Building a MARC-to-OLAC Crosswalk:

Repurposing Library Catalog Data for the Language Resources Community

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Searching for language resources

The Open Language Archives Community (OLAC) is an international partnership of institutions (numbering 35 and growing) who curate collections of language resources (e.g. recordings, texts, dictionaries, grammars, language learning materials) concerning the majority of the world's known 7,500+ languages. OLAC seeks to support precise search for language resources by aggregating the catalogs of the participating archives. Catalogs are expressed using a community-specific refinement of qualified Dublin Core [1] and harvested with a community-specific refinement of the OAI Protocol for Metadata Harvesting [2].

Many institutions with sizable collections of language resources already have catalogs in MARC format. In the effort to expand its coverage, OLAC has recognized the need to build a crosswalk system that maps language-resource records in an existing MARC catalog into the qualified Dublin Core format used by OLAC.

Language identification and MARC

Standard practice in MARC cataloging has been to identify the main content language with a three-letter code from ISO 639-2/b [3] in 008/35-37 and additional content languages in 041. When a language is the subject of a work, it is identified by an LCSH in 650$a. For instance, the MARC record for a Cheyenne-English dictionary might include:

```
008/35-37 eng
041 0# $aeng$achy
650 00 $Cheyenne language$vDictionaries$xEnglish
```

The ISO 639-2/b codes can identify only 360 individual languages. LCSH has much greater coverage with headings for about 3,500 specific languages. But still this covers under half of the known languages. A new best practice (which OLAC recommends) is to use ISO 639-3 (adopted 2007) which has over 7,500 three-letter codes covering all known languages, past and present [4]. For instance, the following encodes a work in the Bagirmi language of Chad:

```
041 07 $abmi$2iso639-3
```

Given the fact that cataloging standards have not covered all known languages until very recently, collections with a focus on minority languages have developed local practices to fill the gap. For instance, the Graduate Institute of Applied Linguistics (GIAL) uses a locally defined $l (language) subfield of field 590 (local note) to code a language which the resource is about, e.g.

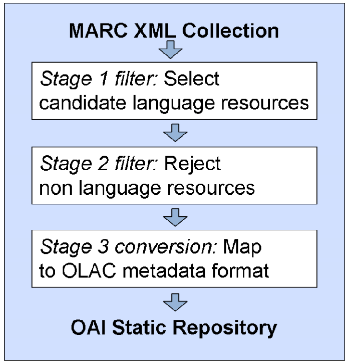
```
590 ## $lbmi$2iso639-3
```

The National Anthropological Archives (NAA) have designated field 695 (local subject access) to specify the name of the ethnolinguistic community, e.g.

```
695 ## $aAlibamu
```

Design of the crosswalk

The crosswalk follows a basic three-stage process:



MARC XML Collection

Stage 1 filter: Select candidate language resources

Stage 2 filter: Reject non language resources

Stage 3 conversion: Map to OLAC metadata format

OAI Static Repository

The filters for a given collection are configured via an XML vocabulary for expressing tests on the MARC leader, control fields, and data fields, e.g. the following is the RELAX NG definition for a data field test:

```
element data-field {
  # x is a wildcard; only xxx, dxx, ddx are allowed
  attribute tag { xsd:string { pattern = "[0-9x][0-9x][0-9x]" } },
  # if @code is empty, all subfields are searched. If @code is not
  # empty, it is a list of the subfields to search in
  attribute code { xsd:string { pattern = "[a-z0-9]*" } },
  attribute test { "exists" | "equals" | "contains" | "starts-with" },
  (element text { text })*
}
```

For instance, the following test is used in the GIAL filter to select a record if it contains a local note with a language code:

```
<data-field test="exists" tag="590" code="l"/>
```

The following selects a record if it contains the stem of a linguistic data type word in any subfield of any type of title entry:

```
<data-field test="contains" tag="24x" code="">
   <text>dictionar</text> <text>vocabular</text>
   <text>lexic</text> <text>gramma</text> <text>text</text>
</data-field>
```

Implementation of the crosswalk

Our crosswalk implementation was created with several goals in mind. **Open source:** Our solution is open source and leverages open source technologies like Python and XSLT, enabling OLAC community members to freely download and run the crosswalk on their local MARC catalogs. **Scalability:** Our solution scales to large MARC XML input files that a typical XSLT processor could not handle due to memory constraints. **Local customization:** Our solution provides for a local XSLT file to override any delivered crosswalk mapping and for the delivered filter to be customized with local filter rules.

A Python script drives the entire crosswalk. It begins with a SAX process that splits the MARC XML input into manageable chunks of (by default) 1000 records each. The filter stages are then implemented as XSLT scripts that are applied in succession to each chunk. These scripts are generated at run time by an XSLT script that compiles the XML file describing the filter tests into XSLT. The Python script uses the Java Saxon XSLT 2.0 processor to apply XSL transformations.

The final mapping stage applies an XSLT script which defines an XSL template for each MARC field that is relevant to OLAC. E.g., the template for the 650 subject field uses a mapping from LCSH to ISO 639-3 compiled by the project [5]:

```
<xsl:template match="marc:datafield[@tag='650']">
  <xsl:variable name="code">
     <xsl:call-template name="map-to-iso639">
      <xsl:with-param name="lcsh"
                    select="marc:subfield[@code='a']"/>
     </xsl:call-template> </xsl:variable>
  <dc:subject xsi:type="dcterms:LCSH">
   <xsl:call-template name="subfieldSelect">
     <xsl:with-param name="codes">abcdexyzv</xsl:with-param>
     <xsl:with-param name="delimiter">--</xsl:with-param>
   </xsl:call-template>
  </dc:subject>
  <xsl:if test="$code != '' ">
   <dc:subject xsi:type="olac:language">
     <xsl:attribute name="olac:code" select="$code"/>
   </dc:subject> </xsl:if>
</xsl:template>
```

For instance, given the following MARC XML input,

```
<marc:datafield ind1="0" ind2="0" tag="650">
  <marc:subfield code="a">Cheyenne language</marc:subfield>
  <marc:subfield code="v">Dictionaries</marc:subfield>
  <marc:subfield code="x">English</marc:subfield>
</marc:datafield>
```

the above template produces this qualified Dublin Core:

```
<dc:subject xsi:type="dcterms:LCSH">Cheyenne language--
   Dictionaries--English</dc:subject>
<dc:subject xsi:type="olac:language" olac:code="chy"/>
```

Results

The complete crosswalk package with the configuration for the GIAL and NAA data sets is available for download [6]. The crosswalk has been successfully run over a collection of records supplied by the NAA and over the complete GIAL catalog; the resulting repositories will soon be operational at OLAC [7] [8]. The following table summarizes results in terms of the original collection size, the size after filtering, and the number with a language code of interest after mapping (e.g. more than just "eng" as content language).

	Records in MARC collection	Records in OAI repository	Records with ISO 639-3 code
NAA	5,654	4,226	2,499 (59%)
GIAL	32,654	8,176	5,252 (64%)

We have begun work on two fronts to improve the precision in the final column: developing a stochastic classifier trained on *Ethnologue* data to extract language identification from titles and descriptions, and incorporating a final evaluation to reject records for which no language is identified.

References

1. http://www.language-archives.org/OLAC/metadata.htm
2. http://www.language-archives.org/OLAC/repositories.htm
3. http://www.loc.gov/standards/iso639-2/
4. http://www.sil.org/iso639-3/
5. http://olac.googlecode.com/svn/src/marc-crosswalk/lib/iso639.xsl
6. http://code.google.com/p/olac/source/browse/#svn/src/marc-crosswalk
7. http://www.language-archives.org/archive/naa.nmnh.si.edu
8. http://www.language-archives.org/archive/gial.edu

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