METADATA INFRASTRUCTURE FOR SOUND RECORDINGS

Catherine Lai, Ichiro Fujinaga
Music Technology
McGill University
{lai, ich}@music.mcgill.ca

David Descheneau, Michael Frishkopf
Department of Music
University of Alberta
{dpd, michaelf}@ualberta.ca

Jenn Riley
Digital Library Program
Indiana University
jenlrile@indiana.edu

Joseph Hafner, Brian McMillan
McGill University Libraries
McGill University
{joseph.hafner, brian.mcmillan}@mcgill.ca

ABSTRACT

This paper describes the first iteration of a working model for searching heterogeneous distributed metadata repositories for sound recording collections, focusing on techniques used for real-time querying and harmonizing diverse metadata models. The initial model for a metadata infrastructure presented here is the first of its kind for sound recordings.

1. INTRODUCTION

Librarians and information technologists have been collaborating to formulate strategies for building digitized collections. The development of digital collections and technology applications has revolutionized libraries, offering them new opportunities to disseminate organized information, i.e., metadata, about their collections and special library holdings, such as sound recordings. As an expanding number of digital sound recording collections emerge, the task of searching at individual repository sites becomes impractical for end-users. For example, users have to learn multiple interfaces located at different sites where each interface is designed with different features, functionalities, and interaction metaphors. Users must also manually combine search results and move data between applications. The metadata infrastructure for sound recordings provides a common framework that allows different metadata systems of sound recordings to be shared and reused, thus facilitating the interoperability among heterogeneous repositories of digital sound recordings.

2. RELATED WORK

New kinds of metadata infrastructures have been discussed in the literature. Tennant proposed a new bibliographic metadata infrastructure, which is interoperable between different library-based metadata standards and protocols [4]. Godby et al. have introduced new paradigms of metadata translation service for the purpose of increasing accessibility with improvements in searching [1]. In music, the Sheet Music Consortium has built a Web portal (at UCLA) where seven collections of sheet music, in distributed locations, can be accessed [3]. Other metadata aggregation experiments using OAI-PMH for digital libraries such as the NSDL have also been reported [2].

3. SYSTEM FUNCTION

The core function of the metadata infrastructure for sound recordings, the distributed metadata service (DMS), supports the following processes. First, queries are submitted from a search portal to the DMS where the queries are distributed synchronously to partner repository interfaces. Result sets from the repositories are then obtained and translated into RDF (Resource Description Framework) statements, which preserve source metadata elements and relationships. Finally, the RDF statement sets from partner repositories are aggregated and returned to the search portal for display.

4. IMPLEMENTATION

4.1. Partner Metadata Repository

Three universities hosting heterogeneous digital repositories of sound recordings participate in the prototype of cross-repository interoperability: FolkwaysAlive! at the University of Alberta (a collection of world music, including commercial and field recordings), Variations2 at Indiana University (a collection of selected recordings and scores for instructional use at the IU Jacobs School of Music), and the digital archive of Handel LPs at McGill University. The metadata source repositories are located at partner institutions, with the exception of the IU Variations2 metadata repository (MR), which was not available as a public Web service at the time of the prototype's design. To make the data available for searching in aggregations, the Variations2 MR was duplicated at the UA site where a data store and remote connection to it were created in order to proceed with the prototype.

The partner repositories implement a variety of connection methods and search APIs. For FolkwaysAlive! repository, a connection to an RDF server is made. In the Handel repository, an HTTP connection with the custom XML query API is made. And in Variations2, a MySQL database query connection is made. The participating repositories, moreover, implement a wide variety of metadata schemas. The deployed metadata schemas come in various syntaxes with different metadata structure, reflecting a diversity of approaches to managing digital libraries of sound recordings.

4.2. Internal Services

The DMS internal services perform real-time querying of existing MR services, in the context of the federation. First, all requests are directed to a URL rewriter, which intercepts and passes the requests to the Request Handler. The Request Handler inspects the query requests and forwards them to the Request Aggregator. The Request Aggregator then synchronously passes the query string to all partner repository interfaces, specified in a crosswalk configuration file. The crosswalk configuration is read at runtime with each search request. The RDF Translator then transforms metadata result sets from the repository interfaces (in custom XML) into RDF statements and converts metadata statement predicates in the RDF to their common (i.e., Dublin Core) equivalents, according to the custom metadata-to-DC equivalences specified in the configuration file, which maps one common element to many repository-specific elements. Finally, the repository-specific and common metadata is combined for all repositories and returned as search results to the Request Handler.

4.3. User Interface

A search portal UI has been designed and provides a simple search box for entering the words or phrase. The set of metadata returned is the DC equivalent of the various types of metadata deployed at the different digital repositories. The results page shows brief records of the DC metadata and provides hyperlinks to the full metadata records residing at the host digital repositories.

5. CHALLENGES

The absence of uniformity in the repository APIs and metadata implementation raised issues in areas of search and retrieval, system performance, and presentation.

First, inconsistent implementation of search and asset retrieval APIs at the partner repositories complicates consolidation of metadata. Different treatments of Boolean operators, wildcard operators, and query matching algorithm between the APIs affect the results of federated search operations.

Second, custom configuration of performance metrics at the individual repositories, which is often implemented and optimized for local use, influences the overall performance of the Web portal. As an example, the McGill Handel asset retrieval API provides one metadata record at a time. In order to retrieve the full metadata necessary for translation to DC and subsequent transformation for correct display in the search portal, a separate HTTP request must be made for each desired asset. This requirement becomes a major contributor to network overhead and is inherently inefficient and problematic for the implementation of the metadata infrastructure.

Third, different understanding of the common metadata elements when writing the configuration files can favor or exclude repositories. Since the implementation of the metadata crosswalk is optional per-element, unless a visible trace of the query is provided, recall of result sets may suffer in not knowing whether a repository is empty or a metadata mapping was excluded for a particular query string.

Fourth, related to the various interpretations for common metadata elements, mapping of custom metadata to different common elements is possible (e.g., mapping of performer or lyricist to Dublin Core's creator or contributor). This ambiguity degrades the quality of presentation. Consistent and precise mappings of metadata elements from local to common schemas can enhance the presentation of records by logical sorting of metadata result sets, such as grouping by creator.

6. FUTURE ENHANCEMENT

For future iterations, enhancements will be made to provide better functionality and improved performance. These include development of a Web-based portal for partners to modify their own subsections of the central crosswalk configuration file; enforcement of consistent and precise mappings from local to common schemas; incorporation of parallel/asynchronous access to partner MRs; presentation of logical groupings of metadata result sets; providing visible trace of the query; and investigation of other search protocols and Web service tools such as Search/Retrieval via URL (SRU) and Common Query Language (CQL) for federated searching and returning metadata.

7. ACKNOWLEDGEMENT

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8. REFERENCES

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