## BibFrame

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### Introduction

Bibframe is an initiative of the Library of Congress (LC) to provide a means of expressing bibliographic data for the future. One of the main motivations for embarking on the Bibframe project is to replace MARC. The need to replace MARC was largely born out of the U.S. national libraries' testing of RDA:

> Many survey respondents expressed doubt that RDA changes would yield significant benefits without a change to the underlying MARC carrier[1].

Bibframe is short for the BIBliographic FRAMEwork Initiative. It is being developed by LC together with the consultants Zepheira and a number of partners or early experimenters. Zepheira are consultants with expertise and experience with the Semantic Web, including work with OCLC on Schema.org as well as a new project with University of California, Davis to "investigate the future of research library operations, particularly the production of metadata — or data on data — and deployment on the Web.[2]" Its president, Eric Miller, has been prominent in the development of the Semantic Web and RDF. The partners include the British Library, Deutsche National-bibliothek, George Washington University, National Library of Medicine, OCLC, and Princeton University.

This article will focus primarily on the Bibframe model itself and what it looks like. A suggestion is also made for how cataloguers can compare existing MARC examples with how they might be represented in Bibframe, although care must be taken considering that Bibframe is still very much under development and conversions are automatic.

### Terminology and Examples

It is worth dwelling at least briefly on the name itself, which is officially all in capitals (BIBFRAME), although it is not an acronym. It seems, perhaps thankfully, to be not unacceptable to spell it with an initial capital only. In the interests of calm, Bibframe will be used throughout this article.

Examples will generally use the Turtle serialization of RDF. In brief, RDF represents all data as *triples*, which are simple statements with three elements:

> Subject - Predicate - Object

The *Subject* and *Object* are entities (thing, person, concept, anything) related by the Predicate. So, the Subject might be a book, the Object an author, related by a creation relationship as the *Predicate*. Each of these is normally identified by a URI- basically a URL used as an identifier, or a string of text. For example, *http://id.loc.gov/authorities/names/n78095332* is a URI coined by LC for Shakespeare. These can be shortened for readability by using a system of prefixes. The URI for the Bibframe creator relationship is *http://bibframe.org/vocab/creator*. With the following line…
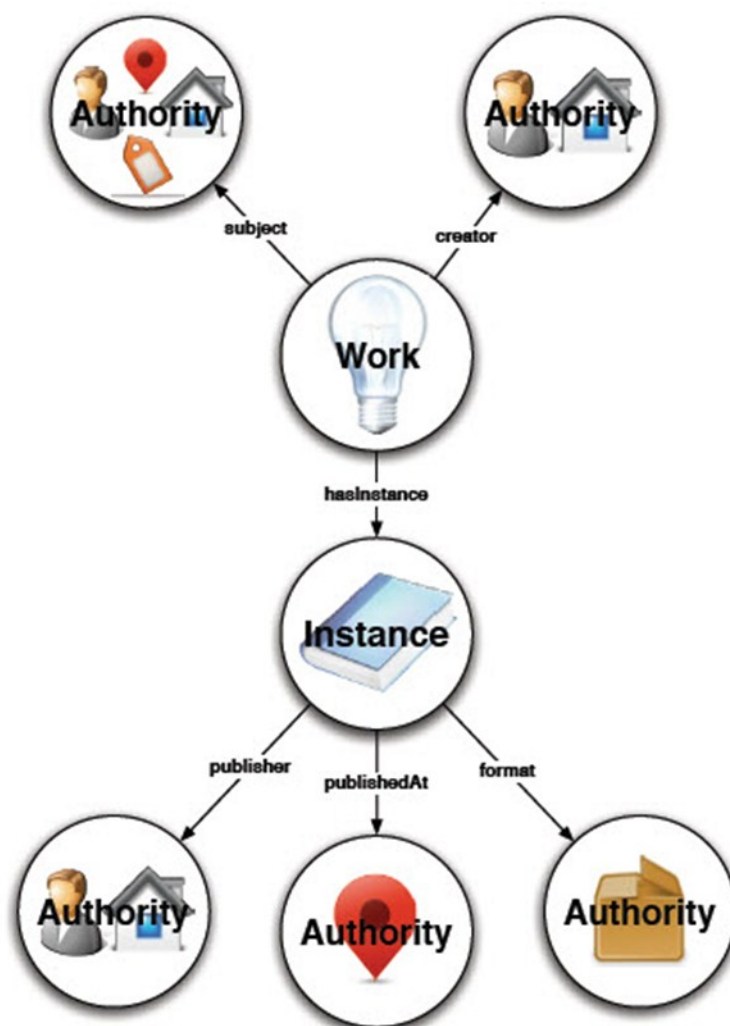
```
@prefix bf: <http://bibframe.org/vocab/> .
```

…this can be represented instead more succinctly as *bf:creator*. The prefix bf: will be used throughout this article although the prefix declaration will be omitted in examples; the prefix ex: will be used to refer to made up entities used as *ex*amples.. Note that where several triples have the same Subject, the Subject is not repeated on second and subsequent lines. Generally each triple ends in a full stop or a semicolon.

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[1] U.S. RDA Test Coordinating Committee. *Report and Recommendations of the U.S. RDA Test Coordinating Committee. Executive Summary.* 2011. P. 8. http://www.loc.gov/bibliographic-future/rda/source/rdatesting-finalreport-20june2011.pdf

[2] University of California, Davis. *UC Davis library to lead transformation of cataloging*. 2013. http://www.news.ucdavis.edu/search/news_detail.lasso?id=10752

**The Bibframe Model**

The basic Bibframe model is illustrated below.



Those familiar with the FRBR model will notice some similarities, in particular entities, or things, linked together with relationships. There are Works and Instances representing FRBR Group 1 entities, and Authorities representing Group 2 and 3 entities. There are also obvious differences such as the Group 1 entities being separated into Works and Instances rather than Works, Expressions, and Manifestations. We will consider these types of entity in turn.

**Work (and Expression…)**

The Bibframe Work is "a resource reflecting a conceptual essence of the cataloging resource". This is clearly similar to the FRBR Work defined as a "distinct intellectual or artistic creation"[4] The FRBR Expression- "the specific intellectual or artistic form that a work takes each time it is 'realized'"[5] is also conceptual: a specific French translation of Evelyn Waugh's *Decline and Fall* is still an abstract idea not tied to a particular printing or copy.

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[3] Bibliographic Framework Initiative. *The BIBFRAME Model*. http://bibframe.org/vocab-model/
[4] IFLA Study Group on the Functional Requirements for Bibliographic Records. *Functional requirements for bibliographic records : final report. 1998*. Section 3.2.1. http://archive.ifla.org/VII/s13/frbr/frbr1.htm#3.2
[5] IFLA Study Group on the Functional Requirements for Bibliographic Records. *Functional requirements for bibliographic records : final report. 1998*. Section 3.2.2. http://archive.ifla.org/VII/s13/frbr/frbr1.htm#3.2

Whereas Bibframe Instances map fairly well to FRBR Manifestations, there is an absence of anything where one might expect a FRBR Expression which is also conceptual: "the specific intellectual or artistic form that a work takes each time it is 'realized'". A specific French translation of Evelyn Waugh's *Decline and Fall* is still an abstract idea not tied to a particular printing or copy. However, Bibframe is not intended to be tied tightly to RDA and FRBR in the same way that MARC was tied to AACR; Bibframe is intended to accommodate a wider range of metadata and be useful to a wider community than traditional cataloguers:

> "In addition to being a replacement for MARC, BIBFRAME serves as a general model for expressing and connecting bibliographic data."[6]

It can still accommodate FRBR Works and Expressions and some attempt will be made in the following account to relate the two models.

That Bibframe, FRBR, and RDA all use the same word "Work" does not necessarily mean they are the same thing[7]. None of these are necessarily the same thing as the WorldCat Work described by Richard Wallis as:

> a high-level description of a resource, containing information such as author, name, descriptions, subjects etc., common to all editions of the work[8]

This is itself based on the CreativeWork defined by the Schema.org vocabulary.[9] However, they clearly have some similarity and the Bibframe Work can potentially accommodate these and other models. So, a FRBR Expression could also be represented as a Bibframe Work. How could this work in practice? First we will examine some basic properties of a Bibframe Work.

A Bibframe Work[10] is a type of Bibframe Resource. A Resource in this sense is the linked data sense of anything that can be given a name and described. A number of properties can be applied to any Resource ,[11] e.g.

```
bf:authorizedAccessPoint
bf:identifier
bf:label
bf:relatedTo
```

---

[6] Library of Congress. *Bibliographic Framework Initiative*. http://www.loc.gov/bibframe/

[7] To put it more flippantly: "Bibframe has worked on modelling works as Works within the Bibframe model, similar to the RDA modelling work, itself modelled on the work on the FRBR model of Works and Expressions. A Bibframe Work is a creative work, perhaps a FRBR Work, or an RDA FRBR Work but it also expresses a FRBR Expression, and of course an RDA FRBR Expression. A Work may express another Work based on others' work, not just a FRBR Work or an RDA Work. That also works. FRBR Works or RDA Works expressed as Bibframe Works can relate to FRBR Expressions (Bibframe Works or RDA Expressions). So, Works are works that can be Works but also Expressions linked to Works that really are Works." Meehan, Thomas. *The BIBFRAME Work*. http://www.aurochs.org/aurlog/2013/05/25/the-bibframe-work/

[8] Wallis, Richard. *OCLC Preview 194 Million Open Bibliographic Work Descriptions*. 2014. http://dataliberate.com/2014/02/oclc-preview-194-million-open-bibliographic-work-descriptions/

[9] Schema.org. *CreativeWork*. http://schema.org/CreativeWork

[10] Bibliographic Framework Initiative. *Work*. http://bibframe.org/vocab/Work.html

[11] Bibliographic Framework Initiative. *Resource*. http://bibframe.org/vocab/Resource.html

An *identifier* is a "number or code that uniquely identifies an entity"; a *label* is most commonly the textual name of something: "Bombus vestalis", "Tom", "Evelyn Waugh", "Decline and fall"; an *authorizedAccessPoint* access point would be a controlled name such as we are used to in authority work. All of these can be applied to a Work. In addition, Bibframe lays out a great many additional properties specifically for a Work, including the following:

```
bf:contributor
bf:creator
bf:language
bf:title
```

It would be straightforward to imagine how relevant RDA elements could be mapped to these (albeit with some interesting questions about subtitles, part titles, parellel titles and so on...). Note however that contributor and language are RDA Expression elements, while creator and title are RDA Work elements. There are also properties showing relationships to other Bibframe Works, for example:

```
bf:translation
bf:translationOf
```

In the above case, these would be found in RDA Expression records. What really clarifies this are the following two properties of Bibframe Work:

```
bf:expressionOf
bf:hasExpression
```

In the following example, *eg:wk0123* represents Evelyn Waugh's Brideshead revisited, an RDA work, as a Bibframe Work:

```
ex:wk0123    a bf:Work ;
             bf:authorizedAccessPoint "Waugh, Evelyn, 1903-1966. Brideshead revisited" ;
             bf:hasExpression ex:exp0456
```

The first line says that *eg:wk0123* is a Bibframe Work; the second gives a controlled name, in this case the LC authorized form; the third line says that this FRBR Work is related to a FRBR Expression. Here is an example for that Expression:

```
ex:exp0456   a bf:Work ;
             bf:authorizedAccessPoint "Waugh, Evelyn, 1903-1966. Brideshead revisited.
             Russian" ;
             bf:expressionOf ex:wk0123 .
```

The first line says that *ex:exp0456* is also a Bibframe Work; the second again gives a controlled name, in this case qualified by language; the third line relates the FRBR Expression back to the FRBR Work., So, *ex:exp0456* is both a Bibframe Work and a FRBR Expression.

**Instance**

The Bibframe Instance is distinct and is analogous to the FRBR Manifestation: a "resource reflecting an individual, material embodiment of the Work."[12] Any of the four Resource properties can be applied to the Instance, as well as a number of specific ones, including:

```
bf:edition
bf:isbn
bf:instanceOf
bf:publication
bf:titleStatement
```

---

[12] Bibliographic Framework Initiative. *Instance.* http://bibframe.org/vocab/Instance.html

*Edition* and *isbn* are straightforward; *titleStatement* is for a transcribed title, such as you might find in AACR2 or RDA, and *publication* links to further details about places, publishers, and dates. *InstanceOf* provides a link back to a Bibframe Work, so we might extend our example as follows, also adding the complementary Work property *hasInstance*:

```
ex:wk0123    a bf:Work ;
             bf:authorizedAccessPoint "Waugh, Evelyn, 1903-1966. Brideshead revisited" ;
             bf:hasExpression ex:exp0456 .

ex:exp0456   a bf:Work ;
             bf:authorizedAccessPoint "Waugh, Evelyn, 1903-1966. Brideshead revisited.

Russian" ;
             bf:expressionOf eg:wk0123 ;
             bf:hasInstance ex:inst0789

ex:inst0789  a bf:Instance ;
             bf:titleStatement "Vozvrashchenie v Braĭdskhed" ;
             bf:instanceOf ex:exp0456
```

In this example, *ex:wk0123* is a FRBR Work represented as a Bibframe Work; *ex:exp0456* is a FRBR Expression also represented as a Bibframe Work; finally, *ex:inst0789* is a FRBR Manifestation represented as a Bibframe Instance. They are related to each other and have properties of their own.

### Authority

The Bibframe Authority represents "People, Places, Topics, Organizations, etc."[13] However, the way it does so is not necessarily quite so straightforward as one might expect in a linked data context. The classic linked data example of a book and its author looks something like this:



Or,                                                                              in

Bibframe triples:

```
ex:wk666     a bf:Work ;

             bf:creator <http://id.loc.gov/authorities/names/n79049248> .
```

The Work *ex:wk666* has a creator identified by the LC URI on the right, which represents Evelyn Waugh. However, Bibframe is concerned to preserve some aspects of traditional authority control. A typical name index on a library catalogue might be made up of authorised headings linked to  locally held LC Authority records as well as unauthorised headings with no corresponding authority record and therefore, in linked data terms, no URI to link to. The library might not undertake its own authority work or might simply have a large number of headings it does not have the time to authorise. Bibframe uses what it calls a "lightweight abstraction layer" to sit in the middle between a Work or Instance and an external authority:

---

[13] Bibliographic Framework Initiative. *Authority.* http://bibframe.org/vocab/Authority.html

In Bibframe triples, the arrangement looks like this:

```
ex:wk666        a Work ;
                bf:creator ex:person99

ex:person99     a bf:Person ;
                authorizedAccessPoint "Waugh, Evelyn,1903-1966."
                hasAuthority <http://id.loc.gov/authorities/names/n79049248>
```

In this example, the book again has a creator, but they are not identified directly by the LC Authorities URI. Instead, a local authority- *ex:person99*- is used: this is a Bibframe Authority. There are several different kinds of Bibframe Authority: agents, places, times, and topics; in turn, there are several types of Agent: Person, Family, Organization, Jurisdiction, and Meeting. Evelyn Waugh is clearly a Person, so the first triple of the Authority section says so:

```
ex:person99   a bf:Person ;
```

We can assign it a heading using the *authorizedAccessPoint* property:

```
ex:person99 authorizedAccessPoint "Waugh, Evelyn,1903-1966." ;
```

This is the same as the 100 field in a MARC authority record which records the definitive textual string identifying a person.  We can give the specific URI for this authority so the system has a link to follow, or as a source of variant or updated names:

```
ex:person hasAuthority <http://id.loc.gov/authorities/names/n79049248> .
```

This explicit linking is not something we can currently do in MARC without following something along the lines of Karen Coyle's recommendation to use the subfield $0[14]. Bibframe also provides ways of recording which authority scheme has been used, e.g. Library of Congress or MeSH, using the *authoritySource* property (akin to the second indicator of a 650 field).

## Annotation

Annotation is the fourth class of resource in the Bibframe model which adds further information about a resource such as a Bibframe Work[15] . An Annotation could comprise cover art, a review, summary, or, more controversially, holdings. In these cases, Annotations also provides a mechanism to record who made the link between, for example, a book and a review of the book. Individual libraries might for example want to highlight different book reviews for their readers or display cover art matching the actual printing they have in stock. Below is an example in Turtle for linking the Work *Brideshead Revisited* with a summary of the book:

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[14] Coyle, Karen. *Linked Data First Steps & Catch-21*. 2013. http://kcoyle.blogspot.co.uk/2013/07/linked-data-first-steps-catch-21.html

[15] Bibliographic Framework Initiative. *Annotation.* http://bibframe.org/vocab/Annotation.html

```
ex:wk005        a bf:Work ;
                bf:authorizedAccessPoint "Waugh, Evelyn, 1903-1966. Brideshead revisited" ;
                bf:hasAnnotation ex:ann010 .


ex:ann010       a bf:Summary ;
                bf:summaryOf ex:wk005 ;
                bf:annotationAssertedBy <http://id.loc.gov/vocabulary/organizations/ukluc> ;
                bf:annotationDate "20131125" ;
                bf:annotationSource <http://dbpedia.org/resource/Decline_and_Fall> ;
Waugh, first published in 1928. It was Waugh's first published novel; an earlier attempt, entitled
The Temple at Thatch, was destroyed by Waugh while still in manuscript form. Decline and Fall is
based in part on Waugh's undergraduate years at Hertford College, Oxford, and his experience as a
teacher in Wales. It is a social satire that employs the author's characteristic black humour in lam-
pooning various features of British society in the 1920s. The novel's title is a contraction of Ed-
ward Gibbon's The History of the Decline and Fall of the Roman Empire."
```

The first two triples say that the book *ex:wk005* is a Bibframe Work and that it is an edition of *Brideshead Revisited*. The third triple make the link to the Annotation. The Annotation named *ex:ann010* in this case identifies itself as a Bibframe Summary and makes a reciprocal link back to the Work using the the *summaryOf* property. The *annotationAssertedBy* property is the part which specifies which library wanted to link the book to the summary; the URI above is from the list of LC institution codes (also available as linked data)[16] and specifies University College London (UCL). The *annotationSource* gives the source of the summary, in this case DBpedia (the linked data version of Wikipedia)[17] and the *startOfSummary* contains the start of the summary itself. Bibframe provides a number of similar properties for the whole summary or other type of Annotation.

## Getting More Examples

Examples are often the best way to get a grip on this kind of thing and the Bibframe website provides a means of getting Bibframe data that has been converted from LC's MARC21 record.

- Go to the **MARC to BIBFRAME Comparison Service** page: *http://bibframe.org/tools/compare/*
- Enter an LC system number (e.g. 10342843) and click on **Run Comparison**
- Select **BIBFRAME RDF/XML** view. As RDF/XML is not always easy to read, you might want to convert this to Turtle, as used in this article, in which case:
- Copy the result and paste it into the **Input Field** tab at this RDF converter *http://rdf-translator.appspot.com/.* Make sure there are no stray blank lines or bits of text.
- Select **N3** (i.e. Turtle) output.
- Submit!

## The Future

Bibframe is still very much a work in progress. The general model described above has been fairly stable since it was first proposed although the precise properties and details have changed considerably over time. It will doubtless continue to do so although in 2014 the emphasis moved more towards testing the existing work. An "Implementation Testbed" has been set up. This is aimed at organisations who will be expected to:

- have developed or be developing a BIBFRAME implementation;
- participate in testing;
- participate in listserv discussion;
- report results of testing;

as well as "make an earnest effort to participate in conference calls" [18].LC is also maintaining a "BIBFRAME Implementation Register" of planned or existing implementations. Activities by several of the partners and Colorado College have already been registered.[19] One of the most interesting is the Deutsch Nationalbibliothek's addition of an option to view a Bibframe representation of a record on their catalogue.[20]

The big question is of course when, and indeed if, Bibframe will be widely adopted. It is certainly impossible to predict at this point. It has the backing of LC as well as significant libraries as partners, but there is clearly a shift needed in either the capabilities of library management systems or a change to the systems used by libraries before adoption can be contemplated if successful adoption means the replacement of MARC. There is no Scenario 3 where we can use existing systems with a few tweaks. This applies of course to any linked data implementation and, in some respects, Bibframe is already playing catch-up. The British National Bibliography, for instance, already publishes linked data using its own data model. [21] Like the BNB, the Europeana data model

> re-uses elements coming from already-established vocabularies, such as Dublin Core, OAI-ORE, SKOS and CIDOC-CRM, thus lowering the cost of its creation and, hopefully, its adoption [22]

This is in contrast to the approach taken by Bibframe:

> There are many benefits of vocabulary reuse, but as with many things, there are costs as well that need to be carefully considered. Designing systems that leverage multiple vocabularies managed by various stakeholders is a tricky issue and one that requires careful consideration. There are many reasons why namespaces/vocabularies "drift" over time ("not found" errors being a worse case example) and all of these may have an affect on systems. Business acquisitions, economic factors, organizational changes, changing social interests, etc. are just a handful of reasons for causing such change. Thinking ahead to infrastructure to support the next 40+ years of libraries, namespace persistence is a key point to consider when dealing with how best to integrate and invest in vocabulary terms outside of ones community[23].

With RLUK joining the European Library in 2013[24] there is also the prospect of 200 million records from UK academic libraries becoming available as linked data using the Europeana Data Model. Will there be incentives for this data to be converted to Bibframe, whether as a replacement or in parallel, especially when the re-use of existing vocabularies is often considered as more within the spirit of linked data?

18 Library of Congress. *BIBFRAME Implementation Testbed.*
http://www.loc.gov/bibframe/implementation/testbed.html

19 Library of Congress. *BIBFRAME Implementation Registe*r.
http://www.loc.gov/bibframe/implementation/register.html

20 Deutsche Nationalbibliothek. *Katalog der Deutschen Nationalbibliothek.* http://www.dnb.de/katalog

21 British Library. *Free Data Services: Linked Open BNB*. http://www.bl.uk/bibliographic/datafree.html#lod

22 Europeana. *Technical Details.* http://pro.europeana.eu/tech-details

23Library of Congress. *BIBFRAME Frequently Asked Questions*. http://www.loc.gov/bibframe/faqs/#q06

24 European Library. *Research Libraries UK (RLUK) Joins the European Library*. 2013. http://www.theeuropeanlibrary.org/tel4/newsitem/2450

It is perhaps likely that there will not be a direct substitution of Bibframe for MARC. It seems unlikely, and undesirable, that cataloguers will be inputting bibliographic data using Bibframe vocabulary directly, although the continued prevalence of MARC-based input forms might cast some doubt on that. There has been some work on developing a prototype Bibframe editor, as described at an ALCTS forum in January 2014:

> A demo of BIBFRAME Editor illustrated a dynamic interface, in which users select an item type (such as image, electronic article or paperback book), and enter information into the BIBFRAME Editor form. As the user enters properties, like subject, artist, author, or language, a dropdown list appears and the user can choose the desired description, in a way that is visually the same as what we have become used to seeing as we type search terms in a search engine. Images, such as cover art for an album, can be dragged and dropped into the BIBFRAME Editor as well. Once completed, that record can be saved and exported [25]

The move from MARC to a linked data solution will in many ways be more profound than that from AARC2 to RDA. To what extent Bibframe is the principal answer, or instead part of a largely hybrid solution in partnership with other models and vocabularies, remains to be seen.

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[25] ALCTS. *CaMMS Forum: Bibframe*. 2014. http://www.ala.org/alctsnews/conf/mw14-camms-forum

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