MARC 21 AND MARK-UP LANGUAGES

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CURRENT ENVIRONMENT

- **There is an exponential increase in the quantity of available information;**
- **During the 20th century, the sciences contributed not only to the quantity of information, but also to its quality;**
- **The arrival of automation (computers) has revolutionized the processing information;**
- **Automation has improved access to information.**

THE ROLE OF LIBRARIES IN AUTOMATION

- **With MARC, librarians were some of the first professionals to apply automation to their work;**
- **The joined the telecommunication and finance industries in using computers to maintain services;**
- **Implementing computers was a major challenge;**
- **During the 60s, in large libraries, there was an overabundance of cards to be filed in the manual catalog;**

INNOVATIONS DEVELOPED BY LIBRARIES

- **Libraries were some of the first institutions to apply computers to textual data;**
- **Cataloging standards preceded the development of word processing software;**
- **Cataloging data are linguistically rich** (many languages and scripts are represented in library collections);
- **Almost all library systems were developed in-house, from the ground up (from zero).**

EXAMPLES OF LIBRARY INNOVATIONS:

- **Rich character encodings, including characters for a variety of languages** (various scripts)**;**
- **Databases of variable length records;**
- **Explicit identification of data elements;**
- **Support for indexing, sorting, and searching;**
- **Sophisticated data entry, including prompt screens and validation** (no more punched cards!)

THE EARLY YEARS:

- **Beginning in 1969 with the first distribution of MARC records, libraries found themselves on the cutting edge of automation;**
- **A new market for machine-readable products developed;**
- **Bibliographic agencies like OCLC were born;**
- **Increase in machine-readable data;**
- **Increase in the demand for information.**

INITIAL LIMITATIONS

- **Databases were relatively isolated;**
- **Despite the quantity of records created, there was little exchange;**
- **Costs associated with original cataloging provoked exploration of data sharing;**
- **Initial shared cataloging projects were bases on tape distribution of records;**
- **The physical media had limitations.**

BIRTH OF THE INTERNET

- **The suggestion for “inter-networking” was proposed in 1962 for military applications;**
- **In 1967 four (4) separate computers were linked electronically with ARPANET;**
- **In 1971 the number of linked computers grew to 23;**
- **In 1972 the InterNetworking Working Group was established with Vinton Cerf as president;**
- **1974 - Telenet; commercial version of ARPANET**

CHILDHOOD OF THE INTERNET

- **1982-1987: Vint Cerf and Bob Kahn develop TCP/IP** (software that supports communication between systems)
- **1984: increase in sales of PCs; appearance of the term cyberspace in the press;**
- **1987: Internet domains surpassent 10.000;**
- **1988: First computer virus is spread over the Web;**
- **1991: NSFNET assumes the role of Web "backbone"**
- **1993: MOSAIC – first Web browser.**

LIBRARIES CONFRONT NEW REALITIES

- **The use of computers in libraries leads to the OPAC (Online Public Access Catalog);**
- **After the birth of the Internet, pressure on libraries increases to offer to outside users online access to their catalogs;**
- **The MARC formats continue to develop to handle new forms of material (video, audio, digital technologies, CD-ROM, etc.) and to provide richer bibliographic data.**

GENERALIZED MARKUP LANGUAGE - GML

- **In 1969, Charles Goldfarb, Edward Mosher and Raymond Lorie (G-M-L) led work at IBM on the Generalized Markup Language (GML);**
- **Their work was based on a project to replace existing textual coding structures with something less proprietary;**
- **ANSI considers a draft American standard in 1978;**
- **In 1980 it becomes and ISO draft under the name: SGML - Standard Generalized Markup Language.**

THE CHALLENGE OF SGML TO MARC

- **Publication of ISO 8879 (SGML) in 1986;**
- **Growth in interest in SGML before being noticed by MARC users;**
- **The Library of Congress first considered its potential usefulness in 1990;**
- **SGML tagging was found to be compatible with MARC, not a threat;**
- **1995 – start of a project to develop MARC-SGML.**

SGML IN BRIEF

- **SGML is a non-proprietary syntax for explicitly identifying text structures;**
- **Like MARC, implementation of SGML is based on predetermined tags;**
- **SGML tags must begin with a letter of the Latin alphabet and are delimited by the signs less-than and greater-than: <p>**
- **A list of SGML tags is called a “Document Type Definition” (acronym "DTD").**

ADVANCED SGML CONCEPTS

- **An SGML DTD defined the valid tags and syntax for their use, that is, which tags can be used;**
- **SGML is recursive, that is, tags can contain tags;**
- **Attributes are possible; they are part of the tag (e.g.: <h1 position="center">);**
- **Start and end tags are possibles, they are not required: Paragraph text. ** (note: "/" is used in the end tag after the character "<")

SAMPLE OF TAGGED TEXT

```
<h2>Introduction</h2>
<p>This document contains lists codes which have been assigned to...
an online database after assignment.</p><p>Entries in the first list are
arranged in <i>alphabetical order</i>by the code and consist of the
 source code followed by the name and address of the organization.</p>
<p>The code consists of a <i>maximum</i> of eight characters as follows:
<ul><li>1-2  Country prefix</li>
<li>3-4  City prefix</li>
<li>5-8  Organization portion of code</li></ul></p>
```

POSSIBLE DISPLAY OF TAGGED TEXT

Introduction

This document contains lists codes which have been assigned to... an online database after assignment**.**

Entries in the first list are arranged in *alphabetical order* by the code and consist of the source code followed by the name and address of the organization**.**

The code consists of a *maximum* of eight characters as follows:

***** 1-2 Country prefix

* 3-4 City prefix

* 5-8 Organization portion of code

SGML VOCABULARY

- **Like MARC, the development of SGML resulted in the introduction of new terms:**
  - **instance: a block of text with tags from one DTD;**
  - **to parser: validate the content of an instance**
  - **entity reference: a series of characters that represents another character or character string (e.g., ">" instead of "<")**
  - **empty tag: an SGML tag without data.**

MARC SGML

- In 1995 a special working group began development on a DTD for MARC;
- SGML and MARC experts were part of the group;
- They made decisions on the MARC DTD to accommodate SGML;
- They decided to defined rigorously SGML tags that followed the MARC-style tags for each MARC element: for example: <mrcb245-a>

SPECIAL CONSIDÉRATIONS WITH MARC SGML

- **The working group decided to treat MARC fixed-length elements with SGML attributes:**
  - **<mrcbldr-bd-06 value="j">**
- **Special “wrapper” tags were defined to group important MARC fields (for ex., 1XX, 2XX, 3XX)**
- **One problem was how to encode MARC characters in MARC-SGML;**
- **The decision: permit options.**

EXPERIMENTATION WITH MARC SGML

- **Despite considerable publicity, the MARC user community did not rush to SGML;**
- **Some libraries have experimented with the DTD;**
- **A MARC-to-SGML conversion tool was developed** (the tool used PERL scripts)
- **Due to the decision on tag style, the MARC DTD was very big, which was a source of problems.**

XML - eXTENSIBLE MARKUP LANGUAGE

- **Certain syntactical characteristics of SGML created problems for its implementation;**
- **SGML minimisation – the possibility of omitting certain final tags, and sometimes even initial tags;**
- **Empty tags resulted in ambiguity;**
- **XML – the extensible markup language resolved all these problems and facilitated parsing (syntactic analysis);**
- **XML is compatible with ISO 8879 and SGML.**

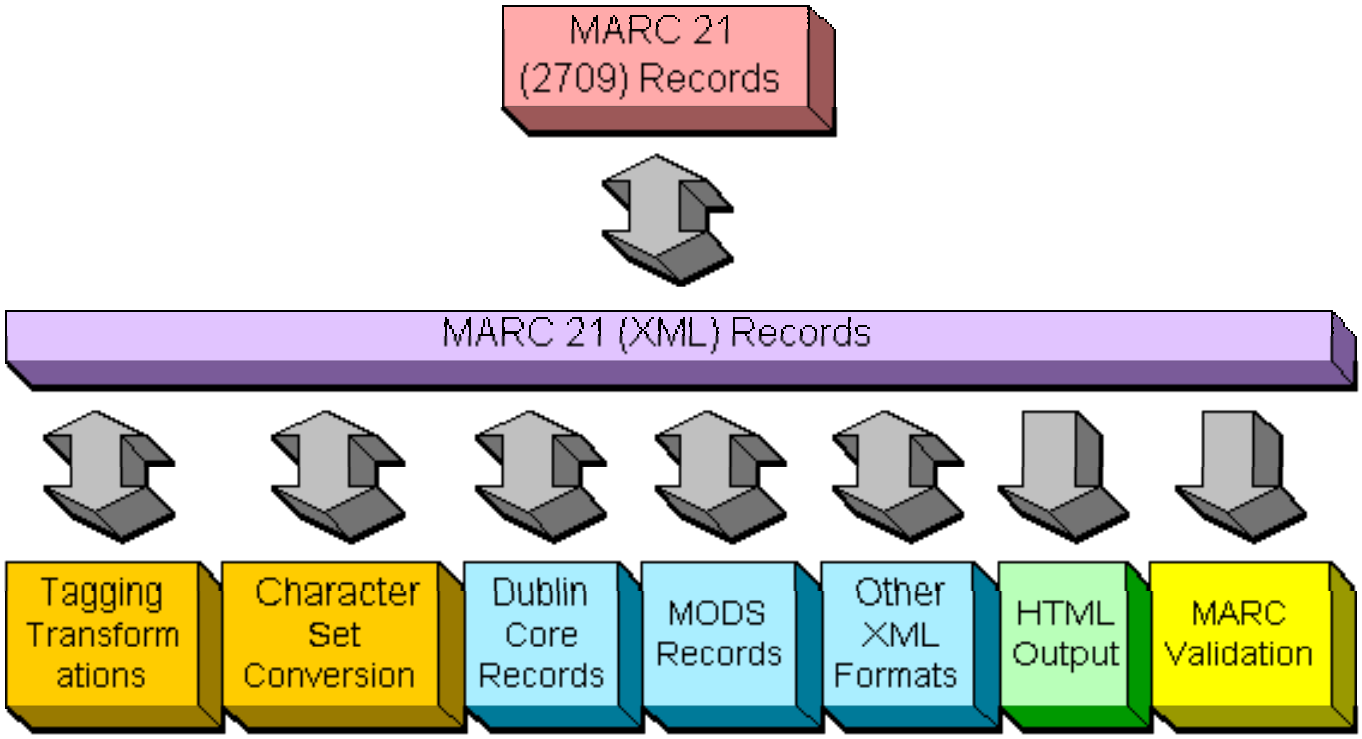
XML BASICS

- **Every XML start tag *must* be paired with a corresponding end tag: ex.: paragraph **
- **Empty tags, which only have attribute values, have a special syntax; the start tag begins with “</”; e.g., </mrcbldr-br-06 value="j">**
- **SGML options are not part of XML, thus instances are more sure;**
- **Parsing of XML is simpler.**

MARC XML

- **The MARC SGML DTD was modified to conform to XML requirements;**
- **Existing conversion tools were adjusted to generate XML;**
- **Alternative simplified DTDs were created to reduce the dimensions of the DTD file and to improve MARC XML instanced;**
- **The new MARC XML DTD allow local tags;**
- **Available at: http://www.loc.gov/standards/marcxml///**

MARC XML CONVERSION ARCHITECTURE



HTML - HYPERTEXT MARKUP LANGUAGE

- **The development of SGML follows the growth of the Internet, protocols and browsers;**
- **SGML and XML are powerful, but they are sometimes limited by the lack of meaning and style linked to the tags;**
- **The HTML tag set is fairly simple, with a small number of universally understood structures, mostly textual;**
- **HTML define structural tags (ex., <p> for «paragraph») and some functions (ex., links)**

BROWSERS AND HTML

- **Almost all browsers understand the meaning of tags from the HTML DTD;**
- **Not all browsers act the same, but most can display Web documents acceptably;**
- **The HTML tag set is small, but Web site developers have created attractive resources online;**
- **Style sheet technology is improving the use of HTML.**

MARC AND HTML

- As a result of the need to give access to catalogs via the Internet, many libraries filter their cataloging data through HTML;
- Most modern MARC systems provide an HTML view of their MARC data;
- Mappings are made between MARC fields and subfields and HTML for interpretation by browsers;
- Some systems even support the entry of MARC records by means of HTML/Web interfaces.

IMPLEMENTATION OF TAGGING WITH MARC

- **The development of SGML, XML and HTML technology hasn't stopped people from using MARC;**
- **The richness and flexibility of the MARC format are supplemented by the alternative SGML structure;**
- **The existence of thousands of MARC-based systems and the millions of MARC records favor the continued use of the traditional ISO 2709 record structure.**

FUTURE OF THE ISO 2709 RECORD STRUCTURE

- **It's not clear if the ISO 8879 (SGML) structure will replace the ISO 2709 (MARC) structure already in place in most library systems;**
- **In the future, systems based on SGML/XML tags could certainly serve as alternatives;**
- **Recursion (tags within tags) in SGML and XML could enrich the existing flexibility of MARC;**
- **Currently, the library community if experimenting.**

THE RISE OF METADATA IN THE WORLD OF INFORMATION

- **With the progress of technology in libraries, other bibliographic agencies that create and use bibliographic records have joined the development effort;**
- **Suppliers of non-MARC metadata are studying the use of existing MARC data;**
- **MARC users are considering ways of using non-MARC data encoded with standards like XML.**

XML SCHEMAS

- **Schemas are part of the most recent developments in the area of XML;**
- **Schemas are vocabularies of shared XML elements;**
- **Schemas allow computers to apply structural rules to documents;**
- **They define the structure, content and semantics of XML documents;**
- **XML Schema 1.1 is now a W3C recommendation.**

MARC XML *"Slim" SCHEMA*

- **An XML schema for MARC 21 data;**
- **Supports XML tagging of MARC 21 records;**
- **MARCXML *"Slim"* is restrictive to the forms of MARC content designation;**
- **Alphabetic tags are permitted, as well as signs (ex. %) as subfield codes and locally defined data elements (9XX);**
- **Available at: http://www.loc.gov/standards/marcxml///**

DUBLIN CORE AND METS

- **Users outside the MARC community decided to use XML and schemas to handle their bibliographic data;**
- **Dublin Core: a project to create a brief schema with 15 basic (core) elements;**
- **METS - Metadata Encoding & Transmission Standard: non-MARC schema for data relative to objects in a digital library.**

DUBLIN CORE ELEMENTS:

Title	**Creator**
Subject	**Description**
Publisher	**Contributor**
Date	**Type**
Format	**Identification**
Source	**Language**
Relation/Link	**Coverage**
Copyright	

SOURCE OF INFORMATION ON DUBLIN CORE

- **See the Dublin Core Metadata Initiative web site:**

  http://dublincore.org/

- **Mappings from MARC to DC were developed by the Library of Congress; this documentation is available at:**

  http://www.loc.gov/marc/marc2dc.html

  http://www.loc.gov/marc/dccross.html

PRIMARY METS METADATA TYPES

- **The METS DTD structures XML data into five (5) main section of tags;**
  - **Descriptive metadata (MARC elements are here)**
  - **Administrative metadata (about the machine files)**
  - **File groups (for files relating to digital objects and electronic resources)**
  - **Structural plan (essential for the structure of digital objects)**
  - **Behavior (of software associated with digital objects)**

SOURCE OF INFORMATION ON METS

- **The Library of Congress, maintenance agency for METS;**
- **As a schema, METS is going through a test period;**
- **A special METS Web site is available at:**
  - **http://www.loc.gov/standards/mets/**
- **This Web site has links to documentation and tools that can be used with MARC and METS data .**

MODS - Metadata Object Description Schema

- **MODS is another XML schema that defines a set of bibliographic data elements;**
- **It was created for various uses, in particular for use by non-MARC library applications;**
- **Instances contain data taken from MARC 21 records, but the MARC 21 list of data elements is not required in order to make use of the schema;**
- **MODS is compatible with MARC 21, essentially a subset of MARC 21 data elements.**

HIGHEST LEVEL MODS ELEMENTS

- **titleInfo**
- **name**
- **typeOfResource**
- **genre**
- **originInfo**
- **language**
- **physicalDescription**
- **tableOfContents**
- **targetAudience**
- **note**
- **subject**
- **classification**
- **relatedItem**
- **identifier**
- **location**
- **accessCondition**
- **recordInfo**

EXAMPLE OF MODS SUBELEMENTS: "titleInfo"

- **titleInfo** [required]
  - **title**
  - **subTitle**
  - **partNumber**
  - **partName**
  - **nonSort**
- **"titleInfo" attributes in the MODS DTD**
  - **ID, type (abbreviated, translated, alternative, uniform), authority, displayLabel, xlink (to the authority record), xml:land, script, transliteration**

SOURCE OF INFORMATION ON MODS

- **The Library of Congress is the maintenance agency for the MODS DTD;**
- **Development of MODS is still ongoing; version 3.0 MODS is now available;**
- **A special MODS Web site is available at:**
  - **http://www.loc.gov/mods/**
- **The Web has links to documentation and tools that can be used with MARC and MODS.**

MADS - Metadata Authority Description Schema

- **MADS is another XML schema that defines a set of elements for authority records;**
- **It is intended for many users, in particular non-MARC library applications;**
- **Instances will contain data taken from MARC 21 records, but the MARC 21 list of elements is not required to use the schema;**
- **MADS is compatible with MARC 21, essentially a subset of MARC 21 data elements.**

HIGHEST LEVEL MADS ELEMENTS

authority	**name**
refs	**references and tracings**
note	**notes**
affiliation	**affiliation**
url	**Internet identification (address)**
identifier	**identification**
fieldOfActivity	**field of professional activity**
extension	**extension/other information**
recordInfo	**record-level information**

EXAMPLE OF MADS SUBELEMENTS: “authority"

- **authority** [required]
  - **name**
  - **titleInfo (for a uniform title)**
  - **topic (subject headings)**
  - **temporal (chronological)**
  - **genre**
  - **geographic**
  - **occupation (profession)**

SOURCE OF INFORMATION ON MADS

- **The Library of Congress is the maintenance agency for the MADS DTD;**
- **MADS is still being tested; version 1.0 is now available;**
- **A special MADS Web site is available at:**
  - **http://www.loc.gov/mads/**
- **The Web site has links to documentation and tools that can be used with MARC and MADS data.**

DEVELOPMENT STRATEGY

- **The MARC (2709) record structure is still popular;**
- **The MARC 21 data element set (2000+ éléments) remains stable, flexible and is often used as a model;**
- **MARCXML (8879) seems to be the preferred alternative structure to MARC (2709);**
- **Conversion and bibliographic data validation tools are now being developed using MARCXML as a central intermediary data structure.**

CONCLUSION

- **Up to now no other standard for bibliographic data has surpassed MARC, especially among MARC 21 users;**
- **The MARC 21 data element list has helped the development and implementation of new technologies;**
- **New technologies supplement the traditional MARC (2709) record structure for migration of data to different environments and systems;**
- **Cooperation between the MARC and non-MARC communities is still very essential.**

SOURCES OF INFORMATION ON MARC 21

U.S. Library of Congress
Network Development and MARC Standards Office,
Washington, DC 20540-4402, U.S.A.
***Tel:* +1-202-707-6237**
***Fax:* +1-202-707-0115**
***Email:* NDMSO@LOC.GOV**
***Web Page:* HTTP://WWW.LOC.GOV/MARC/**

To request technical documentation, contact:
Cataloging Distribution Service
Washington, DC 20541-4910, U.S.A.
***Web Page:* HTTP://WWW.LOC.GOV/CDS/**