



## International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 4 Number 3 (March-2016) pp. 238-246

Journal home page: <http://www.ijcrar.com>

doi: <http://dx.doi.org/10.20546/ijcrar.2016.403.026>



### RDF Standards for e-Library Services: A Study of Metadata Standards and Protocols

S. Machendranath<sup>1\*</sup> and Umesha Naik<sup>2</sup>

<sup>1</sup>University Librarian I/c. University of Agricultural Sciences, Raichur, Karnataka, India

<sup>2</sup>Department of Library and Information Science, Mangalore University, Mangalagangothri, Mangalore - 574 199, Karnataka, India

*\*Corresponding author*

#### KEYWORDS

Metadata,  
e-resources,  
e-Tools, e-Services,  
Standards, Web  
Services, WSDL

#### A B S T R A C T

Metadata is data about data. Metadata standards, protocols and tools are now a part of information processing and dissemination tools. The structured information used to aid identification, description, management and location of resources and also may include physical resources. The Resource Description Framework (RDF) is an infrastructure that enables the encoding, exchange and reuse of structured metadata and focusing on simple resource description for discovery. In this article author highlights the importance of metadata, its standards, protocols, tools available on the internet. These tools and standards are varying from discipline to discipline. This article also focus and different subjects and areas of specific functions and its use for the web developers and managers.

#### Introduction

The RDF developed under the auspices of the W3C is an infrastructure that enables the encoding, exchange and reuse of structured metadata. RDF defines a resource as any object that is uniquely identifiable by an URL and it provides a model for describing resources. According to NISO metadata as structured information that describes, explains, locates or otherwise makes it easier to retrieve, use or manage an information resource. Metadata is often called data about data or information about information (NISO, 2004).

The Universal Description Discovery and Integration (UDDI) specifications is a tools for registry service and it support for Web services and for other electronic and non-electronic services. This paper focus the advantage of W3C and Internet Engineering Task Force (IETF) standards such as Extensible Markup Language (XML), HTTP and Domain Name System (DNS) protocols. Additionally, cross platform programming features are addressed by adopting early versions of the proposed Simple Object Access Protocol (SOAP) known as XML

Protocol messaging specifications found at the W3C Web site. The UDDI protocol is the building block that will enable businesses to quickly, easily and dynamically find and transact with one another using their preferred applications. (Robin, 2008).

### The Web Services Description Language (WSDL)

WSDL is XML based interface definition language that is used for describing the functionality offered by a web service. It is a format for describing a Web Services interface. It is a way to describe services and how they should be bound to specific network addresses. It has three parts: a. Definitions; b. Operations and c. Service bindings.

The WSDL describes services as collections of network endpoints or ports. The WSDL specification provides an XML format for documents for this purpose. WSDL is often used in combination with SOAP and an XML Schema to provide Web services over the Internet. The figure 1. shows that the WSDL documents structured in this way are easier to use and maintain, although the base WSDL structure supports bindings for the transmission primitives, WSDL only defines bindings for the One-way and Request-response primitives.

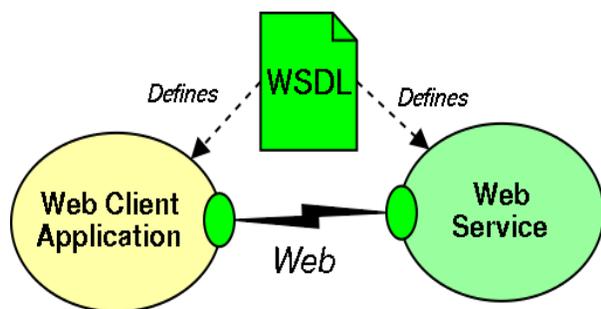


Figure.1 Web Service Description Language

### MARC 21 Evolutions to XML

In moving from dispersed digital collections to interoperable digital libraries, the most important activity we need to focus on is standards, most important is the wide variety of metadata standards including all the types of metadata like descriptive metadata, administrative metadata, structural metadata and terms and conditions metadata. The Library of Congress Network Development and MARC Standards Office is developing a framework for working with MARC data in a XML environment. This framework is intended to be flexible and extensible to allow users to work with MARC data in ways specific to their needs. The framework itself includes many components such as schemas, style sheets, and software tools.

The Figure 2 shows that the metadata standards for data structures, information about standards for data contents and data values can be found.

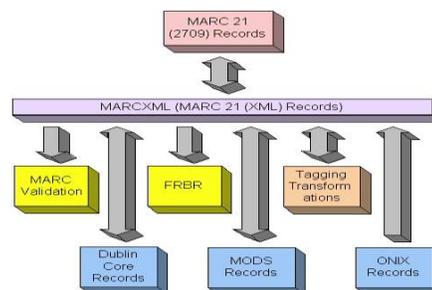


Figure: 2 MARC 21 evolutions to XML

The term metadata is used differently in different communities. Many different metadata schemes are being developed as standards across different disciplines, such as library science, education, archiving, e-commerce, and arts etc. The figure-3. Indicates an overview of available metadata standards is given (Wikipedia, 2016).

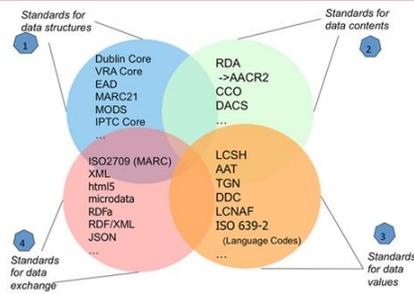


Figure: 3 Metadata Scheme

The machine understandable information for the web is Metadata can be used to describe physical items as well as digital items.

### Metadata Publishing

The metadata publishing is the process of making metadata data elements available to external users, both people and machines using a formal review process and a commitment to change control processes. This process is the foundation upon which advanced distributed computing functions are being built. The building foundations, care must be taken in metadata publishing systems to ensure the structural integrity of the systems built on top of them. The main characteristics of published metadata are;

- Metadata structures available to the general public on a public web site or by a download
- There is a documented review and approval process for adding or updating data elements to the system
- New releases are made available without disturbing prior versions
- A publishing organization that makes a commitment to change control process

Efforts were made to use available original articles/abstracts for the review of literature. Many numbers of studies has been conducted on the RDF related metadata standards and protocols, its popularity, standards and overall functions are included.

The RDF and new technologies recognizes some emerging issues on metadata as a mechanism of resource discovery and its impact on precision of search results in a distributed network environment.

Pal (2010) examines various metadata-harvesting tools and related technologies that fulfill the task implicit in a user's search. The study brings out some popular standards, useful protocols and open-source harvesters along with their intrinsic capabilities for harvesting and presenting metadata. It also emphasizes on a variety of metadata services viz., OCLC's metalogue service, UKOLN metadata editor service, OAIster harvester service, DP9 gateway service, etc. that are predominantly used in different metadata communities.

Some of the past research in India and other country have often focused on:

- Metadata Standards and Applications (Hillmann, Marker, & Brady, 2008).
- Understanding Metadata and its Purpose (Coyle, 2004).
- Metadata and the Web (Gill, 2016)
- A Standards Framework For Digital Library Programmes (Kelly, Russell & Johnston, 2005).
- Metadata Matters: Connecting People and Information (Woodley, 2016).
- A RDF-based approach to metadata crosswalk for semantic interoperability at the data element level (Chen, 2015).
- Linked Data for Libraries: Benefits of Conceptual Shift from Library-Specific Record Structures to RDF based Data Models (Alemu, Stevens, Ross, & Chandler, 2012).
- An Introduction to RDF for Librarians (of a Metadata Bent) (Ruthillman. 2016).
- Metadata Standards and Web Services in Libraries, Archives, and Museums: A active learning resource (Mitchell, 2015).

- Building a disciplinary metadata standards directory (Ball et al, 2013).

### Objectives

The primary objective of these efforts was to initiate the standardization of the data content and structure of metadata projects are as follows;

- To understand the standards for Metadata value and data content standards
- To find out the metadata standards developed by specific communities
- To evaluate the efficacy of the standard for a specific community, their strengths and weaknesses
- To find out the different terminology and objectives of metadata management
- To identify the different metadata standards for each different discipline

### Materials and Methods

Adopted an online (Internet) surveys research tool for collecting the data

including the different metadata standards and its availability status, subject coverage and detailed information about standards and its emblem. Based on the URL the investigator finds the detailed information about the metadata standards.

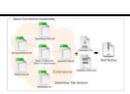
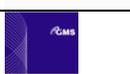
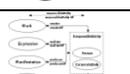
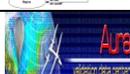
### Results and Discussion

#### Presentation and Discussion of Findings

Metadata is rapidly becoming one of the most used words in the vocabulary of digital content dissemination. Using these tool one can display the metadata development objects of the projects. The comparison represents a technical and generic view of the metadata on which the logical application entities are based. The analysis also differentiates explicitly between objects that are subject in their own field and those are part of different areas. The main aim shows the different types of metadata objects. For the data analysis, one can open these sites and tools detailed are available on their websites.

**Table.1** List of Metadata Standards, Protocols and Tools

Name	Support	Focus	Description
<b>AGRIMetaMaker</b>		<b>Agriculture</b>	<b>The AGRIMetaMaker is a web form developed using the Drupal CMS</b>
<b>ALTO</b>		<b>Librarianship</b>	<b>The Analyzed Layout and Text Object (ALTO)</b>
<b>Atom</b>		<b>Web Syndication</b>	<b>The metadata atom is the container for carrying metadata.</b>
<b>audioMD and videoMD</b>		<b>Librarianship</b>	<b>About audioMD and videoMD</b>
<b>BIBFRAME</b>		<b>Librarianship</b>	<b>Bibliographic Framework</b>
<b>BIBO</b>		<b>Semantic Web</b>	<b>Bibliographic Ontology Specification</b>
<b>CDWA</b>		<b>Arts</b>	<b>Categories for the Description of Works of Art</b>

Name	Support	Focus	Description
CSDGM		Geographic Data	Content Standard for Digital Geospatial Metadata
CWM		Data warehousing	The Common Warehouse Met model
Darwin Core		Biology	The Darwin Core is a metadata specification for information about the geographic occurrence
Darwin Core		Biodiversity Information Standards - TDWG	Darwin Core is an extension of Dublin Core for biodiversity informatics.
DDI		Archiving and Social Science	The Data Documentation Initiative (DDI)
DIF		Scientific data sets	Directory Interchange Format
DOI		Networked resources	Digital Object Identifier
Dublin Core		Networked resources	Dublin Core
EAD		Archiving	Encoded Archival Description
EBU CCDM		Ontology defining	The EBU Class Conceptual Data Model (CCDM)
EBUCore		Audiovisual content	EBUCore is a set of descriptive and technical metadata.
e-GMS		Government	The e-Government Metadata Standard (E-GMS)
EML		Ecology	EML - Ecological Metadata Language
FOAF		Ontology	The Friend of a Friend (FOAF)
FRBR		Librarianship	Functional Requirements for Bibliographic Records
GEOMS		Archiving	Generic Earth Observation Metadata Standard
Geospatial Metadata		Geographic	Geospatial metadata / Geographic metadata/ metadata when used in a geographic context metadata
GILS		Government/ Organizations	The Global Information Locator Service
IEEE LOM		Education	Learning Objects Metadata - specifies the syntax and semantics of Learning Object Metadata.
ISO 23081		Records management	ISO 23081 - addresses principles, addresses conceptual and implementation issues

Name	Support	Focus	Description
ISO/IEC 11179	 Information technology – Metadata registries (MDR) Formulation of data definitions	Organizations	ISO/IEC 11179 Standard
ISO/IEC 19506	 Information technology – Object Management Group Architecture-Driven Interim (ODI) – Knowledge Discovery Metadata (KDM)	Software Systems	ISO/IEC 19506 Standard
MADS		Librarianship	Metadata Authority Description Schema (MADS)
MARC		Librarianship	MARC - MACHine Readable Cataloging
MARXML		Librarianship	A framework for working with MARC data in a XML environment.
MDA		Software Systems	The MDA - OMG's Model Driven Architecture
MDDL		Financial market	The (Financial) Market Data Definition Language (MDDL)
MEI		Music notation	Music Encoding Initiative
METS		Librarianship	Metadata Encoding and Transmission Standard
MODS		Librarianship	Metadata Object Description Schema
MoReq2010		Records management	MoReq2010 - A specification describing the MODEL REquirements for the management of electronic records.
MPEG-7		Multimedia	The Multimedia Content Description Interface MPEG-7.
NIEM	 NATIONAL INFORMATION EXCHANGE MODEL	Law enforcement; Social services; Enterprise resource planning	NIEM -the National Information Exchange Model
NISO MIX		Librarianship	Z39.87 Data dictionary - technical metadata for digital still images (MIX)
OAI-ORE		Compound Digital Objects	The Open Archives Initiative Object Reuse and Exchange (OAI-ORE)
OAI-PMH		Archiving	The Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH)
ONIX		Book industry	Online Information Exchange
PBCore		Media	PBCore is a Metadata & Cataloging Resource for Public Broadcasters and Associated Communities
POWDER		Describing web resources	Protocol for Web Description Resources
PREMIS		Librarianship	PREservation Metadata: Implementation Strategies (PREMIS)

Name	Support	Focus	Description
PRISM		Multi-channel publishing	Publishing Requirements for Industry Standard Metadata
RDA		Librarianship	Resource Description and Access
RDF		Web resources	Resource Description Framework
SAML		Shibboleth Internet2/MACE	Security Assertion Markup Language
SKOS		Knowledge Organization System	Simple Knowledge Organization System
SMPTE		Engineering	The Society of Motion Picture and Television Engineers (SMPTE)
SOAP		Web Services in computer networks	Simple Object Access Protocol (SOAP)
SPARQL		Semantic query language	SPARQL Protocol and RDF Query Language
TEI		Humanities, social sciences and linguistics	Text Encoding Initiative
textMD		Librarianship	Technical Metadata for Text (textMD)
VRA Core		Arts	Visual Resources Association
XMPP		Message-oriented middleware	Extensible Messaging and Presence Protocol (XMPP)
XOBIS		Librarianship	XML Organic Bibliographic Information Schema

The Table 1 shows that there are number of metadata standards and protocols are available for the web developers, but only few popular tools are highlighted in this article. This table shows only the list of standards and protocols, but some are very useful to the LIS professionals.

### Conclusion

The newer forms of e-library technology however, are expanding or enhancing the way that data is stored with and about digital objects using the RDF to construct relationships, descriptions and digital objects that are more semantically connected to the web. Metadata standards

supports for many of the e-library collections. These standards have been expressed for the most part, using XML and it is easy to store, read, update and easy to share. This way of standardizing metadata has presented many challenges: introducing a new model midway through projects, migrating content from older models to RDF models and figuring out in general that what it means to use an RDF model for e-library collections.

### References

Alemu, G., Stevens, B., Ross, P., & Chandler, J. (2012). *Linked Data for*

- Libraries: Benefits of a Conceptual Shift from Library-Specific Record Structures to RDF-based Data Models* Paper presented at the New futures for bibliographic data formats: reflections and directions.
- Ball, A., Chen, S., Greenberg, J., Perez, C., Jeffery, K., & Koskela, R. (2013). Building a disciplinary metadata standards directory. Retrieved 9-11-2016, from <https://www.rd-alliance.org/sites/default/files/ball-et-al-MSD-idcc14.pdf>
- Chen, Y.-N. (2015). A RDF-based approach to metadata crosswalk for semantic interoperability at the data element level. *Library Hi Tech*, 33(2), 175 - 194.
- Coyle, K. (2004). Understanding Metadata and its Purpose. *Journal of Academic Librarianship*, 31(2), 160-163.
- DCC. (2016). List of Metadata Tools. Retrieved 1-11-2016, from <http://www.dcc.ac.uk/resources/metadata-standards/tools>
- DublinCore. (2016). Dublin Core Metadata Initiative (DCMI). Retrieved 14-10-2016, from <http://dublincore.org/about-us/>
- GFBIO. (2016). Data exchange standards, protocols and formats relevant for the collection data domain within the GFBio network. Retrieved 10-10-2016, from [https://gfbio.biowikifarm.net/wiki/Data\\_exchange\\_standards,\\_protocols\\_and\\_formats\\_relevant\\_for\\_the\\_collection\\_data\\_domain\\_within\\_the\\_GFBio\\_network](https://gfbio.biowikifarm.net/wiki/Data_exchange_standards,_protocols_and_formats_relevant_for_the_collection_data_domain_within_the_GFBio_network)
- Gill, T. (2016). Metadata and the Web. Retrieved 10-11-2016, from <https://www.getty.edu/publications/intrometadata/metadata-and-the-web/>
- Hardesty, J. L. (2015). Metadata's Next Top Model: RDF and Its Impact on Digital Library Technology. Retrieved 12-10-2016, from <https://libraries.indiana.edu/metadata%E2%80%99s-next-top-model-rdf-and-its-impact-digital-library-technology>
- Hillmann, D. I., Marker, R., & Brady, C. (2008). Metadata Standards and Applications. *The Serials Librarian*, 54(1-2), 7-21.
- IPTC. (2016). IPTC Photo Metadata Standard. Retrieved 12-10-2016, from <http://iptc.org/standards/photo-metadata/iptc-standard/>
- Kelly, B., Russell, R., & Johnston, P. (2005). A Standards Framework For Digital Library Programmes. Retrieved 12-11-2016, from [http://opus.bath.ac.uk/444/3/KellyIC\\_HIM05S02.doc](http://opus.bath.ac.uk/444/3/KellyIC_HIM05S02.doc)
- LOC. (2007). Tools for preservation metadata implementation. Retrieved 11-10-2016, from [https://www.loc.gov/standards/premises/tools\\_for\\_premis.php](https://www.loc.gov/standards/premises/tools_for_premis.php)
- LOC. (2012). Metadata for Digital Content Retrieved 2-11-2016, from <http://www.loc.gov/standards/mdc/elements/>
- LOC. (2013). Metadata Encoding and Transmission Standard (METS). Retrieved 10-10-2016, from <http://www.loc.gov/standards/mets/>
- LOC. (2014). MARC Standards. Retrieved 10-10-2016, from <http://lcweb.loc.gov/marc/>
- LOC. (2015). Standards at the Library of Congress. Retrieved 10-10-2016, from <http://www.loc.gov/standards/Metadataetc.> (2008). Metadata for cultural objects and visual resources. Retrieved 15-10-2016, from <http://www.metadataetc.org/book-website/exercises/exercise2-2a.htm>
- Mitchell, E. (2015). *Metadata Standards and Web Services in Libraries, Archives, and Museums: A active learning*

- resource. California: Libraries Unlimited.
- NASA. (2016). Metadata Protocols and Standards. Retrieved 2-11-2016, from <http://gcmd.nasa.gov/add/standards/>
- NISO. (2004). Understanding Metadata. Retrieved 20-10-2016, from <http://www.niso.org/publications/press/UnderstandingMetadata.pdf>
- Pal, J. K. (210). Metadata initiatives and emerging technologies to improve resource discovery. *Annals of Library and Information Studie*, 57, 44-53.
- Robin, C. (2008). Universal Description, Discovery, and Integration (UDDI). Retrieved 4-11-2016, from <http://xml.coverpages.org/uddi.html>
- Ruthillman. (2016). An Introduction to RDF for Librarians (of a Metadata Bent). Retrieved 10-11-2016, from <http://ruthillman.com/introduction-rdf-librarians-metadata/>
- USGIN. (2010). Geospatial data and metadata protocols, services, standards, and profiles. Retrieved 1-11-2016, from <http://lab.usgin.org/groups/csw-debug-blog/geospatial-data-and-metadata-protocols-services-standards-and-profiles>
- Wikipedia. (2016). Metadata standard. Retrieved 10-10-2016, from [https://en.wikipedia.org/wiki/Metadata\\_standard](https://en.wikipedia.org/wiki/Metadata_standard)
- Woodley, M. S. (2016). Metadata Matters: Connecting People and Information. Retrieved 12-11-2016, from <http://www.getty.edu/publications/intrometadata/metadata-matters/>
- Zeng, M. L. (2004). Metadata Basics Retrieved 10-10-2016, from [http://marciazeng.slis.kent.edu/metadata\\_basics/creation.htm](http://marciazeng.slis.kent.edu/metadata_basics/creation.htm).

**How to cite this article:**

Machendranath, S. and Umesha Naik. 2016. RDF Standards for e-Library Services: A Study of Metadata Standards and Protocols. *Int.J.Curr.Res.Aca.Rev.*4(3): 238-246.  
doi: <http://dx.doi.org/10.20546/ijcrar.2016.403.026>