bibliotek-o Titles Pattern

NOTE: the following represents the direction taken by the LD4L Labs and LD4P Ontology Group in the development of bibliotek-o and may not be fully formed. This pattern document was used internally to define a direction and is shared with the intention of contextualizing a pattern found within the ontology; terms specified below may not fully align to the ontology as published. Further, discussion of BIBFRAME 2.0 may be out-of-date.

2016 December

Introduction

This document describes the bibliotek-o title model. It includes diagrams, sample RDF, rationales, and comparisons with BIBFRAME 2.0 and LD4L-O v1 where these shed light on the issues. It also includes formal requests for modifications to specific BIBFRAME 2.0 terms to allow reuse by bibliotek-o. Finally, for issues that are currently unresolvable or out of scope, it enumerates open questions and directions for future research.

The discussion is organized into the following topics:

1. Resource-to-title relationships
2. Title class hierarchy
3. Title sources
4. Title origins
5. Title elements
6. Other title properties

Requests for Modifications to BIBFRAME 2.0

Open Requests

There are no open requests. All requests have been either approved or denied.

Approved Requests

These requests have been approved by LC, though not yet published in the current BIBFRAME 2.0 spec.

- Define bf:titleOf as inverse of bf:title.
    - If request is denied, LD4L-O will define bib:isTitleOf as inverse of bf:title.

- Eliminate Title subclasses bf:WorkTitle and bf:InstanceTitle.
- bf:translation is defined as a subproperty of bf:derivativeOf, and bf:translationOf a subproperty of bf:hasDerivative. Should these be turned around? I.e., bf:translation a subproperty of bf:hasDerivative, and bf:translationOf a subproperty of bf:derivativeOf.
    - This request may or may not be relevant to the Title model, depending on the as-yet-to-be-defined bibliotek-o ParallelTitle model. But it is good to correct it.

Rejected Requests

These requests have been rejected by LC. bibliotek-o action is stated.

- Title class hierarchy
    - Eliminate the subclass of bf:Title, bf:VariantTitle, making the various Title subclasses direct subclasses of bf:Title.
    - bibliotek-o will define the following direct bf:Title subclasses in its own namespace:
        - bib:AbbreviatedTitle
        - bib:KeyTitle
    - Provide a definition and examples of the use of bf:CollectiveTitle, so that LD4L can evaluate whether to reuse it (if bf:VariantTitle is removed).
        - LD4L will not use CollectiveTitle.
    - Define the following additional bf:Title subclasses:
        - bf:ConciseTitle
        - bf:DistinctiveTitle
        - LD4L-O will define these classes in its own namespace.
    - bf:ParallelTitle: The Ontology Group has not yet discussed parallel titles. If the group does not have time to develop a recommendation, it will reuse bf:ParallelTitle (if bf:VariantTitle is removed). Otherwise, and if the proposed bibliotek-o model differs from the BIBFRAME 2.0 model, there may be additional requests related to ParallelTitle.
        - LD4L will define ParallelTitle in its own namespace.
    - Remove the class bf:CollectiveTitle. If the work is a collection, it has a title. If the work is in a collection, it has its own title, as well as being part of the collection, from which the collective title can be derived.
        - bibliotek-o will ignore the type bf:CollectiveTitle.
- Title source
    - Remove the specified range of bf:source (bf:Source) so that any resource may serve as its object.
        - bibliotek-o will define bib:hasSource and bib:isSourceOf, domain and range unspecified.
- Define bf:preferredTitle and inverse bf:preferredTitleOf to indicate primary Title of a resource. The predicates should be subproperties of bf:title and bf:titleOf, respectively.

    - LD4L-O will define properties bib:isPreferredTitle and bib:isPreferredTitleOf in its own namespace.
- Title origin
    - Define object property bf:origin to designate the part of a resource from which the Title was derived (e.g., container, spine).
        - LD4L-O will define bib:hasOrigin.
    - Define the following owl:NamedIndividuals in an id.loc.gov namespace to serve as objects of bf:origin. We expect that other origins may be defined as the need arises.
        - addedTitlePage
        - binder
        - caption
        - container
        - cover
        - margin (for RunningTitle)
        - spine
        - supplied
        - Transcribed
            - LD4L-O will define these named individuals in its namespace.
- Title elements
    - Define the following classes to represent parts of a Title:
        - bf:TitleElement. Subclasses
            - bf:NonSortTitleElement
            - bf:MainTitleElement
            - bf:SubtitleElement
            - bf:PartNumberElement
            - bf:PartNameElement
    - Use dcterms:hasPart and dcterms:isPartOf to relate a Title to its component TitleElements and the reverse.
    - Use vivo:rank to sort TitleElements of a Title, where this order is known.
    - If the requests are denied, LD4L-O will:
        - Mint the TitleElement terms in its own namespace.
        - Reuse dcterms:hasPart and dcterms:isPartOf to relate Title to TitleElements and the reverse.
        - Use vivo:rank to order the TitleElements within a Title.
- Other Title properties
    - Use dcterms:date rather than defining a new predicate bf:date to express specific time periods associated with a Title, if known.
        - LD4L-O will reuse bf:date.
    - Leave expected subject and object of bf:translation and bf:translationOf so that they could also be used to relate Titles to one another.
        - These are not formal domain and range specifications in BIBFRAME 2.0, but are described as “expected” usage and value in rdfs:comments.

- This request may or may not be relevant to the Title model, depending on the as-yet-to-be-defined bibliotek-o ParallelTitle model.
- LD4L will use the bf:translation and bf:translationOf terms with no modification. Caveat: May use RDAU properties instead: see Relations Recommendation.

The BIBFRAME 2.0 Title Model

Reference: BIBFRAME 2.0 Title Specification.

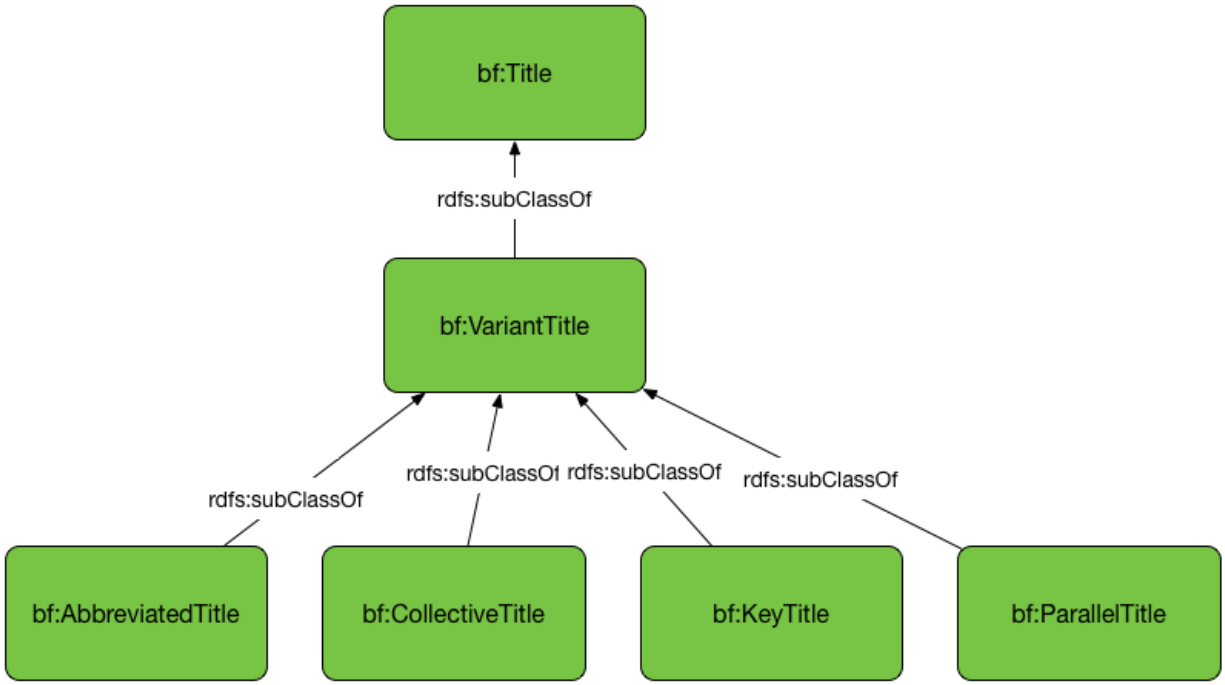
BIBFRAME 2.0 Resource-to-Title Relationships

bf:title (object property)

Label: Title resource
URI: http://id.loc.gov/ontologies/bibframe/title
Definition: Name given to a resource.
Comment: Used with Work, Instance or Item
Range: bf:Title

BIBFRAME 2.0 Title Class Hierarchy

Diagram 1. BIBFRAME 2.0 Title Class Hierarchy



bf:Title

Label: Title entity
URI: http://id.loc.gov/ontologies/bibframe/Title
Definition: Title information relating to a resource: mail title, translated title, or variant form of title.

~~bf:WorkTitle~~

~~**Label**: Work title~~
~~**URI**: http://id.loc.gov/ontologies/bibframe/WorkTitle~~
~~**Definition**: Title or form of title chosen to identify the work, such as a preferred title, preferred title with additions, uniform title, etc.~~
~~**Subclass of**: http://id.loc.gov/ontologies/bibframe/Title~~
Removed

~~bf:InstanceTitle~~

~~**Label**: Instance title~~
~~**URI**: http://id.loc.gov/ontologies/bibframe/InstanceTitle~~
~~**Definition**: Title chosen as the name of an Instance, sometimes called "title proper" and often transcribed from the instance.~~
~~**Subclass of**: http://id.loc.gov/ontologies/bibframe/Title~~
Removed

bf:VariantTitle

Label: Title variation
URI: http://id.loc.gov/ontologies/bibframe/VariantTitle
Definition: Title associated with the resource that is different from the Work or Instance title.
Subclass of: http://id.loc.gov/ontologies/bibframe/Title
Defined subclasses: bf:AbbreviatedTitle, bf:CollectiveTitle, bf:KeyTitle, bf:ParallelTitle
Commentary: The VariantTitle and its subclasses represent alternate, non-primary titles.

bf:AbbreviatedTitle

Label: Abbreviated title
URI: http://id.loc.gov/ontologies/bibframe/AbbreviatedTitle
Definition: Title as abbreviated for citation, indexing, and/or identification.
Subclass of: http://id.loc.gov/ontologies/bibframe/VariantTitle

bf:CollectiveTitle

Label: Collective title
URI: http://id.loc.gov/ontologies/bibframe/CollectiveTitle
Definition: Title for a compilation of resources.
Subclass of: http://id.loc.gov/ontologies/bibframe/VariantTitle
See explanation of BIBFRAME 2.0 CollectiveTitle.

bf:KeyTitle

Label: Key title
URI: http://id.loc.gov/ontologies/bibframe/KeyTitle
Definition: Unique title for a continuing resource that is assigned by the ISSN International Center in conjunction with an ISSN.
Subclass of: http://id.loc.gov/ontologies/bibframe/VariantTitle

bf:ParallelTitle

Label: Parallel title proper
URI: http://id.loc.gov/ontologies/bibframe/ParallelTitle
Definition: Title in another language and/or script.
Subclass of: http://id.loc.gov/ontologies/bibframe/VariantTitle

BIBFRAME 2.0 Title Sources

bf:source (object property)

Label: Source
URI: http://id.loc.gov/ontologies/bibframe/source

Definition: Resource from which value or label came or was derived, such as the formal source/scheme from which a classification number is taken or derived, list from which an agent name is taken or derived, source within which an identifier is unique.
Comment: Used with Unspecified
Domain: unspecified
~~**Range**: bf:Source~~ ***Removed***
Commentary: May be supplied for a VariantTitle (see BIBFRAME 2.0 Title Specification).

bf:Source

Label: Source
URI: http://id.loc.gov/ontologies/bibframe/Source
Definition: Resource from which value or label came or was derived.

BIBFRAME 2.0 Title Elements

bf:mainTitle (datatype property)

Label: Main title
URI: http://id.loc.gov/ontologies/bibframe/mainTitle
Definition: Title being addressed. Possible title component.
Domain: bf:Title
Range: rdfs:Literal

bf:subtitle (datatype property)

Label: Subtitle
URI: http://id.loc.gov/ontologies/bibframe/subtitle
Definition: Word, character, or group of words and/or characters that contains the remainder of the title after the main title. Possible title component.
Domain: bf:Title
Range: rdfs:Literal

bf:partNumber (datatype property)

Label: Part number
URI: http://id.loc.gov/ontologies/bibframe/partNumber
Definition: Part or section enumeration of a title. Possible title component.
Domain: bf:Title
Range: rdfs:Literal

bf:partName (datatype property)

Label: Part title
URI: http://id.loc.gov/ontologies/bibframe/partName
Definition: Part or section name of a title. Possible title component.
Domain: bf:Title

Range: rdfs:Literal

Other BIBFRAME 2.0 Title Properties

bf:date (datatype property)

Label: date
URI: http://id.loc.gov/ontologies/bibframe/date
Definition: Date designation associated with a resource or element of description, such as date of title variation; year a degree was awarded; date associated with the publication, printing, distribution, issue, release or production of a resource. May be date typed.
Comment: Used with Unspecified
Domain: unspecified
Range: rdfs:Literal (may be typed)

bf:variantType (datatype property)

Label: Variant title type
URI: http://id.loc.gov/ontologies/bibframe/variantType
Definition: Type of title variation, e.g., acronym, cover, spine, earlier, later, series version.
Domain: bf:VariantTitle
Range: rdfs:Literal

From BIBFRAME 2.0 Title Specification**:** Used to specify type of VariantTitle when no defined subclass exists; e.g., “spine”.

bf:qualifier (datatype property)

Label: Qualifier
URI: http://id.loc.gov/ontologies/bibframe/qualifier
Definition: Qualifier of information, such as an addition to a title to make it unique, or qualifying information associated with an identifier.
Comment: Used with Unspecified
Domain: unspecified
Range: rdfs:Literal
Commentary: From BIBFRAME 2.0 Title Specification**:** May occur within the Title resource.

rdfs:label

Label: Label
URI: https://www.w3.org/2000/01/rdf-schema#label
Definition: A human-readable name for the subject.
Domain: rdfs:Resource
Range: rdfs:Literal

Commentary: From BIBFRAME 2.0 Title Specification**:** May be used to supply the “title string.” The title string may be a constructed or simple title; may include parts main title, subtitle, part name and number, and other information, concatenated into a single string.

Comments about the BIBFRAME 2.0 Title Model

These comments are irrelevant to bibliotek-o because they involve terms that it will not adopt. They are pointed out only for the sake of internal consistency in BIBFRAME 2.0.

- bf:WorkTitle and bf:InstanceTitle were removed at the request of LD4L/P, who argued that they simply encode the type of the subject of a bf:title assertion, and are thus redundant. While this is true, these classes were also used to differentiate primary Titles from secondary Titles (bf:VariantTitle and its subclasses). With the removal of bf:WorkTitle and bf:InstanceTitle, the primary Title can no longer be designated: in the open world, the absence of an assertion that a Title is a bf:VariantTitle does not allow the inference that the Title is *not* a VariantTitle and that it is therefore a primary Title. LD4L uses the predicate bib:hasPreferredTitle to indicate primary Title.
- Some examples of bf:variantType (e.g., “spine” and “cover”) can be removed if BIBFRAME 2.0 defines the bf:origin predicate.

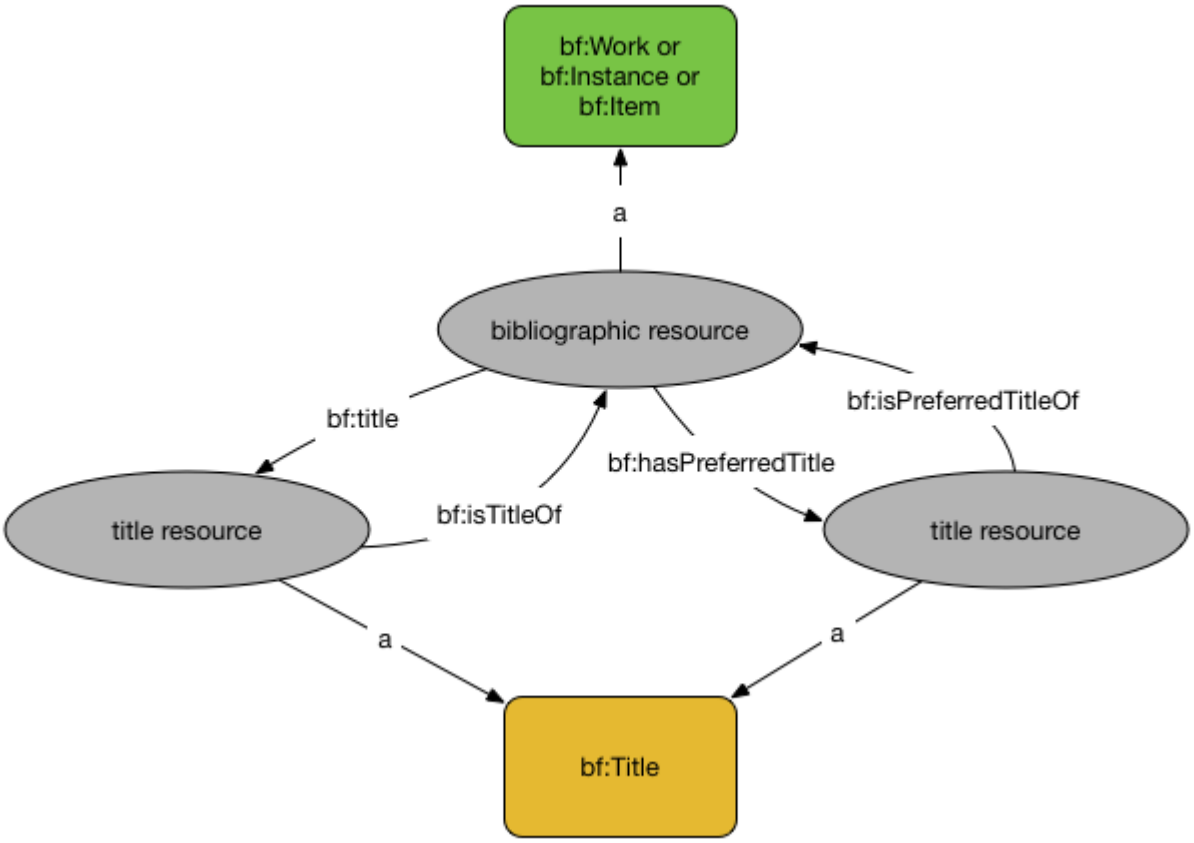
bibliotek-o Title Model

Note: These proposals assume the acceptance of the LD4L Labs / LD4P Ontology Group’s requests for BIBFRAME 2.0 modifications. Appropriate adjustments, as indicated with the requests, will be made for those that are not accepted. The full formal specification is included in an appendix.

The LD4L-O v1 model is included in an appendix, for reference.

bibliotek-o Resource-to-Title Relationships

Diagram 2. bibliotek-o Resource-to-title relationships



bf:title (object property)

Label: Title resource
URI: http://id.loc.gov/ontologies/bibframe/title
Definition: Name given to a resource.
Comment: Used with Work, Instance or Item
Domain: unspecified
Range: bf:Title
Inverse: bf:titleOf

bf:titleOf (object property)

Label: title of
URI: http://id.loc.gov/ontologies/bibframe/titleOf
Definition: This Title is the title of the resource

Domain: bf:Title
Range: unspecified
Inverse: bf:title
Comment: Expected value Work, Instance, or Item

bf:preferredTitle (object property)

Label: preferred title
URI: http://id.loc.gov/ontologies/bibframe/preferredTitle
Definition: Specifies the preferred Title of this resource.
Domain: unspecified
Range: bf:Title
Subproperty of: bf:title
Inverse: bf:preferredTitleOf
Comment: A resource may have multiple directly linked Titles, among which this is the preferred Title.

bf:preferredTitleOf (object property)

Label: preferred title of
URI: http://id.loc.gov/ontologies/bibframe/titleOf
Definition: This Title is the preferred Title of the resource
Domain: bf:Title
Range: unspecified
Inverse: bf:preferredTitle
Subproperty of: http://id.loc.gov/ontologies/bibframe/titleOf
Comment: A resource may have multiple directly linked Titles, among which this is the preferred Title.

bibliotek-o Title Class Hierarchy

bibliotek-o Title Superclass

The superclass of all Title classes is bf:Title:

bf:Title

Label: Title entity
URI: http://id.loc.gov/ontologies/bibframe/Title
Definition: Title information relating to a resource: mail title, translated title, or variant form of title.

Before considering the details of the Title class hierarchy, we begin with some general issues related to Title types.

Primary and Variant Titles

There is a need to distinguish the primary or preferred Title of a resource from other Titles.

In the original version of BIBFRAME 2.0, every title was either a bf:WorkTitle, a bf:InstanceTitle, or a bf:VariantTitle, and the three are pairwise disjoint (though not explicitly defined as such). All other Title classes are subclasses of bf:VariantTitle. The bf:WorkTitle and bf:InstanceTitle are meant to represent the primary title, while the bf:VariantTitle and its subclasses represent alternate, non-primary titles.

Since the initial release of BIBFRAME 2.0, the bf:WorkTitle and bf:InstanceTitle classes have been removed. This was in response to LD4L Labs / LD4P Ontology Group, who argued that these classes redundantly embed the type of bibliographic resource related to the Title into the Title type itself. That is, the fact that a Title is a bf:WorkTitle simply means that it is linked to a bf:Work resource.

It was not clearly understood at the time that these classes were also used to designate the primary title, and that they did therefore carry some new information. With the removal of these classes BIBFRAME 2.0 has no way to designate a primary Title: the open world assumption does not allows us to conclude from the fact that an entity is typed only as bf:Title that it is *not* a bf:VariantTitle. BIBFRAME 2.0 would need to define an opposing class such as bf:PrimaryTitle or bf:PreferredTitle to designate this.

The problem with this approach is that VariantTitle entities may be the primary title of a resource; e.g., the ContainerTitle of a CD. The distinction between VariantTitle and primary title is therefore not valid.

In bibliotek-o, the primary title is indicated through use of the bib:hasPreferredTitle predicate. The various classes of subtitles are direct subclasses of bf:Title. This allows Titles of any type to be designated as the primary Title.

The bf:variantType and bf:qualifier properties are not used in bibliotek-o, for similar reasons. In addition, the LD4L Labs / LD4P Ontology Group recommends the use of object properties with controlled vocabularies, either through subclassing or owl:NamedIndividuals, rather than string values.

Title Subclasses

LD4L-O v1 relied on a number of Title subclasses to express specific types of Titles: bib:AbbreviatedTitle, bib:CoverTitle, bib:SpineTitle, etc. (see LD4L-O v1 Title Class Hierarchy).

It has since been recognized that several of these subclasses are best expressed as the Title source or origin rather than type. The bibliotek-o Title class hierarchy thus uses and/or defines a

more limited number of Title subclasses. See the following sections on the bibliotek-o Title Source Model and bibliotek-o Title Origin Model.

In the interest of producing a “minimal viable ontology” we will agree now on a provisional set of subclasses and leave the others for further consideration as needed by tool development and/or as further use cases arise.

bf:CollectiveTitle may or may not be adopted, depending on clarification and examples from LC.

ParallelTitles are postponed for later consideration due to the number of cases and complications involved. bf:ParallelTitle will be adopted in the absence of an LD4L-O proposal.

bf:AbbreviatedTitle

Label: Abbreviated title
URI: http://id.loc.gov/ontologies/bibframe/AbbreviatedTitle
Definition: Title as abbreviated for citation, indexing, and/or identification.
Subclass of: http://id.loc.gov/ontologies/bibframe/Title

bf:CollectiveTitle

Label: Collective title
URI: http://id.loc.gov/ontologies/bibframe/CollectiveTitle
Definition: Title for a compilation of resources.
Subclass of: http://id.loc.gov/ontologies/bibframe/Title
Comment: We recommend deleting this type: if the work is a collection, it has a title. If the work is in a collection, it has its own title, as well as being part of the collection, from which the collective title can be derived.

bib:ConciseTitle

Label: Concise title
URI: http://bibliotek-o.org/ontology/ConciseTitle
Comment: The concise version of a Title.
Subclass of: http://id.loc.gov/ontologies/bibframe/Title
Example: ‘Modern Writing’ could serve as the concise title for ‘The Berkley Book of Modern Writing’.

bib:DistinctiveTitle

Label: Distinctive title
URI: http://bibliotek-o.org/ontology/DistinctiveTitle
Comment: Special title that appears in addition to the regular title on individual issues of a work and by which the issue may be known.
Subclass of: http://id.loc.gov/ontologies/bibframe/Title

bf:KeyTitle

Label: Key title
URI: http://id.loc.gov/ontologies/bibframe/KeyTitle
Definition: Unique title for a continuing resource that is assigned by the ISSN International Center in conjunction with an ISSN.
Subclass of: http://id.loc.gov/ontologies/bibframe/Title

bf:ParallelTitle

Label: Parallel title proper
URI: http://id.loc.gov/ontologies/bibframe/ParallelTitle
Definition: Title in another language and/or script.
Subclass of: http://id.loc.gov/ontologies/bibframe/Title

bibliotek-o Title Source Model

Proposed by LC and adopted by bibliotek-o: Title sources, which are URI resources, are distinguished from Title origins, which indicate a non-resource location from which the Title was derived (e.g., cover, spine). See details on Title origins in bibliotek-o Title Origin Model.

bf:source (object property)

Label: Source
URI: http://id.loc.gov/ontologies/bibframe/source
Definition: Resource from which value or label came or was derived, such as the formal source/scheme from which a classification number is taken or derived, list from which an agent name is taken or derived, source within which an identifier is unique.
Domain: unspecified
Range: unspecified
Inverse: http://id.loc.gov/ontologies/bibframe/sourceOf

bf:sourceOf (object property)

Label: is source of
URI: http://id.loc.gov/ontologies/bibframe/sourceOf
Comment: The subject is the source of the object.
Domain: unspecified
Range: unspecified
Inverse: http://id.loc.gov/ontologies/bibframe/source

Domains and ranges of these predicates are deliberately undefined so that the can have broad applicability to:

- Many types of entities that have sources
- Many types of entities that serve as sources

dcterms:source was considered and rejected:

- Semantics may be inappropriate. The definition of dcterms:source is “A related resource from which the described resource is derived.” It was originally conceived as the derivation relationship, e.g. a work that was based on another; a digitized resource from an original physical resource. Perhaps it is used more broadly, but this seems like a stretch.
- It is an rdf:Property rather than an owl:Property, so doesn’t allow assertion of inverse.

RDF examples:

```
# Title sources

:title1 a bf:Title , bf:KeyTitle ;
    bf:source <http://www.issn.org/centre/united-states-etats-unis/> .

:title2 a bf:Title ;
    bf:source <http://www.zinepublisher.com/screenprintingset> .
```

Note that KeyTitles are a specific Title type with ISSN as a source.

Reference Sources

Suggested RDF:

```
# Reference work Title sources

:title1 a bf:Title ;
    rdfs:label “Some title”@en ;
    bf:source http://some/reference/source .

http://some/reference/source a bf:Work ,
    bf:title :title2 .

:title2 a bf:Title ;
    rdfs:label “Title of some reference work” .
```

bibliotek-o Title Origin Model

Proposed by LC and adopted by bibliotek-o: Title sources, which are URI resources, are distinguished from Title origins, which indicate a non-resource location from which the Title was derived (e.g., cover, spine).

bf:origin (object property)

Label: Origin of a Title

URI: http://id.loc.gov/ontologies/bibframe/origin
Definition: Links a Title to a non-resource location from which value or label came or was derived, such as the cover or spine of a book.
Domain: bf:Title
Range: bf:TitleOrigin

bf:TitleOrigin

Label: Title origin
URI: http://id.loc.gov/ontologies/bibframe/TitleOrigin
Definition: A non-resource location from which value or label came or was derived, such as the cover or spine of a book.
Domain: bf:Title
Range: bf:TitleOrigin

Proposed bibliotek-o Title Origin Individuals

In the interest of producing a “minimal viable ontology” we provisionally agree on the uncontroversial origin and leave others for further consideration as called for by tool development and/or further ontology work.

This list of proposed types is based on the LD4L-O v1 subclasses that specify origin. Namespace is to be determined - either some namespace under http://id.loc.gov, or the LD4L-O namespace.

Title Origin Named Individuals

Namespace TBD.

addedTitlePage

Label: added title page
Type: owl:NamedIndividual, bf:TitleOrigin

binder

Label: binder
Type: owl:NamedIndividual, bf:TitleOrigin

caption

Label: caption
Type: owl:NamedIndividual, bf:TitleOrigin

container

Label: container
Type: owl:NamedIndividual, bf:TitleOrigin

cover

Label: cover
Type: owl:NamedIndividual, bf:TitleOrigin

margin (for running title)

Label: margin
Type: owl:NamedIndividual, bf:TitleOrigin

spine

Label: spine
Type: owl:NamedIndividual, bf:TitleOrigin

supplied

Label: supplied
Comment: supplied by the cataloger
Type: owl:NamedIndividual, bf:TitleOrigin

transcribed

Label: transcribed
Comment: transcribed from the resource
Type: owl:NamedIndividual, bf:TitleOrigin

RDF example:

```
# Title origins

# Controlled vocabulary of bf:Source individuals for sources not represented as URI
resources

:title1 a bf:Title ;
    rdfs:label “Semantic Web for the Working Ontologist”@en ;
    bf:origin :cover .

:cover a owl:NamedIndividual , bf:TitleOrigin ;
   rdfs:label “Cover” .
```

bibliotek-o TitleElement Model

bibliotek-o TitleElement Class Hierarchy

bib:TitleElement

Label: Title element
URI: http://bibliotek-o.org/ontology/TitleElement
Definition: A resource that is a part of a Title.

bib:NonSortElement

Label: Non-sort element
URI: http://bibliotek-o.org/ontology/NonSortElement
Definition: An initial TitleElement that is not used in sorting the Title.
Subclass of: http://bibliotek-o.org/ontology/TitleElement
Example: "The " in "The inland lakes of Wisconsin. The plankton. I. Its quantity and chemical composition"

bib:MainTitleElement

Label: Main title element
URI: http://www.loc.gov/mads/rdf/v1#MainTitleElement
Definition: The main part of the title, consisting of the Title label itself with other TitleElement removed.
Subclass of: http://bibliotek-o.org/ontology/TitleElement
Example: Title "A Tree Grows in Brooklyn" has MainTitleElement "Tree Grows in Brooklyn".

bib:SubtitleElement

Label: Subtitle element
URI: http://bibliotek-o.org/ontology/SubtitleElement
Definition: A subtitle
Subclass of: http://bibliotek-o.org/ontology/TitleElement
Example: Title “Semantic Web for the Working Ontologist: Effective Modeling in RDFS and OWL” has SubtitleElement “Effective Modeling in RDFS and OWL.”

bib:PartNumberElement

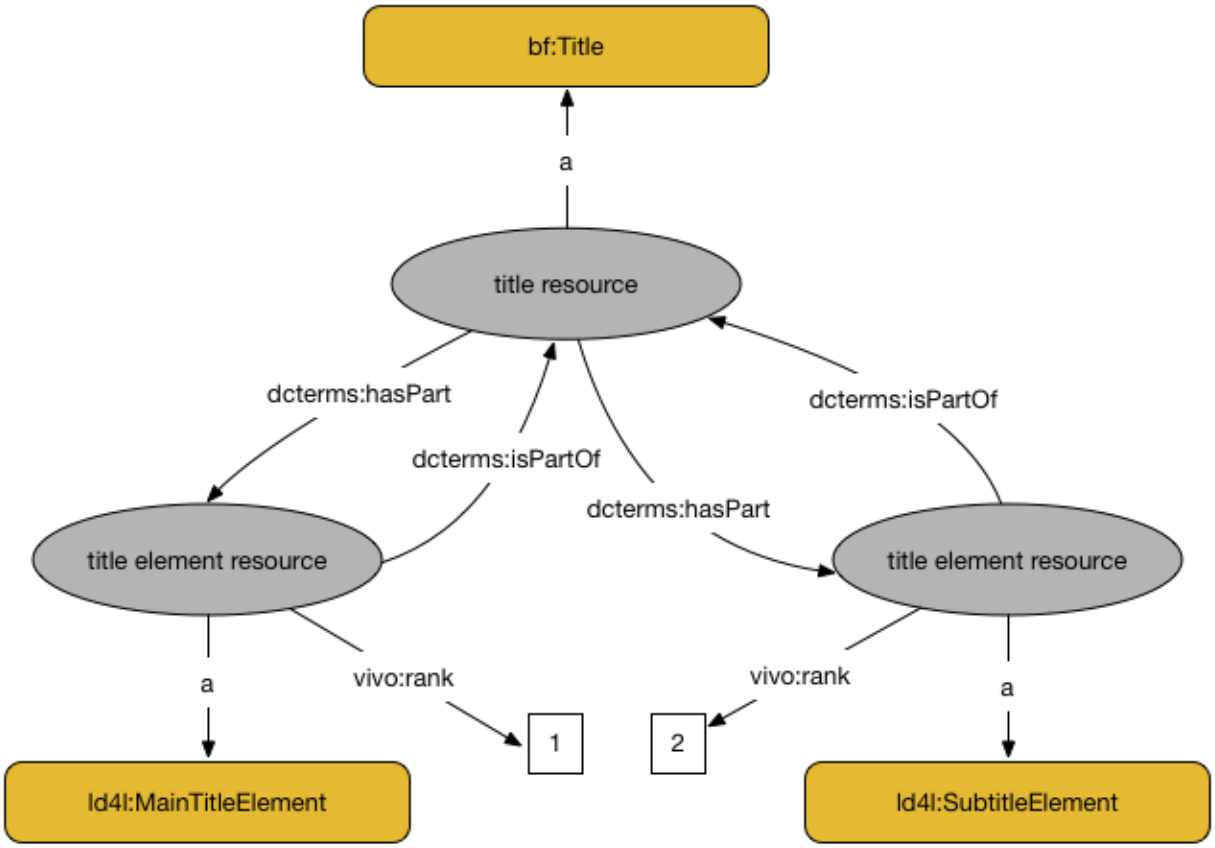
Label: Part number element
URI: http://bibliotek-o.org/ontology/PartNumberElement
Definition: The part of a Title indicating number in a serial or multipart resource.
Subclass of: http://bibliotek-o.org/ontology/TitleElement
Example: "I" in "The inland lakes of Wisconsin. The plankton. I. Its quantity and chemical composition."

bib:PartNameElement

Label: Part name element
URI: http://bibliotek-o.org/ontology/PartNameElement
Definition: The part of a Title for a resource that is a part of a serial or multipart resource.
Subclass of: http://bibliotek-o.org/ontology/TitleElement
Example: "Its quantity and chemical composition" in "The inland lakes of Wisconsin. The plankton. I. Its quantity and chemical composition."

bibliotek-o TitleElement Relationships

Diagram 3. bibliotek-o TitleElement relationships



dcterms:hasPart (property)

Label: Has Part
URI: http://purl.org/dc/terms/hasPart

Domain: unspecified
Range: unspecified
Comment: A related resource that is included either physically or logically in the described resource.
Note: This term is intended to be used with non-literal values as defined in the DCMI Abstract Model (http://dublincore.org/documents/abstract-model/). As of December 2007, the DCMI Usage Board is seeking a way to express this intention with a formal range declaration.

Note that as an RDFS ontology, the inverse relationship to dcterms:isPartOf is not formally asserted.

dcterms:isPartOf (property)

Label: Is Part Of
URI: http://purl.org/dc/terms/isPartOf
Domain: unspecified
Range: unspecified
Comment: A related resource in which the described resource is physically or logically included.

Note: This term is intended to be used with non-literal values as defined in the DCMI Abstract Model (http://dublincore.org/documents/abstract-model/). As of December 2007, the DCMI Usage Board is seeking a way to express this intention with a formal range declaration.

Note that as an RDFS ontology, the inverse relationship to dcterms:hasPart is not formally asserted.

vivo:rank

Label: rank
URI: http://vivoweb.org/ontology/core#rank
Comment: An integer indicating the position of an entity in a list.

Used here to order TitleElements of a Title with respect to one another. An alternative would be predicates for precedes and follows.

Note: Ordering TitleElements with respect to one another is never *required.* There are cases where it cannot and/or should not be done: for example, subtitles from various parts of an object, such as the cover and spine of a CD case.

Rationale

Because the bibliotek-o Title Element model is significantly more complex than the BIBFRAME 2.0 model, it requires justification. The principle motivations are:

- Structured data is one of the goals of RDF representation, and is preferred over unstructured strings, which must be parsed into component parts. The Title should be deconstructible into its components without parsing the Title label.
- Title elements need to be explicitly ordered, both for elements of the same type and those of different types when these do not occur in a prescribed order.
- Colons and other delimiters are not part of the element strings.
- Subtitles of a single Title can be in different languages and so need to be assigned different xml:lang values.
- Some examples can only be modeled with elements of elements.
- A sort title can be easily identified by dividing the Title into non-sort and main title elements, again without parsing the Title label. Parsing must be applied algorithmically, and while that would be the ideal approach, there may be cases (e.g., of rare languages for which no algorithms have been developed) where the decomposition must be done manually.

Titles with Multiple Subtitles

Titles with multiple subtitles are not rare. Examples:

Das Auge des Betrachters: Beiträge zum Konstruktivismus: Festschrift für Heinz von Foerster
http://d-nb.info/989197492

Urlaubsreif? 110 Länder, 6000 Ideen. Zur richtigen Zeit am richtigen Ort
https://www.amazon.de/dp/3866902603/ref=rdr_ext_tmb

Cries Unheard: Why Children Kill: The Story of Mary Bell
https://newcatalog.library.cornell.edu/catalog/3673479

Asia-Pacific rebalance 2025 : capabilities, presence, and partnerships : an independent review of U.S. defense strategy in the Asia-Pacific
https://clio.columbia.edu/catalog/11894382

The BIBFRAME 2.0 model does not allow the specification of order among multiple subtitles. Consider:

```
# Multiple subtitles in BIBFRAME 2.0

:work1 a bf:Work ;
    bf:title :title1 .

:title1 a bf:Title ;
     rdfs:label “Das Auge des Betrachters: Beiträge zum Konstruktivismus:
Festschrift für Heinz von Foerster”@de ;
     bf:mainTitle “Das Auge des Betrachters”@de ;
```

```
     bf:subtitle  “Beiträge zum Konstruktivismus”@de ,
                  “Festschrift für Heinz von Foerster”@de .
```

There is no way to order the subtitles short of parsing the entire title string value. This defies one of the goals of RDF representation, to use structured data rather than flat strings (strings to things).

The bibliotek-o model is as follows:

```
# Multiple subtitles in bibliotek-o

:work1 a bf:Work ;
    bf:title :title1 .

:title1 a bf:Title ;
     rdfs:label “Das Auge des Betrachters: Beiträge zum Konstruktivismus:
Festschrift für Heinz von Foerster”@de ;
    dcterms:hasPart :main , :subtitle1 , :subtitle2 .

:main a bib:MainTitleElement ;
          rdfs:label “Das Auge des Betrachters”@de ;
          vivo:rank 1 .

:subtitle1 a bib:SubtitleElement ;
          rdfs:label “Beiträge zum Konstruktivismus”@de ;
          vivo:rank 2 .

:subtitle2 a bib:SubtitleElement ;
          rdfs:label “Festschrift für Heinz von Foerster”@de ;
          vivo:rank 3 .
```

BIBFRAME 2.0 could resort to creating a single subtitle for both subtitles:

```
# Multiple subtitles in BIBFRAME 2.0 - take 2

:work1 a bf:Work ;
    bf:title :title1 .

:title1 a bf:Title ;
     rdfs:label “Das Auge des Betrachters: Beiträge zum Konstruktivismus:
Festschrift für Heinz von Foerster”@de ;
     bf:mainTitle “Das Auge des Betrachters”@de ;
     bf:subtitle  “Beiträge zum Konstruktivismus: Festschrift für Heinz von
Foerster”@de .
```

There are a few problems with this approach:

- Two elements are combined into one. This again contradicts the goal of structured data. If subtitle elements are not to be separated from one another, why do we parse the full title string into subparts at all?
- The colons in the string values are merely artifacts of the need to separate the title parts; they are not actually parts of any of the string values. So it is not correct to say that the subtitle of the work is “Beiträge zum Konstruktivismus: Festschrift für Heinz von Foerster”, including the colon.
- There are cases of multiple subtitles in different languages. Combining the subtitles into a single text value does not allow assigning different xml:lang values to the two strings. See illustrative side-by-side example below.

Elements of Title Elements

There are cases where a subtitle itself has components. Example:

```
# Sub-subtitles

Title: Cantica canticorum

Subtitles with sub-subtitles from container:

    Lof der liefde: Hooglied in de renaissance

    In praise of love: Song of songs in the renaissance

    Eloge d’amour: Cantique de cantique à la renaissance
```

The following model is proposed to express such data. The rationale, including comparison with models that do *not* meet the requirements, are discussed in an appendix.

```
# Sub-subtitles

:title1 a bf:Title ;
    dcterms:hasPart :subtitle1, :subtitle4, :subtitle7 .


:subtitle1 a bib:SubtitleElement ;
    rdfs:label “Lof def liefde: Hooglied in de renaissance”@nl ;
    dcterms:hasPart :subtitle2, :subtitle3 .

:subtitle2 a bib:SubtitleElement ;
    rdfs:label ‘“Lof def liefde”@nl  ;
    vivo:rank 1 .
```

```
:subtitle3 a bib:SubtitleElement ;
    rdfs:label ‘“Hooglied in de renaissance”@nl ;
    vivo:rank 2 .



:subtitle4 a bib:SubtitleElement ;
    rdfs:label “In praise of love: Song of songs in the renaissance”@en ;
    dcterms:hasPart :subtitle5, :subtitle6 .

:subtitle5 a bib:SubtitleElement ;
    rdfs:label “In praise of love”@en ;
    vivo:rank 1 .

:subtitle6 a bib:SubtitleElement ;
    rdfs:label “Song of songs in the renaissance”@en ;
    vivo:rank 2 .



:subtitle7 a bib:SubtitleElement ;
    rdfs:label “Eloge d'amour : Cantique de cantique a la renaissance”@fr ;
    dcterms:hasPart :subtitle8, :subtitle9 .

:subtitle8 a bib:SubtitleElement ;
    rdfs:label “Eloge d'amour”@fr  ;
    vivo:rank 1 .

:subtitle9 a bib:SubtitleElement ;
    rdfs:label “Cantique de cantique à la renaissance”@fr  ;
    vivo:rank 2 .
```

There are also cases where a SubtitleElement follows a PartNameElement. This could be modeled in one of two ways:

- The PartNameElement is broken into a MainTitleElement and a SubtitleElement.
- The SubtitleElement is ordered after the PartNameElement.

We need concrete examples to determine the correct model for such cases, though I suspect the second option is a more faithful representation of the structure of the Title. Possibly both structures occur in different cases. Since our model accommodates either implementation, we will not consider this case further.

Non-sort Elements

A sort title can be easily identified by dividing the Title into a NonSortElement and a MainTitleElement, again without parsing the Title label. Parsing must be applied algorithmically,

and while that is always the preferred approach, there may be cases (e.g., of rare languages for which no algorithms have been developed) where the decomposition must be done manually.

BIBFRAME 2.0 and bibliotek-o: Side-by-Side Examples of Title Elements

On title page: “This is my long title string [vertical bar] Subtitle craziness appended”
On the front cover: “Ceci n’est pas une pipe [spacing] subtitle A [spacing] sous-titre B”
On the publisher’s list online: “Zine screen printing set : publication 6”

```
# BIBFRAME 2

:work1 a bf:Work ;
    bf:title :title1 , :title2 .

:title1 a bf:Title ;
    rdfs:label “This is my long title string : Subtitle craziness appended”@en ;
    bf:mainTitle “This is my long title string”@en ;
    bf:subtitle “Subtitle craziness appended”@en .

:title2 a bf:VariantTitle ;
    rdfs:label “Ceci n’est pas une pipe : subtitle A : sous-titre B” ;
    bf:mainTitle “Ceci n’est pas une pipe”@fr ;

    ##
    # Two options
    # subtitle option (i)
    bf:subtitle “subtitle A : sous-titre B” ;
    # subtitle option (ii)
    bf:subtitle “subtitle A”@en , “subtitle B”@fr ;
    ##


:instance1 a bf:Instance ;
    bf:title :title3 .

:title3 a bf:Title ;
    rdfs:label “Zine screen printing set : publication 6”@en ;
    bf:mainTitle “Zine screen printing set”@en ;
    bf:partNumber “publication 6”@en ;
```

```
# bibliotek-o

:work1 a bf:Work ;
    bib:hasPreferredTitle :title1 ;
    bf:title :title2 .
```

```
:title1 a bf:Title ;
    rdfs:label “This is my long title string : Subtitle craziness appended@en” ;
    dcterms:hasPart :main1, :subtitle1 .

:main1 a bib:MainTitleElement ;
    rdfs:label “This is my long title string”@en ;
    vivo:rank “1”^^xsd:integer .

:subtitle1 a bib:SubtitleElement ;
    rdfs:label “Subtitle craziness appended”@en ;
    vivo:rank “2”^^xsd:integer .

:title2 a bf:Title ;
    bf:origin :cover ;
    rdfs:label “Ceci n’est pas une pipe : subtitle A : sous-titre B” ;
    dcterms:hasPart :main2, :subtitle2, :subtitle3 .

:main2 a bib:MainTitleElement ;
    rdfs:label “Ceci n’est pas une pipe”@fr ;
    vivo:rank “1”^^xsd:integer .

:subtitle2 a bib:SubtitleElement ;
    rdfs:label “subtitle A”@en ;
    vivo:rank “2”^^xsd:integer .

:subtitle3 a bib:SubtitleElement ;
    rdfs:label “sous-titre B”@en ;
    vivo:rank “3”^^xsd:integer .


:instance1 a bd:Instance ;
    bf:title :title3 .

:title3 a bf:Title ;
    rdfs:label “Zine screen printing set : publication 6”@en ;
    dcterms:hasPart :main3 , :partnum ;
    dcterms:source <http://www.zinepublisher.com/screenprintingset> .

:main3 a bib:MainTitleElement ;
    rdfs:label “Zine screen printing set”@en ;
    vivo:rank “1”^xsd:integer .

:partnum a bib:PartNumberElement ;
    rdfs:label “publication 6”@en ;
    vivo:rank “2”^^xsd:integer .
```

Use of BIBFRAME 2.0 Title and bibliotek-o TitleElement Classes

LD4L-O v1 used MADS/RDF Title and TitleElement classes. In bibliotek-o we have elected to define our own TitleElements, and reuse bf:Title, for the following reasons:

- Alignment with BIBFRAME 2.0 is more important than alignment with MADS/RDF.
- The future of the MADS/RDF vocabulary is uncertain. LC states that the ontology is not going away, but madsrdf:Title may go away.
- Reusing bf:Title allows us to also reuse bf:title, since its range is bf:Title.
- MADS/RDF uses madsrdf:elementList to order TitleElements. This requires that an order is always imposed, even when it cannot or should not be. See above. In addition, it uses the extremely awkward rdf:List / rdf:first / rdf:Last implementation under the cover.

Other bibliotek-o Title and TitleElement Properties

dcterms:date (property)

Label: Date
URI: http://purl.org/dc/terms/date
Definition: A point or period of time associated with an event in the lifecycle of the resource.
Comment: Date may be used to express temporal information at any level of granularity. Recommended best practice is to use an encoding scheme, such as the W3CDTF profile of ISO 8601.
Range: rdfs:Literal

Examples of Titles with dates:

- Art works are frequently known by one title for a certain time and then by another, for example when it was discovered that the sitter depicted in a painting was actually somebody else (real life example). So adding a date would be useful in this earlier/later name situation.
- Integrating resources such as Websites often change titles. Same Website, different title.

In such cases, the date value of the Title means “Date (range) when this title applied.”

rdfs:label (property)

Label: Label
URI: https://www.w3.org/2000/01/rdf-schema#label
Definition: A human-readable name for the subject.
Domain: rdfs:Resource
Range: rdfs:Literal
Commentary: Use with Title and TitleElement instances to represent the resource’s string. In the case of the Title, the rdfs:label is the concatenation of all TitleElements in order. In the case of unparsed titles in the bibliographic record, the full title string will be stored in the rdfs:label of the Title resource, with possible future normalization applied to structure the components.

Title Language

LD4L-O v1 proposed to use dcterms:language to express a language of the entire title, independent of the language of its subelements. After further thought, it seems likely that this was a misleading way to express one of two things: (1) the language of the MainTitleElement, or (2) the language of the bibliographic resource itself. In either case, positing an independent language value for the Title resource is not the appropriate means of expressing this data, and a mechanism for expressing both (1) and (2) already exists: an xml:lang value on MainTitleElement, and language value of the Work itself, respectively.

So bibliotek-o proposes to drop this attribute of Titles and simply use xml:lang values on Title and TitleElement labels.

Open Questions and Areas for Future Work

- Reconsider reuse of MADS/RDF TitleElements instead of the new LD4L-O ones.
- Enumerate a more complete set of Title subclasses.
- Enumerate a more complete set of Title origins.
- Consider replacing TitleOrigin and hasTitleOrigin with the more general Origin and hasOrigin. Are there origins (as opposed to sources) for other kinds of resources? Would we want the same terms to apply to these as well, even though they would require be a different set of named individuals?
- Parallel Titles. Compile cases of translated and transcribed Titles and propose models.
- Can there be direct Title-to-Title relationships, in addition to Resource-to-Title relationships? AbbreviatedTitles and ParallelTitles are candidates.
- Use precedes/follows predicates rather than vivo:rank to order TitleElements? Pros and cons of each. One obvious pro: don't have to reset all ranks when inserting an element, just reset one precedence relationship and add one. Not likely with TitleElements, but as a general model for other ranked elements it is preferable. See also the Ordered List Ontology, but probably overkill for this usage.
- Reusability of Title resources. LD4L assumes that Title and TitleElement resources are not reusable, even if two titles have the same lexical string. LC assumes that Title resources are reusable. What are the consequences of the two approaches? For now we leave this to implementation, but non-reusability could be encoded in the ontology by typing the bf:isTitleOf predicate as a owl:FunctionalProperty.
- Consider enriching the ontology with appropriate cardinality and disjointness axioms. Weigh gains against additional complexity.

Appendices

Appendix A: Full bibliotek-o Title Model Specification

This is a reference list of all terms included in the bibliotek-o Title model.

bibliotek-o Resource-to-Title Relationships

bf:title (object property)

Label: Title resource
URI: http://id.loc.gov/ontologies/bibframe/title
Definition: Name given to a resource.
Comment: Used with Work, Instance or Item
Domain: unspecified
Range: bf:Title
Inverse: bf:titleOf

bf:titleOf (object property)

Label: title of
URI: http://id.loc.gov/ontologies/bibframe/titleOf
Definition: This Title is the title of the resource
Domain: bf:Title
Range: unspecified
Inverse: bf:title
Comment: Expected value Work, Instance, or Item

bf:preferredTitle (object property)

Label: preferred title
URI: http://id.loc.gov/ontologies/bibframe/preferredTitle
Definition: Specifies the preferred Title of this resource.
Domain: unspecified
Range: bf:Title
Subproperty of: bf:title
Inverse: bf:preferredTitleOf
Comment: A resource may have multiple directly linked Titles, among which this is the preferred Title.

bf:preferredTitleOf (object property)

Label: preferred title of
URI: http://id.loc.gov/ontologies/bibframe/titleOf
Definition: This Title is the preferred Title of the resource
Domain: bf:Title

Range: unspecified
Inverse: bf:preferredTitle
Subproperty of: http://id.loc.gov/ontologies/bibframe/titleOf
Comment: A resource may have multiple directly linked Titles, among which this is the preferred Title.

bibliotek-o Title Class Hierarchy

bf:Title

Label: Title entity
URI: http://id.loc.gov/ontologies/bibframe/Title
Definition: Title information relating to a resource: mail title, translated title, or variant form of title.

bf:AbbreviatedTitle

Label: Abbreviated title
URI: http://id.loc.gov/ontologies/bibframe/AbbreviatedTitle
Definition: Title as abbreviated for citation, indexing, and/or identification.
Subclass of: http://id.loc.gov/ontologies/bibframe/Title

bf:CollectiveTitle

Label: Collective title
URI: http://id.loc.gov/ontologies/bibframe/CollectiveTitle
Definition: Title for a compilation of resources.
Subclass of: http://id.loc.gov/ontologies/bibframe/Title

bib:ConciseTitle

Label: Concise title
URI: http://bibliotek-o.org/ontology/ConciseTitle
Definition: The concise version of a Title.
Subclass of: http://id.loc.gov/ontologies/bibframe/Title
Example: ‘Modern Writing’ could serve as the concise title for ‘The Berkley Book of Modern Writing’.

bib:DistinctiveTitle

Label: Distinctive title
URI: http://bibliotek-o.org/ontology/DistinctiveTitle
Definition: Special title that appears in addition to the regular title on individual issues of a work and by which the issue may be known.
Subclass of: http://id.loc.gov/ontologies/bibframe/Title

bf:KeyTitle

Label: Key title
URI: http://id.loc.gov/ontologies/bibframe/KeyTitle
Definition: Unique title for a continuing resource that is assigned by the ISSN International Center in conjunction with an ISSN.
Subclass of: http://id.loc.gov/ontologies/bibframe/Title

bf:ParallelTitle

Label: Parallel title proper
URI: http://id.loc.gov/ontologies/bibframe/ParallelTitle
Definition: Title in another language and/or script.
Subclass of: http://id.loc.gov/ontologies/bibframe/Title

bibliotek-o Title Source

bf:source (object property)

Label: Source
URI: http://id.loc.gov/ontologies/bibframe/source
Definition: Resource from which value or label came or was derived, such as the formal source/scheme from which a classification number is taken or derived, list from which an agent name is taken or derived, source within which an identifier is unique.
Domain: unspecified
Range: unspecified
Inverse: http://id.loc.gov/ontologies/bibframe/sourceOf

bf:sourceOf (object property)

Label: is source of
URI: http://id.loc.gov/ontologies/bibframe/sourceOf
Definition: This resource is the source of the object.
Domain: unspecified
Range: unspecified
Inverse: http://id.loc.gov/ontologies/bibframe/source

bibliotek-o Title Origin

bf:origin (object property)

Label: Origin of a Title
URI: http://id.loc.gov/ontologies/bibframe/origin
Definition: Links a Title to a non-resource location from which value or label came or was derived, such as the cover or spine of a book.
Domain: bf:Title

Range: bf:TitleOrigin

bf:TitleOrigin

Label: Title origin
URI: http://id.loc.gov/ontologies/bibframe/TitleOrigin
Definition: A non-resource location from which value or label came or was derived, such as the cover or spine of a book.
Domain: bf:Title
Range: bf:TitleOrigin

Named Individuals:

addedTitlePage

Label: added title page
Type: owl:NamedIndividual, bf:TitleOrigin

binder

Label: binder
Type: owl:NamedIndividual, bf:TitleOrigin

caption

Label: caption
Type: owl:NamedIndividual, bf:TitleOrigin

container

Label: container
Type: owl:NamedIndividual, bf:TitleOrigin

cover

Label: cover
Type: owl:NamedIndividual, bf:TitleOrigin

margin

Label: margin
Type: owl:NamedIndividual, bf:TitleOrigin
Comment: For running title

spine

Label: spine
Type: owl:NamedIndividual, bf:TitleOrigin

supplied

Label: supplied
Comment: supplied by the cataloger
Type: owl:NamedIndividual, bf:TitleOrigin

transcribed

Label: transcribed
Comment: transcribed from the resource
Type: owl:NamedIndividual, bf:TitleOrigin

bibliotek-o Title Elements

bib:TitleElement

Label: Title element
URI: http://bibliotek-o.org/ontology/TitleElement
Definition: A resource that is a part of a Title.

bib:NonSortElement

Label: Non-sort element
URI: http://bibliotek-o.org/ontology/NonSortElement
Definition: An initial TitleElement that is not used in sorting the Title.
Subclass of: http://bibliotek-o.org/ontology/TitleElement
Example: "The " in "The inland lakes of Wisconsin. The plankton. I. Its quantity and chemical composition"

bib:MainTitleElement

Label: Main title element
URI: http://www.loc.gov/mads/rdf/v1#MainTitleElement
Definition: The main part of the title, consisting of the Title label itself with other TitleElement removed.
Subclass of: http://bibliotek-o.org/ontology/TitleElement
Example: Title "A Tree Grows in Brooklyn" has MainTitleElement "Tree Grows in Brooklyn".

bib:SubtitleElement

Label: Subtitle element
URI: http://bibliotek-o.org/ontology/SubtitleElement
Definition: A subtitle
Subclass of: http://bibliotek-o.org/ontology/TitleElement
Example: Title “Semantic Web for the Working Ontologist: Effective Modeling in RDFS and OWL” has SubtitleElement “Effective Modeling in RDFS and OWL.”

bib:PartNumberElement

Label: Part number element
URI: http://bibliotek-o.org/ontology/PartNumberElement
Definition: The part of a Title indicating number in a serial or multipart resource.
Subclass of: http://bibliotek-o.org/ontology/TitleElement
Example: "I" in "The inland lakes of Wisconsin. The plankton. I. Its quantity and chemical composition."

bib:PartNameElement

Label: Part name element
URI: http://bibliotek-o.org/ontology/PartNameElement
Definition: The part of a Title for a resource that is a part of a serial or multipart resource.
Subclass of: http://bibliotek-o.org/ontology/TitleElement
Example: "Its quantity and chemical composition" in "The inland lakes of Wisconsin. The plankton. I. Its quantity and chemical composition."

dcterms:hasPart (property)

Label: Has Part
URI: http://purl.org/dc/terms/hasPart
Domain: unspecified
Range: unspecified
Comment: A related resource that is included either physically or logically in the described resource.
Note: This term is intended to be used with non-literal values as defined in the DCMI Abstract Model (http://dublincore.org/documents/abstract-model/). As of December 2007, the DCMI Usage Board is seeking a way to express this intention with a formal range declaration.

dcterms:isPartOf (property)

Label: Is Part Of
URI: http://purl.org/dc/terms/isPartOf
Domain: unspecified
Range: unspecified
Comment: A related resource in which the described resource is physically or logically included.

Note: This term is intended to be used with non-literal values as defined in the DCMI Abstract Model (http://dublincore.org/documents/abstract-model/). As of December 2007, the DCMI Usage Board is seeking a way to express this intention with a formal range declaration.

vivo:rank

Label: rank
URI: http://vivoweb.org/ontology/core#rank

Comment: An integer indicating the position of an entity in a list.

bibliotek-o Other Title and TitleElement Properties

dcterms:date (property)

Label: Date
URI: http://purl.org/dc/terms/date
Definition: A point or period of time associated with an event in the lifecycle of the resource.
Comment: Date may be used to express temporal information at any level of granularity. Recommended best practice is to use an encoding scheme, such as the W3CDTF profile of ISO 8601.
Range: rdfs:Literal

rdfs:label (property)

Label: Label
URI: https://www.w3.org/2000/01/rdf-schema#label
Definition: A human-readable name for the subject.
Domain: rdfs:Resource
Range: rdfs:Literal
Commentary: Use with Title and TitleElement instances to represent the resource's string. In the case of the Title, the rdfs:label is the concatenation of all TitleElements in order. In the case of unparsed titles in the bibliographic record, the full title string will be stored in the rdfs:label of the Title resource, with possible future normalization applied to structure the components.

Appendix B: Full LD4L-O v1 Title Model Specification

LD4L-O v1 Resource-to-Title Relationships

ld4l:hasTitle (object property)

Label: Title resource
URI: http://bib.ld4l.org/ontology/hasTitle
Comment: Word, character, or group of words and/or characters that is a name given to this resource.
Scope note: A Work, Instance, or Item can have a Title.
Domain: bib:Work U bib:Instance U bib:Item
Range: madsrdf:Title
Inverse: bib:isTitleOf

ld4l:isTitleOf (object property)

Label: is title of

URI: http://bib.ld4l.org/ontology/isTitleOf
Comment: Word, character, or group of words and/or characters that is a name given to this resource.
Domain: madsrdf:Title
Range: bib:Work U bib:Instance U bib:Item
Inverse: bib:hasTitle

ld4l:hasPreferredTitle (object property)

Label: has preferred title
URI: http://bib.ld4l.org/ontology/hasPreferredTitle
Comment: The preferred title of this resource.
Scope note: A resource (Work or Instance) may have multiple directly linked Titles, among which this is the preferred Title.
Domain: bib:Work U bib:Instance
Range: madsrdf:Title
Inverse: bib:isPreferredTitleOf

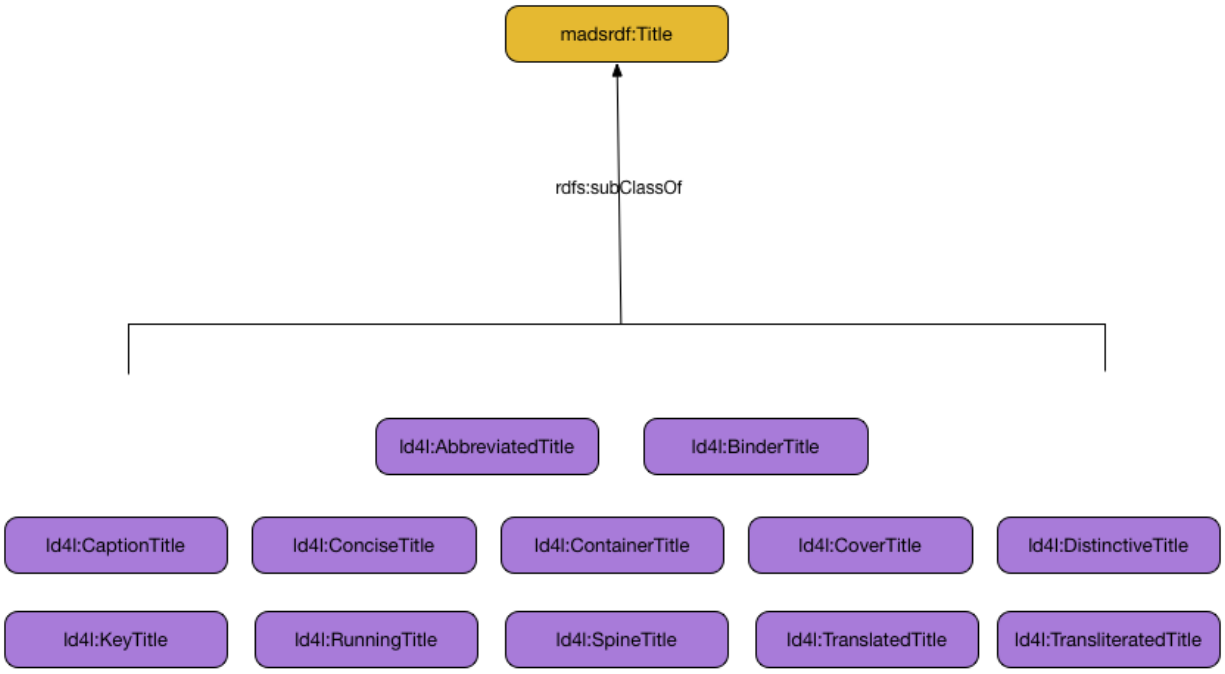
ld4l:isPreferredTitleOf (object property)

Label: is preferred title of
URI: http://bib.ld4l.org/ontology/hasPreferredTitle
Comment: The preferred title of this resource.
Scope note: A resource (Work or Instance) may have multiple directly linked Titles, among which this is the preferred Title.
Domain: bib:Work U bib:Instance
Range: madsrdf:Title
Inverse: bib:hasPreferredTitle

LD4L-O v1 Title Class Hierarchy

LD4L-O v1 Title Class Hierarchy

Diagram 4. LD4L-O v1 title class hierarchy



madsrdf:Title

Label: Title Type
URI: http://www.loc.gov/mads/rdf/v1#Title
Definition: Describes a resource whose label represents a title.
Subclass of: http://www.loc.gov/mads/rdf/v1#SimpleType

ld4l:AbbreviatedTitle

Label: Abbreviated title
URI: http://bib.ld4l.org/ontology/AbbreviatedTitle
Comment: Title as abbreviated for indexing or identification.
Subclass of: http://www.loc.gov/mads/rdf/v1#Title

ld4l:BinderTitle

Label: Binder title
URI: http://bib.ld4l.org/ontology/BinderTitle
Comment: Title printed on an item's cover after rebinding.
Subclass of: http://www.loc.gov/mads/rdf/v1#Title

ld4l:CaptionTitle

Label: Caption title
URI: http://bib.ld4l.org/ontology/CaptionTitle

Comment: Caption title, printed at the head of the first page of text.
Subclass of: http://www.loc.gov/mads/rdf/v1#Title

ld4l:ConciseTitle

Label: Concise title
URI: http://bib.ld4l.org/ontology/ConciseTitle
Comment: The concise version of a Title.
Subclass of: http://www.loc.gov/mads/rdf/v1#Title
Example: 'Modern Writing' could serve as the concise title for 'The Berkley Book of Modern Writing'.

ld4l:ContainerTitle

Label: Container title
URI: http://bib.ld4l.org/ontology/ContainerTitle
Comment: Title on a case or container, such as a CD case.
Subclass of: http://www.loc.gov/mads/rdf/v1#Title

ld4l:CoverTitle

Label: Cover title
URI: http://bib.ld4l.org/ontology/CoverTitle
Comment: Cover title that is printed on the original cover of a publication or lettered or stamped on the publisher's binding.
Subclass of: http://www.loc.gov/mads/rdf/v1#Title

ld4l:DistinctiveTitle

Label: Distinctive title
URI: http://bib.ld4l.org/ontology/DistinctiveTitle
Comment: Special title that appears in addition to the regular title on individual issues of a work and by which the issue may be known.
Subclass of: http://www.loc.gov/mads/rdf/v1#Title

ld4l:KeyTitle

Label: Key title
URI: http://bib.ld4l.org/ontology/KeyTitle
Comment: Unique title for a continuing resource that is assigned by the ISSN International Center in conjunction with an ISSN.
Subclass of: http://www.loc.gov/mads/rdf/v1#Title

ld4l:RunningTitle

Label: Running title
URI: http://bib.ld4l.org/ontology/RunningTitle
Comment: Running title, printed on the top or bottom margin of each page of a publication.
Subclass of: http://www.loc.gov/mads/rdf/v1#Title

ld4l:SpineTitle

Label: Spine title
URI: http://bib.ld4l.org/ontology/SpineTitle
Comment: Title taken from the spine of a resource.
Subclass of: http://www.loc.gov/mads/rdf/v1#Title

ld4l:TranslatedTitle

Label: Translated title
URI: http://bib.ld4l.org/ontology/TranslatedTitle
Comment: A title translated from another title.
Subclass of: http://www.loc.gov/mads/rdf/v1#Title
Example: The film title “Bella Martha” is translated into English as “Mostly Martha”.
Scope note: The TranslatedTitle should be distinguished from two other cases. First, if a Work is translated into another language, the translated Work has a Title. This Title is linked directly to the translated Work rather than to a Title; that is, it is the Title of a translation, rather than the translation of a Title. Second, a Work may have multiple titles in different languages, though none of the titles are the source of the others; examples might be a musical composition or a bilingual book. For example, an Arabic language textbook for English learners has the Arabic title”عربيّة الناس”, literally “Arabic of the People,” and the English title “Living Arabic”; neither is a translation of the other. These Titles are both linked directly to the Work, and the language of each Title is denoted through its dcterms:language value.

ld4l:TransliteratedTitle

Label: Transliterated title
URI: http://bib.ld4l.org/ontology/TransliteratedTitle
Comment: A title transliterated from another title.
Subclass of: http://www.loc.gov/mads/rdf/v1#Title
Example: The Arabic title “عربيّة الناس” is transliterated into Roman orthography as “‘Arabiyyat al-Naas”.

LD4L-O v1 Title Source

ld4l:hasSourceStatus

Label: has source status
URI: http://bib.ld4l.org/ontology/hasSourceStatus
Comment: The source status (either supplied or transcribed) of this resource.
Scope note: Applies to Titles, but could apply to other resources as well.
Range: bib:SourceStatus
Inverse: http://bib.ld4l.org/ontology/isSourceStatusOf

ld4l:isSourceStatusOf

Label: is source status of
URI: http://bib.ld4l.org/ontology/isSourceStatusOf
Comment: This source status (either supplied or transcribed) pertains to the resource.
Scope note: Applies to Titles, but could apply to other resources as well.
Domain: bib:SourceStatus
Inverse: http://bib.ld4l.org/ontology/hasSourceStatus

ld4l:SourceStatus

Label: Source status
URI: http://bib.ld4l.org/ontology/SourceStatus
Comment: The source of information, such as supplied by the cataloger or transcribed from the item. It is related to the resource it describes via the property bib:hasSourceStatus and its inverse.
Subclass of: http://www.w3.org/2004/02/skos/core#Concept

supplied

Label: supplied
URI: http://bib.ld4l.org/ontology/supplied
Comment: Information has been supplied by the cataloger.
Types: ld4l:SourceStatus, owl:NamedIndividual

transcribed

Label: transcribed
URI: http://bib.ld4l.org/ontology/transcribed
Comment: Information has been transcribed from the item.
Types: ld4l:SourceStatus, owl:NamedIndividual

LD4L-O v1 Title Elements

madsrdf:TitleElement

Label: Title Element
URI: http://www.loc.gov/mads/rdf/v1#TitleElement
Subclass of: http://www.loc.gov/mads/rdf/v1#Element

madsrdf:NonSortElement

Label: Non-sort element
URI: http://www.loc.gov/mads/rdf/v1#NonSortElement
Subclass of: http://www.loc.gov/mads/rdf/v1#TitleElement
Example: "The " in "The inland lakes of Wisconsin. The plankton. I. Its quantity and chemical composition"

Commentary: The BIBFRAME 2.0 model does not have a way to represent this other than parsing the rdfs:label value of the Title resource. This approach defies the principle and goal of producing structured data.

madsrdf:MainTitleElement

Label: Main Title Element
URI: http://www.loc.gov/mads/rdf/v1#MainTitleElement
Subclass of: http://www.loc.gov/mads/rdf/v1#TitleElement
Example: Title "A Tree Grows in Brooklyn" has NonSortElement "A " and MainTitleElement "Tree Grows in Brooklyn".

madsrdf:SubTitleElement

Label: Subtitle Element
URI: http://www.loc.gov/mads/rdf/v1#SubTitleElement
Subclass of: http://www.loc.gov/mads/rdf/v1#TitleElement
Example:

madsrdf:PartNumberElement

Label: Part Number Element
URI: http://www.loc.gov/mads/rdf/v1#PartNumberElement
Subclass of: http://www.loc.gov/mads/rdf/v1#TitleElement
Example: "I" in "The inland lakes of Wisconsin. The plankton. I. Its quantity and chemical composition"

madsrdf:PartNameElement

Label: Part Name Element
URI: http://www.loc.gov/mads/rdf/v1#PartNameElement
Subclass of: http://www.loc.gov/mads/rdf/v1#TitleElement
Example: "Its quantity and chemical composition" in "The inland lakes of Wisconsin. The plankton. I. Its quantity and chemical composition"

dcterms:hasPart (property)

Label: Has Part
URI: http://purl.org/dc/terms/hasPart
Comment: A related resource that is included either physically or logically in the described resource.
Note: This term is intended to be used with non-literal values as defined in the DCMI Abstract Model (http://dublincore.org/documents/abstract-model/). As of December 2007, the DCMI Usage Board is seeking a way to express this intention with a formal range declaration.
Domain: unspecified
Range: unspecified
Commentary: As an RDFS ontology, the inverse relationship to dcterms:isPartOf is not formally asserted.

dcterms:isPartOf (property)

Label: Is Part Of
URI: http://purl.org/dc/terms/isPartOf
Comment: A related resource in which the described resource is physically or logically included.

Note: This term is intended to be used with non-literal values as defined in the DCMI Abstract Model (http://dublincore.org/documents/abstract-model/). As of December 2007, the DCMI Usage Board is seeking a way to express this intention with a formal range declaration.
Domain: unspecified
Range: unspecified
Commentary: As an RDFS ontology, the inverse relationship to dcterms:hasPart is not formally asserted.

vivo:rank

Label: rank
URI: http://vivoweb.org/ontology/core#rank
Comment: An integer indicating the position of an entity in a list.
Commentary: Here, to order TitleElements of a Title with respect to one another.
Commentary: An alternative would be some type of ordering relationship, such as bf:succeededBy/bf:precededBy or the similar LD4L-O v1 predicates bib:precedes/bib:follows.

LD4L-O v1 Other Title and TitleElement Properties

rdfs:label (property)

Label: Label
URI: https://www.w3.org/2000/01/rdf-schema#label
Definition: A human-readable name for the subject.
Domain: rdfs:Resource
Range: rdfs:Literal

dcterms:date (property)

Label: Date
URI: http://purl.org/dc/terms/date
Definition: A point or period of time associated with an event in the lifecycle of the resource.
Comment: Date may be used to express temporal information at any level of granularity. Recommended best practice is to use an encoding scheme, such as the W3CDTF profile of ISO 8601.
Range: rdfs:Literal

dcterms:language

Label: language
URI: http://purl.org/dc/terms/language
Comment: A language of the resource.
Range: http://purl.org/dc/terms/LinguisticSystem

Appendix C: Modeling Titles of Title Elements

The following example of sub-subtitles was presented above, along with the proposed model. Here we explicate the modeling requirements of this case and consider models that do not meet these requirements.

```
# Sub-subtitles

Title: Cantica canticorum

Subtitles with sub-subtitles from container:

    Lof der liefde: Hooglied in de renaissance

    In praise of love: Song of songs in the renaissance

    Eloge d’amour: Cantique de cantique à la renaissance
```

Based on the modeling criteria stated above for analyzing Titles into component TitleElements, the requirements for modeling this example are:

- The internal structure of each subtitle must be represented.
- The internal colons should not be considered part of any one atomic string value.
- Order of the components within each subtitle must be modeled.
- Artificial ordering among the three subtitles should not be imposed.

The following model is proposed to meet these requirements.

```
# Sub-subtitles

:title1 a bf:Title ;
    dcterms:hasPart :subtitle1, :subtitle4, :subtitle7 .


:subtitle1 a bib:SubtitleElement ;
    rdfs:label “Lof def liefde: Hooglied in de renaissance”@nl ;
    dcterms:hasPart :subtitle2, :subtitle3 .
```

```
:subtitle2 a bib:SubtitleElement ;
    rdfs:label ‘“Lof def liefde”@nl  ;
    vivo:rank 1 .

:subtitle3 a bib:SubtitleElement ;
    rdfs:label ‘“Hooglied in de renaissance”@nl ;
    vivo:rank 2 .



:subtitle4 a bib:SubtitleElement ;
    rdfs:label “In praise of love: Song of songs in the renaissance”@en ;
    dcterms:hasPart :subtitle5, :subtitle6 .

:subtitle5 a bib:SubtitleElement ;
    rdfs:label “In praise of love”@en ;
    vivo:rank 1 .

:subtitle6 a bib:SubtitleElement ;
    rdfs:label “Song of songs in the renaissance”@en ;
    vivo:rank 2 .



:subtitle7 a bib:SubtitleElement ;
    rdfs:label “Eloge d'amour : Cantique de cantique a la renaissance”@fr ;
    dcterms:hasPart :subtitle8, :subtitle9 .

:subtitle8 a bib:SubtitleElement ;
    rdfs:label “Eloge d'amour”@fr  ;
    vivo:rank 1 .

:subtitle9 a bib:SubtitleElement ;
    rdfs:label “Cantique de cantique à la renaissance”@fr  ;
    vivo:rank 2 .
```

Based on the modeling criteria stated above, the requirements for modeling this example are:

- The internal structure of each subtitle must be represented.
- The internal colons should not be considered part of any one atomic string value.
- Order of the components within each subtitle must be modeled.
- Artificial ordering among the three subtitles should not be imposed.

We first consider two models which fail to meet all the modeling requirements.

Model 1. Three subtitles with no internal structure

```
:title1 a bf:Title ;
    dcterms:hasPart :mainTitle1 , :subtitle1, :subtitle2, :subtitle3 .

:mainTitle1 a bib:MainTitleElement ;
    rdfs:label “Cantica canticorum”@la .

:subtitle1 a bib:SubtitleElement ;
    rdfs:label “Lof def liefde: Hooglied in de renaissance”@nl .


:subtitle2 a bib:SubtitleElement ;
    rdfs:label “In praise of love: Song of songs in the renaissance”@en .


:subtitle3 a bib:SubtitleElement ;
    rdfs:label “Eloge d'amour : Cantique de cantique a la renaissance”@fr .
```

This model succeeds in meeting two of the requirements:

- Order of the components within each subtitle must be modeled.
- Artificial ordering among the three subtitles should not be imposed.

But it fails to meet the remaining two the requirements:

- The internal structure of each subtitle must be represented.
- The internal colons should not be considered part of any one atomic string value.

Model 2. Six distinct subtitles with rank

```
:title1 a bf:Title ;

dcterms:hasPart :mainTitle1 , :subtitle1 , :subtitle2 , :subtitle3  , :subtitle4 ,
:subtitle5 , :subtitle6 .

:mainTitle1 a bib:MainTitleElement ;
    rdfs:label “Cantica canticorum”@la .

:subtitle1 a bib:SubtitleElement ;
    rdfs:label “Lof def liefde”@nl ;
    vivo:rank 1 .

:subtitle2 a bib:SubtitleElement ;
    rdfs:label “Hooglied in de renaissance”@nl ;
    vivo:rank 2 .

:subtitle3 a bib:SubtitleElement ;
    rdfs:label “In praise of love”@en ;
    vivo:rank 3 .
```

```
:subtitle4 a bib:SubtitleElement ;
    rdfs:label “Song of songs in the renaissance”@en ;
    vivo:rank 4 .

:subtitle5 a bib:SubtitleElement ;
    rdfs:label “Eloge d'amour ”@fr ;
    vivo:rank 5 .
:subtitle6 a bib:SubtitleElement ;
    rdfs:label “Cantique de cantique a la renaissance”@fr ;
    vivo:rank 6 .
```

This model succeeds in meeting two of the requirements:

- The internal colons should not be considered part of any one atomic string value.
- Order of the components within each subtitle must be modeled.

But it fails to meet the remaining two the requirements:

- The internal structure of each subtitle must be represented.
- Artificial ordering among the three subtitles should not be imposed.

Model 3. Six distinct subtitles with precedence relations

```
:title1 a bf:Title ;
    dcterms:hasPart :mainTitle1 , :subtitle1 , :subtitle2 , :subtitle3 ,
:subtitle4 , :subtitle5 , :subtitle6.

:mainTitle1 a bib:MainTitleElement ;
    rdfs:label “Cantica canticorum”@la .

:subtitle1 a bib:SubtitleElement ;
    rdfs:label “Lof def liefde”@nl ;
    :precedes :subtitle2 .

:subtitle2 a bib:SubtitleElement ;
    rdfs:label “Hooglied in de renaissance”@nl .

:subtitle3 a bib:SubtitleElement ;
    rdfs:label “In praise of love”@en ;
   :precedes :subtitle4 .

:subtitle4 a bib:SubtitleElement ;
    rdfs:label “Song of songs in the renaissance@en”.

:subtitle5 a bib:SubtitleElement ;
    rdfs:label “Eloge d'amour ” @fr;
    :precedes :subtitle6.

:subtitle6 a bib:SubtitleElement ;
```

```
    rdfs:label “Cantique de cantique a la renaissance”@fr.
```

This model succeeds in meeting three of the requirements:

- The internal colons should not be considered part of any one atomic string value.
- Order of the components within each subtitle must be modeled.
- Artificial ordering among the three subtitles should not be imposed.

But it fails to meet the remaining requirement:

- The internal structure of each subtitle must be represented.

The model presented in the section Elements of Title Elements is adopted because it meets all four requirements. That model is repeated here for ease of comparison.

Model 4. Sub-subtitles (TitleElements with internal structure)

```
# Sub-subtitles

:title1 a bf:Title ;
    dcterms:hasPart :subtitle1, :subtitle4, :subtitle7 .


:subtitle1 a bib:SubtitleElement ;
    rdfs:label “Lof def liefde: Hooglied in de renaissance”@nl ;
    dcterms:hasPart :subtitle2, :subtitle3 .

:subtitle2 a bib:SubtitleElement ;
    rdfs:label ‘“Lof def liefde”@nl  ;
    vivo:rank 1 .

:subtitle3 a bib:SubtitleElement ;
    rdfs:label ‘“Hooglied in de renaissance”@nl ;
    vivo:rank 2 .



:subtitle4 a bib:SubtitleElement ;
    rdfs:label “In praise of love: Song of songs in the renaissance”@en ;
    dcterms:hasPart :subtitle5, :subtitle6 .

:subtitle5 a bib:SubtitleElement ;
    rdfs:label “In praise of love”@en ;
    vivo:rank 1 .

:subtitle6 a bib:SubtitleElement ;
    rdfs:label “Song of songs in the renaissance”@en ;
    vivo:rank 2 .
```

```
:subtitle7 a bib:SubtitleElement ;
    rdfs:label “Eloge d'amour : Cantique de cantique a la renaissance”@fr ;
    dcterms:hasPart :subtitle8, :subtitle9 .

:subtitle8 a bib:SubtitleElement ;
    rdfs:label “Eloge d'amour”@fr  ;
    vivo:rank 1 .

:subtitle9 a bib:SubtitleElement ;
    rdfs:label “Cantique de cantique à la renaissance”@fr  ;
    vivo:rank 2 .
```