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I. *Executive Summary*

Since October 15, 2016 report, the Task Group on URI in MARC (Task Group) began work to lay a foundation for applying subfield \$0 to record URIs that represent objects in RDF triple statements.[1] The Task Group followed up with additional discussion papers submitted for the 2017 Midwinter meeting. These were the result from a series of findings and conversations with stakeholders. Detail descriptions for each discussion papers will follow in Section II.a and b.

In addition, the British Library, incorporating invaluable input gathered at the 2016 Annual Conference, submitted a proposal in collaboration with the Task Group ([2017-01](#)) that broadens the usage of \$4 relator code to include URIs that express relationships. This proposal was approved by MAC. Once implemented, the URIs recorded in \$4 will represent predicates in RDF triple statements.

The Task Group anticipates the approved changes to MARC data will be incorporated into the MARC standard in the next few months. Implementation by bibliographic utilities, e.g. OCLC, will follow in subsequent quarterly release updates.

One particular goal that the Task Group hopes to bring forth is a set of roadmaps by which implementation of exportable URIs in the \$0 for English-language records in OCLC can be reached within the 2017 calendar year. The subgroup on MARC Object/Work Reconciliation took the lead and shared its phase I deliverables with OCLC for review in October 2016. The aim of embedding URIs upon

export will immediately benefit those libraries that are poised to launch linked data discovery services. Options may include inserting URIs in bibliographic records upon export. The subgroup describes the process and additional work that is ahead in *Section II.c* below.

The definition and practices of surrounding real world objects (RWOs)/entity URIs in linked data remain fluid. This further complicates the Task Group's deliberations and recommendations for presenting a real world objects and how they relate to authority data. The RWO subgroup details its process and rationale for recommending a subfield, e.g., \$1 to hold identifiers for Things and to restrict the usage of \$0 to identifiers from authority databases in *Section II.a.* below, as well as laying out some of the issues still in need of resolution.

In a similar vein, the uncertainty of what a work is formed the focal point of the last few months for the subgroup. Answers will vary dependent on from which community the answer comes. The Task Group wishes to introduce conversations surrounding characteristics that will distinguish an identifier for work that has been manually crafted and contributed to an authority database from one that is algorithmically generated throughout machine matching process. The Work ID subgroup landed on a field, 758, that may store an identifier for a work (or resource entity). The subgroup provides its examinations of potential benefits and possible disadvantages of blocks of MARC fields e.g. 00x, 7xx, etc. for storing work identifiers in *Section II.b.* below.

At the 2017 Midwinter meeting, both RWO and MARC ID subgroups submitted discussion papers to bring about awareness of these issues and the work of these subgroups to the library community: [2017-DP01](#), Use of Subfields \$0 and \$1 to Capture Uniform Resource Identifiers (URIs) in the MARC 21 Formats. [2017-DP02](#), Defining Field 758 (Related Work Identifier) in the MARC 21 Authority and Bibliographic Formats. At the annual meeting 2017 in Chicago, the subgroups will submit them as proposals.

Since the October 2016 report, the Task Group has continued to learn and try to better understand several critical issues surrounding data modeling of real world objects, vocabulary synchronization among various communities, etc. Particular focus was given to the alignment process surrounding RDA Registries and MARC codes for genre and form codes/terms and to business models from authority service providers for their implementation of URIs in the \$0 for bibliographic and authority data.

Prior to individual conversations with the above stakeholders, the Task Group circulated a questionnaire to respective vendor services, that provide authority and bibliographic data enhancements, and reconciliation services for library collections. (See Appendix) These interviews helped the Task Group learn about trends outside the library community and about the interests of commercial services. The interviews are summarized in *Section III*.

II. Reports from subgroups:

II.a. Real World Object (RWO):

In Year Two, the RWO subgroup wrote MARC [Discussion Paper No. 2017-DP01 \(2017-DP01\)](#), or the \$0/\$1 DP, which was reviewed by MAC (the MARC Advisory Committee) at ALA Midwinter.

The participants agreed with the need to distinguish formally between URIs that refer to Real-World Objects (or RWOs), and URIs that refer to Authorities (or to documents about RWOs). For many use

cases in the library community that can now be addressed by machine-understandable semantic data, it is necessary to separate assertions about the person named Albert Einstein, for example, from assertions about documents that describe him. The \$0/\$1 DP argued that authority URIs should appear in \$0 fields in MARC bibliographic records, while \$1 URIs should appear in \$1.

The subgroup upgrading the DP to a MAC proposal in the current review cycle, following the recommendations made at the end of the ALA [discussion](#). Nevertheless, the \$0/\$1 proposal will be submitted without fully resolving several issues that will need to be addressed by subsequent standards work and scholarly research:

Populating the descriptions accessible from real-world-object URIs. Descriptions accessible from RWO URIs published by the Library of Congress and other institutions in the library community are populated with data extracted from library authority files. Thus, RWO descriptions for Persons typically contain lifespan dates, professions, and associated places or organizations, while the Authority descriptions contain a fuller range of headings and provenance information. However, most RWO URIs contain no information beyond the preferred heading, and even the fullest descriptions may be insufficient for merging, matching, and authoritative fact collection about the important entities recognized by the library community. They also fail to acknowledge the current activity devoted to advancing the models for entities beyond crosswalks from legacy standards, such as the [model of organizational identifiers developed by ISNI](#).

Topical headings. Some library-community standards experts have expressed uncertainty around whether Topical headings name RWOs. Is "Kindness" real? The W3C does include "abstract idea and non-existing things like a mythical unicorn" in its definition of RWOs.[3] As MAC raised this question in regard to the \$0/\$1, the RWO subgroup of the URI Task group will try to provide clarity around the benefits of treating Topical headings as RWOs and show how this might be done.

Authority-record descriptions. A solution for the 024 field defined in the LCNAF that is semantically consistent with the \$0/\$1 recommendation needs to be proposed. 024 fields are currently populated with the same range of document URLs, document URIs, RWO URIs, and legacy control codes that appear in \$0 in bibliographic records. But this issue is beyond the scope of the current effort. For now, we support the work of the Work URIs task force, which offers a partial solution in the DP submitted in the current review cycle.

II.b. Work/Resource ID:

The Work Identifiers in MARC subgroup was formed to determine which MARC 21 fields are suitable for storing dereferenceable http identifiers for entities related to the resources described in authority and bibliographic records. The work was done with a primary goal of readying MARC 21 records for conversion to RDF and for other linked data purposes. The subgroup ultimately determined that existing MARC 21 fields in the authority and bibliographic formats carried too many legacy uses to unambiguously store an http identifier for the related entity. As a result, the group issued a MARC Advisory Committee (MAC) discussion paper in favor of defining a new field for the purpose in January 2017:

[2017-DP02](#): "Defining Field 758 (Related Work Identifier) in the MARC 21 Authority and Bibliographic Formats."

The discussion paper lays out the semantic difficulties of using existing fields, such as the 7XX fields in the bibliographic format because of the many different usages of these fields in the past. It also describes the advantages of using the newly defined field 758 field over the 024 field in the authority format (e.g. being able to reserve 024 for legacy identifiers, new functions such as being able to use \$5 institution specific http identifiers in the 758, etc.)

While a number of use cases could be identified for the new field 758, including storage of dereferenceable http identifiers derived from traditional library authority workflows such as NACO, the task group focused on one use case in particular. The discussion paper describes it as:

“This is the case where a work identifier (or URI) is available, but is not explicitly associated with an authorized access point or other title construction. Examples include a URI for an algorithmically generated entity such as an OCLC work, or a URI pointing to an external non-library source such as a Wikidata entry.”

The definition of 758 does not require the establishment of an authorized heading and as the paper says: It “by passes the need to accommodate a work identifier in the 130 uniform title or 1XX/240 author-title field that is not directly derived from the authority for the access point found there.” The definition simply focuses on the availability of a dereferenceable http identifier for a related entity to store in the 758.

The MAC discussion resulted in support for the paper to come back to the committee as a proposal at ALA Annual 2017. The task group is working on the proposal in consideration of the comments from MAC and others who have contributed to the discussion. The scope of the field is being widened beyond related “work” entities in the proposal. It may be applied to related FRBR entities, works, expressions, manifestations, and items but is not limited to the entities in the FRBR model. The field label will be changed to reflect the widened scope in the final proposal.

Another important refinement in the proposal will be to focus on defining the 758 in the bibliographic format. The task group encountered several issues that require further work before the field is defined in the authority format.

The anticipated passage of another PCC URI task group proposal will add functionality to the 758 when implemented. [2017-DP01: Use of Subfields \\$0 and \\$1 to Capture Uniform Resource Identifiers \(URIs\) in the MARC 21 Formats](#) recommends that \$0 should “provide access to strictly machine actionable or parseable data from Authority records, SKOS Concepts, and other Record-like entities.” A newly defined \$1 will contain actionable URIs for real world objects.

II.c. MARC Object/Work Reconciliation

At ALA Annual 2016, OCLC reported to the Task Group that it was having difficulty reconciling \$0 URIs for RDF resources with the data in the MARC fields to which they were added because the URI did not necessarily represent *all* the data in the MARC field. For example, the NLM BIB record for the book *Some account of the medical profession in New Haven* includes the following 100 field:

```
100 1_ |a Bacon, Francis, |d 1831-1912, |e author
```

The RDF object of this particular MARC field is comprised of \$a in conjunction with \$d (Bacon, Francis, 1831-1912). (The relevant subfields may vary depending on the label prescribed in the authority file of choice.) Subfield e describes the relationship of the RDF object to the RDF subject (the book *Some account of the medical profession in New Haven*) and therefore is not part of the object of the MARC field. Another way of stating this is that the LCNAF \$0 URI for this 100 field (<http://id.loc.gov/authorities/names/n2006183234>) reconciles to the data in \$a and \$d, while the relationship URI (e.g., <http://rdaregistry.info/Elements/u/P60434>) reconciles to \$e. Therefore, the RDF triple for this 100 field would correlate to:

<[Subject]Book resource><[predicate]has \$e relationship><[object]person expressed in \$a and \$d>

A machine would read this as:

<*Some account of the medical profession in New Haven*>
 <<http://rdaregistry.info/Elements/u/P60434>>
 <<http://id.loc.gov/authorities/names/n2006183234>>

Because of the incremental and at times ad hoc development of MARC over time, it is not possible to specify a set of subfields that will denote the object across all MARC fields. The Task Group therefore recognized that humans must define this mapping for accurate machine conversion of MARC to RDF. The Task Group created the MARC Object/URI Reconciliation subgroup to investigate and define which MARC subfields singly or combined can represent the object that corresponds to the \$0 URI for that MARC datafield. Clarifying RDF object data in MARC fields will help both the cataloging community and programmers understand how to apply \$0 and how to translate MARC fields containing \$0 to RDF.

The following fields were identified for initial investigation:

- 1XX (100, 110, 111, 130)
- 33X (336, 337, 338)
- 368, 37X-38X
- 6XX (600, 610, 611, 630, 650, 651, 655)
- 7XX (700, 710, 711, 730)
- 8XX

The subgroup, with input from the larger Task Group, completed review and made recommendations for the following fields

MARC data field	MARC subfields (singly or combined) equating to RDF Object
100 - Main Entry - Personal Name (NR)	abcdgjq
110 - Main Entry - Corporate Name (NR)	abcdn
111 - Main Entry - Meeting Name (NR)	acdenq
336 - Content Type (R)	a or b (see discussion below)
337 - Media Type (R)	a or b (see discussion below)
338 - Carrier Type (R)	a or b (see discussion below)

650 - Subject Added Entry - Topical Term (R)	All but numbered subfields 2368
651 - Subject Added Entry - Geographic Name (R)	All but numbered subfields 2368
654 - Subject Added Entry - Faceted Topical Terms (R)	All but numbered subfields 2368
655 - Index Term - Genre/Form (R)	All but numbered subfields 23568
656 - Index Term - Occupation (R)	All but numbered subfields 2368
657 - Index Term - Function (R)	All but numbered subfields 2368
700 - Added Entry - Personal Name (R)	Name: abcdgjq Name/title: abcdfghklmnoprst
710 - Added Entry - Corporate Name (R)	Name: abcdgn Name/title: abcdfghklmnoprstu
711 - Added Entry - Meeting Name (R)	Name: acdegnq Name/title: acdeghqklnpst
730 - Added Entry - Uniform Title (R)	adfgklmnoprst
800 - Series Added Entry - Personal Name (R)	abcdklmnopqrst
810 - Series Added Entry - Corporate Name (R)	abcdklmnoprst
811 - Series Added Entry - Meeting Name (R)	acdefklmpqst
830 - Series Added Entry - Uniform Title (R)	adfklnoprst

MARC 33X fields

While the RDF object is identifiable in the 33X fields, implementation of \$0 for this field is complicated by the practice in which the term in \$a and the code in \$b are not necessarily derived from the same source vocabulary and only one source vocabulary is identified in \$2. This raises the following implementation issues for \$0 in the 33X fields:

1. For programmatically adding a URI in \$0, a machine does not know which subfield should be matched to the source vocabulary identified in \$2, i.e., it does not know if it should try to match the string in \$a or \$b or both in order to return an equivalent URI.
2. For conversion of MARC to RDF, when there is \$a and \$b, a machine will not know whether the URI in \$0 represents \$a or \$b or both (should they be sourced from the same vocabulary); therefore, it will not know if it should render one triple with a URI format object or 2 triples, one with a URI format object and one with a string/literal object.

In order to facilitate programmatic addition of \$0 to the 33X fields, and subsequently facilitate MARC to RDF conversion, the Task Group should recommend a best practice from one of the following choices:

1. \$2 will always represent the source vocabulary for \$a if there are both \$a and \$b or
2. \$2 will always represent the source vocabulary for \$b if there are both \$a and \$b or
3. \$a and \$b will always be derived from the same source vocabulary in a single data field, with the data field repeated for each different source vocabulary

II.d. Formulating/Obtaining URIs document

As the document [Formulating and Obtaining URIs: A Guide to Commonly Used Vocabularies and Reference Sources](#) states,

“This document has been established as a guide for metadata practitioners interested in capturing URI identifiers from data sources on the web in their bibliographic data; it is not a policy document. Inclusion of a particular data source in this document is not necessarily an endorsement, but rather an acknowledgment that they are commonly used by the library, archives and museum communities for the purposes of bibliographic description.

Implementation patterns for use and provisioning of URIs by data publishers vary immensely. No judgement is made about which patterns are preferred, but rather the document is designed to help consumers of these data sources (both catalogers and developers) to navigate the patterns to select the appropriate URI to meet specific use cases.”

In anticipation of a number of use cases (some shared) by both catalogers and developers, the authors of this document are considering the following enhancements:

1. In order to be a valuable resource, the content must be kept current; this means coming up with a maintenance plan. Ideally the plan would be open/transparent/distributed, allowing data providers (if willing) to maintain their own entry on the list. Because some data providers may lack the motivation or resources to contribute information on their data, a hybrid approach might be necessary. The hybrid approach could include allowing data providers editing rights for their entries and also appointing a PCC group that performs a periodic review of the entries. Critical to this approach would be include date stamps for when each entry was last updated and/or reviewed.
2. Ongoing, the authors are considering the best way to describe the semantics of various data sources. Currently there are discussions around how to differentiate between Authorities and RWOs (See [2017-DP01](#)), and this document aspires to help provide clarity about how various data sources model their data, acknowledging whether they model it as skos:Concepts, madsrdf:Authorities, merely as websites (without linked data), or other types of resources that align closer with evolving definitions of RWOs.
3. Future work has been identified to make the information found in document more useful and machine actionable specifically for developers (documenting APIs, etc.) who intend to set up tools/pipelines for the data sources included in the document. Possible approaches include asking the developer community preferences for how to capture this information, e.g. [Swagger/YAML](#), [VOID](#) Descriptions, other specifications for describing access to data on the web.

Proposed 2017 Work Plan:

Spring - Late Spring / Early Summer 2017

- Commit to core information captured for each entry in document
 - Notes on data source web user interfaces
 - Describe Modeling Choices
 - Links to Available APIs
 - Date of last review/update.
 - Etc.
- Survey Data Source Providers, and develop maintenance plan
 - Define space to author/maintain the document, Google docs are good for communal editing
 - The document should link to/from official PCC wiki/websites.
 - Appoint a PCC group to periodically maintain the document on top of data source contributions.

Mid Summer- Early Fall 2017: Work with developer community to establish requirements for developers

- What format is most desirable?
- What overlap is there with the document? How not to duplicate effort?
- Identify group qualified/willing to maintain this.

III. Consultation with Stakeholders

III.a. RDA Steering Committee (RSC)

- RDA Registry and synchronization with MARC code/term list
Twenty-three new source codes for vocabularies recorded on the RDA Registry have been defined in MARC.[4] The definition of these new source codes offers a means to unambiguously identify the provenance of RDA terms to support future linked data applications.

III.b. Vendors that have RDF URI implementation plans to a variant degree

- OCLC
Working closely with members from two subgroups: Work/Resource ID and MARC Object/Work Reconciliation to prepare roadmaps in late 2017 for
 - 1) implementing URI to embed in MARC records upon output
 - 2) retaining URI upon data ingest

Working to refine and expand existing services to provide URIs in the \$0 for bibliographic and authority records. In addition to the vocabularies that BSLW has identified as default, e.g. LC NAF, customization for URIs from other available ontologies and thesauri are available (VIAF, ISNI) or are under active review.

- Marcive
Providing identifier or URI in the \$0 of bibliographic and authority records using a variety of thesauri that are available for library community. Reconciliation of AAP and fixed fields is part of authorities data processing.
- Casalini
Converting library data originally in UNIMAC and MARC21 to RDF and enriching the data with URIs to available external thesauri, e.g. VIAF, LC, ISNI, Wikidata, etc. Reconciliation of name and title entities through layers of locally devised clustering processes.
- ProQuest
Still fairly early in development, an update will be available later in 2017.
- ExLibris
The Primo Discovery Layer allows expanded functionality in the user experience. This process includes transforming \$0s from the MARC format into their proprietary PNX data format that Primo uses.

III.c. Open Source Developers

- Koha/Evergreen
Unknown.
- Folio
At this time, no plan for triple store, remains record-centric as the higher principles regarding linked data URI remain in flux. There is not a user interface in place for authority service, though perceived a role for authority data. Two points of development are a browser-based UI and browser widgets that connect services to inserting controlled vocabularies. URIs in \$0 remain in MARC environment as well as a separate data source

III.d. Implementation of URI in \$0 by institutions represented by Task Group member institutions

- British Library: will wait till next ILS
- Columbia University: only a small set of records, focusing on art properties, including 1XX and 600; upload to OCLC under discussion internally.
- Cornell University: \$0 included throughout ILS for FAST headings; for names, currently added only to a small number of records, mainly for dissertations. CU is closely following developments in areas such as ISNI and WorldCat Entities. Its hope is to make a transition to authority control and maintenance processes based on explicit use of identifiers in \$0 as part of the migration to FOLIO; this in turn will be part of a plan to unify authority management across platforms.

- George Washington University: added over 4M \$0 already in its Voyager bibliographic records, including 33x, URI pointing primarily id.loc.gov. FAST headings when available were converted to HTTP URIs. The addition of \$0 and \$4 in bibliographic has become an integral part of daily cataloging routine.
- Harvard University: \$0 takes place in small pilots, e.g. ISNI for Design school faculty. If URIs are in NACO, they will be added in 024. URIs in bibliographic are for a small group of FAST headings.
- German National Library: beginning January 2017 provide HTTP URIs by converting from its internal identifier for both bibliographic and authority records. In September 2017 adding two \$4s to 4XX and 5XX field in MARC authority records to relate to the 2nd entity, e.g. place of birth. The URIs are from the GND ontology. Pairing of \$0 and \$1 may follow later. This activity has not involved cataloging and metadata department.
- Library of Congress: No definite plan of embedding HTTP URIs in \$0.
- National Library of Medicine: For 1.5M legacy bibliographic records, NLM to add MeSH RDF URIs in 650, 651, 655 \$0 in Fall 2017. It is testing the addition of structured data serialized in JSON-LD to the HTML headers of its digital repository resource pages for search engine optimization. This project is being undertaken at this time because it can use URIs from \$0 in MARC records to populate some data values. URIs are being added to appropriate NLM MARC records, which provide the raw/source data for the majority of NLM's digitized resources, via MARCNext.
- Northwestern University: No plan at this time for mass recoding of records.
- Ohio State University: No plan.
- Stanford University: Stanford has added URIs for LC NAF, VIAF, and ISNI to authority records for the past few years, through a project with BSLW (now a service they provide). We are now planning to use BSLW's service to add LC NAF URIs to \$0 in bibliographic data as well, once testing of the interaction of \$0 URIs with our discovery layer is complete. We also add URIs to selective MODS data for our digital library. In a related project, Casalini is providing URIs on an exploratory basis as part of an experiment with enhancing vendor-supplied bibliographic records with URIs and other data to enable better conversion to linked data.
- University of Alberta: Planning to add via BSLW on \$0 and possible \$1 (dependent on progress at time of project progression)
- University of Washington: UW is part of the Orbis Cascade Alliance, a consortium of 39 colleges and universities in Oregon, Washington, and Idaho. The Alliance has a shared Alma ILS that is tied closely to OCLC master records. Any time an OCLC master record is modified and replaced, by any OCLC member library, a new copy of that record is loaded into the Alliance ILS. Therefore, any URIs added locally will be wiped out when a new copy of the OCLC master record is overlaid. Consequently, the Alliance must wait until OCLC makes decisions about \$0 implementation.

IV. [Appendix: Questionnaire](#)

Questionnaire 2016 was sent to service providers with regard to their respective plans of implementing HTTP URIs in \$0.

Endnotes

1. Two discussion papers that were submitted at the 2016 Annual Conference in Orlando, both resulted in acceptance as proposals, [2016-DP18](#): Redefining Subfield \$0 to Remove the Use of Parenthetical Prefix "(uri)" in the MARC 21 Authority, Bibliographic, and Holdings Formats. [2016-DP19](#): Adding Subfield \$0 to Fields 257 and 377 in the MARC 21 Bibliographic Format and Field 377 in the MARC 21 Authority Format.
2. Proposal: [2017-01](#): Redefining Subfield \$4 to Encompass URIs for Relationships in the MARC 21 Authority and Bibliographic Formats
3. W3C (2008). Cool URIs for the Semantic Web. Section 3. URIs for Real-World Objects. Available: <https://www.w3.org/TR/cooluris/#semweb>
4. LC (2017). *Technical Notice. Additions to Source Codes for Vocabularies, Rules, and Schemes*. Available: <http://www.loc.gov/marc/relators/tn170310src.html>

Appendix

1. Cost:
 - 1.1. Add identifiers or URIs in \$0 on access points in **bibliographic** records
 - 1.2. Add identifiers or URIs (or both) in specific fields in **authority** records
2. Type of identifiers or URIs being added and where in MARC? String and/or URI
 - 2.1. 024
 - 2.2. 100
 - 2.3. 500
3. Type of vocabs and ontologies, fair to assume id.loc.gov default, VIAF/ISNI possibility with a charge, are there others?
 - 3.1. Coverage of works/expressions
 - 3.2. Reconciling access points only or other data elements, e.g. fixed field data?
4. If others, is the W3C specifications an expected standard?
5. Is there a relationship of authority and bib headings with the provided service?
6. How closely are you following the work of other vendors and service providers, e.g. Casalini, OCLC?
7. Are you following developments with local authorities, especially outside MARC, e.g. Opaque Namespace? What kind of role do you see for yourselves outside ILS projects?
8. What sorts of questions do you get from your customers about URI enrichment?
9. What about undifferentiated name records? How do you handle changes to URIs, e.g. when dupe authorities get cancelled, split, merged, etc.? Including new definition or subfield added? For instance, proposals and discussion papers from ALA 2017 Midwinter MAC agenda, http://www.loc.gov/marc/mac/mw2017_age.html.
10. What tools, services, and guidelines would help you with your URI enrichment work?
11. Are you doing the 36X-38X fields yet?