in multiple interlibrary loan systems into a single request database.

Z39.83 NISO Circulation Interchange Protocol (NCIP)

The following language is taken from the abstract to the standard

"This standard defines a protocol that is limited to the exchange of messages between and among computer-based applications to enable them to perform the functions necessary to lend items, to provide controlled access to electronic resources, and to facilitate co-operative management of these functions."

The standard is intended to address the need for interoperability among circulation, interlibrary loan, and related applications.