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A Library Software Model in 21st Century Network Environment

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ABSTRACT

Rapid technological changes have brought a drastic change in the resource sharing activities, especially Open Archives Initiatives (OAI) model, enabled the dissemination of research output at international, national and regional levels, thus removing the restrictions placed by the traditional scientific model. Z39.50 protocol has provided a common platform which helps to develop a Union catalogue. These new developments have made resource sharing more practical. Technological changes and development of various systems have created compatibility issues in different hardware and software platforms. In such a scenario, the best approach is to focus on how software will make it possible for the libraries to utilise networked resources for the maximum benefit of their users. This paper presents design of a library software, which is interoperable in nature and supports networking and exploitation of web resources apart from automating library operations.

Keywords: Open access, Open archives initiatives, XML, Z39.50, interoperability, metadata harvesting

1. INTRODUCTION

Managing information is a usual challenge for many organisations. The more information and people, the harder and more complex is the control of information management projects and initiatives. It is true that, effective management of knowledge is now playing a key role in wealth creation. World's most strong economies are giving no more emphasis on industrial production but rather becoming powerhouses of knowledge. Satpathi has identified several organisations all over the world engaged in creating new knowledge through research and development activities particularly in the field of science and technology, which has resulted in "information explosion".[1] The exponential growth of literature and ever increasing cost of published materials have put great financial constraint that has resulted in shrinking collections in the library and information centres. On one side user demands are increasing and librarians are at their wits end to satisfy the needs of users. According to Salgar and Murthy[2] the only viable solution to meet users' demands is to make optimum use of available literature. This is being done through pooling and sharing of resources. Sharing of resources is also not an easy task; the technological changes and development of new systems create compatibility issues in different hardware and software platforms.

Interoperability is a property referring to the ability of diverse systems and organisations to work together. Interoperability includes the exchange of data, records, and messages between computer systems across different hardware, operating systems, and networks. Interoperability is sought to be achieved by establishing standards that different vendors of software and hardware can adopt so that they can share data and information. In case of software the term interoperability is used to describe the capability of different programs to exchange data via a common set of exchange formats, to read and write the same file formats, and to use the same protocols.[3]

The lack of interoperability can be a consequence of a lack of attention to standardisation during the design of a program. During the last couple of decades, communications world has witnessed several new developments, two of which are the Open Access (OA) and Open Archives Initiatives (OAI) whose main objectives are to improve transfer and exchange of research publications. OA is described as a free availability of information on the Internet permitting users to read, download, copy, distribute, print full texts of scholarly and scientific articles, crawl them for indexing, pass them as data to software, or use them for any other lawful purpose, without any financial, legal, or technical barriers other

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than those inseparable from gaining access to the Internet itself. The OA model allows for the widest dissemination of research output, and maximum visibility, while, at the same time, reducing barriers common to traditional diffusion methods of scientific literature. It provides the means for researchers to avail themselves of full text content, using two paths: open access publishing journals, which make articles openly accessible immediately upon publications, and OA archiving which allows authors to deposit a digital document in a publicly accessible website, preferably an OAI complaint open archive. The OAI develops and promotes interoperability solutions that aim to facilitate the efficient dissemination of content. The initiative is built on the principle that interoperability will federate the distributed open archives, thus encouraging the development of value-added services such as portals, subject gateways, and specialised search engines, with the overall benefit of increasing the visibility of the OA.[4] The ultimate objective is to overcome existing barriers to interoperability by using OA for all digital materials.

2. WHAT IS OAI-PMH?

The Open Archives Initiatives–for Metadata Harvesting (OAI-PMH) is one of the mechanisms used to achieve the interoperability between digital repositories. It provides a system to facilitate the harvesting, sharing and discovery of distributed resources. This allows materials within repositories to be accessed by a greater number of users via external services. In addition, data harvested via OAI-PMH is now being used for a range of other repository applications such as reporting, enhanced user interfaces for direct searching of local repositories, and assisting with ingest of data into other systems. OAI was formed originally with a focus on disseminating content from research archives, however, with increasing number and types of repositories, it is now being used for other types of digital material collections.[5] Its main founders are the Digital Library Federation, the Coalition for Network Information, and the National Science Foundation. The OAI-PMH is based on the Hypertext Transport Protocol (HTTP) and Extensible Markup Language (XML) open standards.

3. WHY HTML AND XML?

HTML is mainly for displaying text in a desired format and XML is designed for data exchange. There are certain limitations for both the cases like sometimes, XML will not be up to a certain task, just like HTML is not up to the task of displaying certain information. But when it comes to display, HTML is good most of the time as is XML, and those who work with XML believe to communicate information.[6] The basic difference between HTML and XML is: HTML is designed for a specific application to convey information to humans through a web browser. XML has no specific application; it is designed for whatever use that need it for.

An XML document can be created and retrieve information from the document by any XML parser. HTML and XML are so popular, for information display and exchange, because they are standards. Anyone can follow these standards, and the solutions they develop will be able to interoperate. XML is platform and language independent, which means it does not matter is one computer is using for example, Visual Basic on a Microsoft operating system, and the other Unix with Java code. When it is necessary to communicate between the different systems, XML is a potential fit for the exchange format. Apart from these XML standards have the following advantages:

3.1 Advantages of XML

- It supports Unicode, allowing almost any information in any written human language to be communicated.
- It can represent common computer science data structure such as records, lists and trees.
- Its self documenting format describes structure and field names as well as specific values.
- The strict syntax and parsing requirements make the necessary parsing algorithms extremely simple, efficient, and consistent.
- It is heavily used as a format for document storage and processing, both online and offline.
- It can be updated incrementally.
- It allows validation using schema languages such as XSD and schematron, which makes effective unit-testing, firewalls, acceptance testing, contractual specification and software construction easier.
- Its hierarchical structure is suitable for most types of documents.
- It is platform-independent, thus relatively immune to changes in technology.
- Its forward and backward compatibility are relatively easy to maintain despite changes in DTD to Schema.
- Its processor, SGML, has been in use since 1986, so there is extensive experience and software available.

4. WHAT IS Z39.50?

Z39.50 is the American National Standard Information Retrieval Application Service Definition and Protocol Specification for open Systems Interconnection. The National Information Standards Organization (NISO), an American National Standards Institute (ANSI) accredited standards developer that serves the library, information,

and publishing communities, approved the original standard in 1988 (Version 1).

NISO published a revised version of the standard in 1992 (Version 2). Z39.50 defines a standard way for two computers to communicate for the purpose of information retrieval, and makes it easier to use large information databases by standardising the procedures and features for searching and retrieving information. Specifically, Z39.50 supports information retrieval in a distributed, client and server environment where a computer operating as a client submits a search request to another computer acting as an information server. Software on the server performs a search on one or more databases and creates a result set of records that meet the criteria of the search request. The server returns records from the result set to the client for processing. The power of Z39.50 is that it separates the user interface on the client side from the information servers, search engines, and databases. Z39.50 provides a consistent view of information from a wide variety of sources, and offers client implementers the capability to integrate information from a range of databases and servers. Z39.50 can be implemented on any platform. This means that it enables different computer systems with different operating systems, hardware, search engines, database management systems. A Z39.50 implementation enables one interface to access multiple systems providing end users with nearly transparent access to other systems.[7] Users access multiple systems with the familiar commands and displays of their own local systems. New commands and search techniques do not have to be learned. The results of the search are presented on the local system again, in the formats and styles users are accustomed to. One of the strengths of ANSI/NISO Z39.50 is that it is an American National Standard. NISO developed and maintains Z39.50 using consensus procedures approved by ANSI, the principal coordinator of voluntary standardisation in the United States. Z39.50 is not a proprietary standard and will continue to be responsive to the needs of the implementers that use the standard and the information consumers that benefit from its implementation.

4.1 How to Search and Retrieve Information through Z39.50?

The basic technology of the search and retrieval of information based on Z39.50 standard is:

- A query is typed into the distributed search screen (coming from the Z39.50 server) using a web browser.
- The browser passes the query to the Z39.50 server.
- The Z39.50 server distributes the request to member library servers, with Z39.50 client installed.
- The Z39.50 clients responds with a result passed back to the initiating Z39.50 server.
- The Z39.50 server delivers pooled results to the initiating browser client.

5. PROPOSED DESIGN OF A LIBRARY SOFTWARE

Providing access to a variety of information resources residing on different computer systems with different platforms in several parts of the world to a number of users

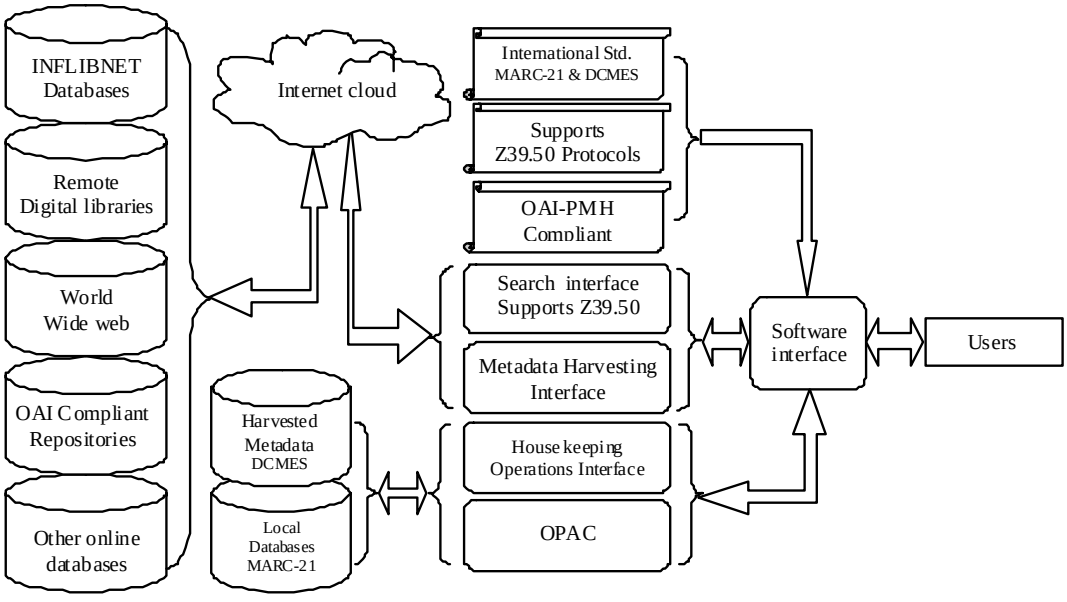

Figure 1. Conceptual design of a library software.

of differing natures and needs is a major challenge for software designers. Library software, should work on different platforms, enable to harvest metadata and store locally, make it possible to search multiple disparate library catalogues and other resources in one search, and bring back one set of results. This involves a number of complex issues related to integration and seamlessness.

Figure 1 shows the basic design of library software. As the Fig. shows, users of a library may have access to a range of information resources with different modes of getting access to these. Alternatively, users may choose one or more resources or collections and then formulate just one query, which is passed on to the various resources or collections by the software interface. The results are brought back after the search is carried out. The user does not need to search the resources one by one, therefore this is a better approach from the user's perspective because he or she formulates only one search query and gets results from all the different sources. However, technologically this approach is more challenging and a number of technical issues need to be considered in order to build this model.

5.1 Suggestions

The software requirement at various levels like union catalogue compilation and database maintenance and for individual library automation at local such as circulation and serial control operations, are clearly mentioned. For application in information retrieval, federated searching and metadata harvesting the software should incorporate the following special features:

- The software package should be an integrated one, to support library automation and database construction and information retrieval.
- It should support international data standards such as MARC-21 and DCMES.
- It should work in multi-user and network environment.
- It should support copy cataloguing authoritative MARC-21 cataloguing sources via the web.
- It should provide high-level language interface to the database for the user to write any special routines to manipulate the database.
- It should facilitate federated searching to different databases using an interoperability standard such as Z39.50.
- The software should allow the building of an OAI-PMH compliant institutional repository of self-archived materials.
- It should allow harvesting metadata from other OAI-PMH compliant repository.

5.2 Interoperability Scheme

One of the major problems faced while developing a library software, is the issue of interoperability. How to get a wide variety of computing systems to work together and/or to talk to one another for accessing and retrieval of information? Interoperability and standardisation are the most important considerations for library software designers.[8] Interoperability of library software can be achieved by a number of means, such as through adopting:

- Common user interfaces.
- Uniform naming and identification systems.
- Standard formats for information resources.
- Standard metadata formats.
- Standard network protocols.
- Standard information retrieval protocols.
- Standard measures for authentication and security, and so on.

6. CONCLUSION

The technological changes and development of numerous library networks using contrasting hardware and software platforms require library software interoperability. The technology also made wandering treasured and heterogeneous knowledge in the field of science, arts, and commerce in the Internet cloud. The basic thing requires use of an interoperable library software which can exploit web resources which are able to search multiple disparate databases in different network and platforms apart from the local repositories and databases. If we develop a software in the line of the above it will promote software interoperability and compatibility. It will also have the capability to integrate all the libraries of the world to a single global library.

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Dr R.K. Joteen Singh is working as Information Scientist in Manipur University. He has 10 years of experience in library profession. He has also been teaching IT papers of MLISc since 2003 and involved in various automation-related library management functions. His research interests include database applications and networking.