bibliotek-o Activities 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 Further, discussion of BIBFRAME 2.0 may be out-of-date.

<div align="right">2016 December</div>

Overview

- Link Agents to Works, Instance, and Items through an bib:Activity class rather than make a distinction between bf:Contribution and bf:Provision. The class would be defined as "An activity or contribution by a single agent that affects or alters the existence or state of a resource."
    - Consider alignment with cidoc-crm:E7_Activity and/or other existing Activity classes in the future.
- Link Works, Instance, and Items to Activities using bib:hasActivity.
- Use subclassing of bib:Activity to capture Agent roles, e.g. bib:IllustrationActivity (more on Roles below).
- Use dcterms:date to capture dates of the bib:Activity.
- Use bf:agent to link bib:Activities to Agents.
- Use bib:atLocation to link bib:Activities to prov:Locations[1]

Comments on implementation:
- Simplifying to Activities with specific roles, rather than Contributions/Provision distinction is an easier model to implement, while still meeting our use cases.
    - It isn't the intent of BIBFRAME that one must decide whether to assert a Contribution or ProvisionActivity based on whether the resource is a Work or Instance (although in most cases it would fall that way). bf:Work, bf:Instance, bf:Item are not defined as disjoint; there will likely be implementations that assert something to be both a bf:Work and bf:Instance, therefore distinguishing contributions on the basis of whether something is a bf:Work or bf:Instance, will not work across all implementations of BIBFRAME.
- We recommend using EDTF for encoding dates as the range of dcterms:date. dcterms:date is a well-established date property, and EDTF allows use to handle a number date related use cases in a parseable way (e.g. date ranges, approximate dates) using only a single date property.
- With regard to co-authorship:

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[1] LD4L proposes the use prov:Location over bf:Place. The definition of bf:Place is narrowly defined as a Geographic location, and there are a number of non-geographic places we may want to refer to.

- Two broad types of co-authorship have been identified:
    1. Collaboration: multiple authors collaborate on the entire work.
        - Make new Activity resource for each author. Follow cases above if specific author fits one of them.
    2. Individual, independent contributions (e.g., chapters) to a whole work
        - Break Work into parts (new Works).
        - Have an Activity resource for each part (new Works)
- Because the modeling differs from case to case, the relationship of an author of a part to the work as a whole **cannot** be inferred from the relationship to the part.
- It *might* be possible to identify specific types of works where the inference would be valid, but, such inferences are outside the scope of OWL.
- We thus refer the decision about whether a contribution to a part is also a contribution to the whole to content standards and implementation recommendations.
- It *may* be possible to state these in terms of broad classes of Works, such as essay collections, journals, journal issues, etc. (this would be preferred); it may truly be a work-by-work modeling decision; or it may be some combination of the two. This analysis has been identified as future work.

Requests for Modifications to BIBFRAME 2.0

Open Requests

- Request LC to define bf:Activity and remove bf:Contribution and bf:ProvisionActivity and related subclasses.
    - If LOC is not open to removing bf:Contribution and bf:ProvisionActivity, request they are made subclasses of bf:Activity
    - If LOC is not open to creating a bf:Activity class, LD4all will create bib:Activity class.
- Request LOC to create subclasses of :Activity to capture roles.
    - If LOC is not open to creating subclasses, request that they make bf:role an object property with a range of rdf:Property.
        - In this case, LD4all would make subclasses for roles.
- Request LOC to create bf:hasActivity and bf:isActivityOf (object properties)x
    - If LOC is not open to creating bf:hasActivity and bf:isActivityOf, LD4all will create bib:hasActivity and bib:isActivityOf.

Approved Requests

These requests have been approved by LC, though not yet published in the current BF2 spec.

Rejected Requests

These requests have been rejected by LC. LD4L action is stated.

- Request LOC make an inverse property of bf:agent, bf:isAgentOf.
  - If LOC is not open to creating a bf:isAgentOf property, LD4all will create bib:isAgentOf.
- Request LOC open the range of bf:agent, so that any type of Agent can be used with the property. If not mint bib:hasAgent.
- Request LOC create a bf:statement data type property, replacing bf:provisionActivityStatement. The LD4All Sprint Group recommendation is to use bib:Activity instead of bf:ProvisionActivity, and because this statement may have more than one agent listed the statement should be asserted on the Instance, rather than the bib:Activity instances.

Approach for Moving Forward (including questions if diverges)

Summary of Recommendation Discussions

LD4all discussion of the bib:Activity and bf:Contribution/bf:Provision patterns began with a focus on the Roles various Agents might have and how best to model these Roles. LD4all focused on devising a method to capture the role of Agents consistently that would rely on Roles as RDF Resources, rather than Literals, thereby encouraging greater linking and enabling more confident querying of instance data. Another attempt to provide confident querying was to minimize the number of ways roles might be captured in the model. In the end, the consensus was to use subclasses of the Contribution/Provision/Activity class that links an Agent to a bf:Work/Instance/Item. Recognizing that the Library of Congress is motivated to reuse their relator properties in the Role pattern, if they decide ultimately not to model Roles through subclassing of Contribution/Provision/Activity classes, we to recommend that bf:role be changed to an object property and have the range rdf:Property.

Irrespective of Roles, BIBFRAME 2.0 currently has a number of ways to relate agents to Works/Instances/Items (illustration, and more on this below). LD4all spent a considerable amount of time discussing how best to prune BIBFRAME 2.0 so that the model provided a consistent, singular way for relating Agents to the Resources they were involved in the making of, or otherwise associated with. We ultimately began to think it would be best to remove the distinction between Contributions and Provisions, preferring instead a simpler Activity pattern. This way of thinking was informed, in part, by discussions on the preference to not treat Works, Instances, and Items as disjoint.

Because the outcome of these discussions included the possibility of collapsing Contributions and Provisions into a new Activity class (with related properties), LD4all first researched if existing patterns would meet our needs. CIDOC-CRM's Activity Class (cidoc-crm:E7_Activity)

and schema.org's Action class ([schema:Action](#)) were identified as possible candidates. The options considered were to reuse either cidoc-crm:E7_Activity or schema:Action, or to create an bib:Activity class and that would align through rdfs:subClassOf assertions to either class.

Creating an bib:Activity class and aligning to the external classes mentioned above has pros and cons. By creating a new class we have the agency to more narrowly define our definition of Activity to meet defined use cases, and to align with any and all other related classes that might exist. On the other hand, it also introduces a new Activity class where other linked data implementations are already be using an existing more broadly defined Activity/Action/Event classes. Ultimately it was decided to propose the new class and align to other classes, rather than relying on looser defined Activity classes which require documented implementation patterns separate from the model employed. While we do not rule out the possibility that some data will model relationships between bf:Works/Instances/Items through more general Activity/Action/Event classes, the preference for querying related Agents is through the more granular bf:Activity.

BF2 Approach to Contributions & Provisions

Illustration
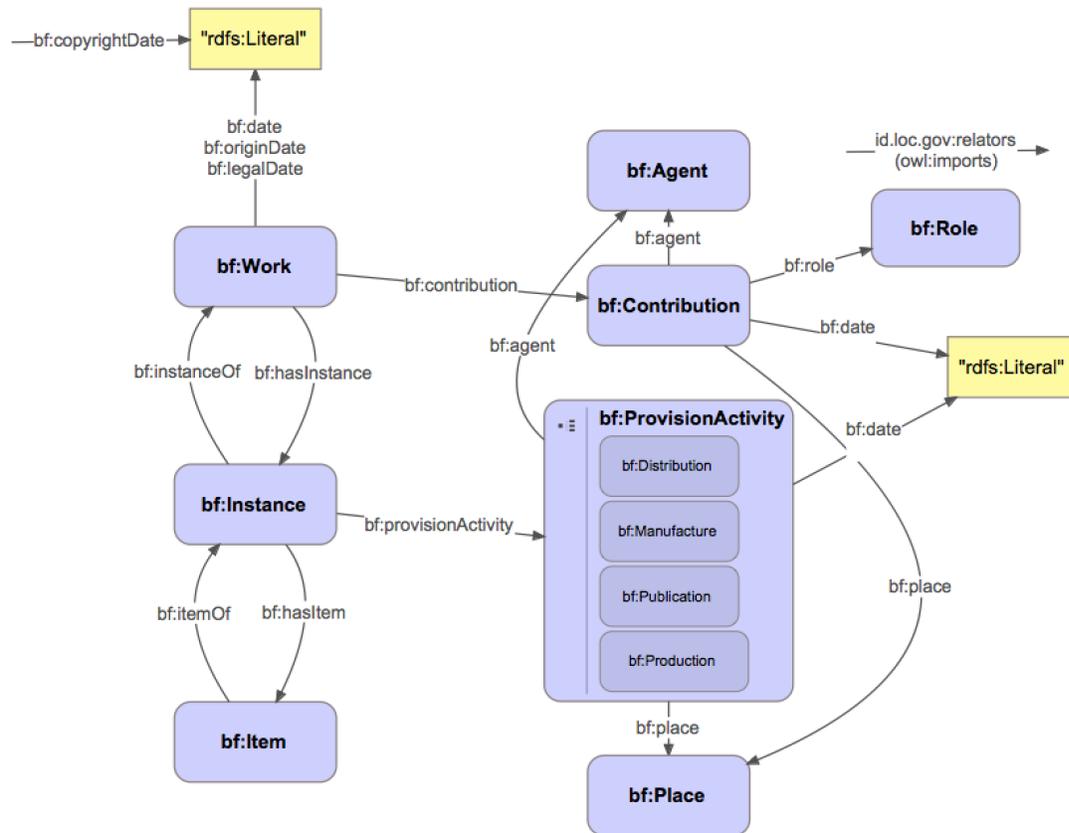
*In the above illustration, predicates with the ld4l namespace should be in the bib namespace

Involved Classes

Contribution

Label: Contribution
URI: http://id.loc.gov/ontologies/bibframe/Contribution
Subclass of: rdfs:Resource
Definition: "Agent and role with respect to the resource being described."
Dcterms:modified: "2016-04-21 (New)" .

ProvisionActivity

Label: "Provider entity"
URI: http://id.loc.gov/ontologies/bibframe/ProvisionActivity
Subclass of: rdfs:Resource

Subclassed as:
- http://id.loc.gov/ontologies/bibframe/Publication
- http://id.loc.gov/ontologies/bibframe/Manufacture
- http://id.loc.gov/ontologies/bibframe/Production
- http://id.loc.gov/ontologies/bibframe/Distribution

Definition: "Information about the agent or place relating to the publication, printing, distribution, issue, release, or production of a resource." .
Dcterms:modified: "2016-04-21 (New)" .

Publication

Label: Publisher
URI: http://id.loc.gov/ontologies/bibframe/Publication
Subclass of: http://id.loc.gov/ontologies/bibframe/ProvisionActivity
Definition: "Information relating to publication of a resource."
Dcterms:modified: "2016-04-21 (New)" .

Production

Label: Producer
URI: http://id.loc.gov/ontologies/bibframe/Production
Subclass of: http://id.loc.gov/ontologies/bibframe/ProvisionActivity
Definition: "Information relating to production of a resource."
Dcterms:modified: "2016-04-21 (New)" .

ProductionMethod

Label: Production method
URI: http://id.loc.gov/ontologies/bibframe/ProductionMethod
Subclass of: rdfs:Resource
Definition: "Process used to produce a resource"
Dcterms:modified: "2016-04-21 (New)" .

Distribution

Label: Distributor
URI: http://id.loc.gov/ontologies/bibframe/Distribution
Subclass of: http://id.loc.gov/ontologies/bibframe/ProvisionActivity
Definition: "Information relating to distribution of a resource."
Dcterms:modified: "2016-04-21 (New)" .

Manufacture

Label: Manufacturer
URI: http://id.loc.gov/ontologies/bibframe/Manufacture
Subclass of: http://id.loc.gov/ontologies/bibframe/ProvisionActivity
Definition: "Information relating to manufacture of a resource."
Dcterms:modified: "2016-04-21 (New)" .

Arrangement

Label: "Organization of materials information"
URI: http://id.loc.gov/ontologies/bibframe/Arrangement
Subclass of: rdfs:Resource
Definition: "Information about the organization and arrangement of a collection of items. For instance, for computer files, organization and arrangement information may be the file structure and sort sequence of a file; for visual materials, this information may be how a collection is arranged." .
Dcterms:modified: "2016-04-21 (New)" .

Capture

Label: "Capture of content"
URI: http://id.loc.gov/ontologies/bibframe/Capture
Subclass of: rdfs:Resource
Definition: "Information about place and date associated with the capture (i.e., recording, filming, etc.) of the content of a resource." .
Dcterms:modified: "2016-04-21 (New)" .

Involved Properties

acquisitionSource (datatype property)

Label: "Source of acquisition"
URI: http://id.loc.gov/ontologies/bibframe/acquisitionSource
Definition: "Information about an organization, etc., from which a resource may be obtained."
Comment: "Used with Work or Instance"
Range: rdfs:Literal
Dcterms:modified: "2016-04-21 (New)" .

acquisitionTerms (datatype property)

Label: "Terms of acquisition"
URI: http://id.loc.gov/ontologies/bibframe/acquisitionTerms
Definition: "Conditions under which the publisher, distributor, etc., will normally supply a resource, e.g., price of a resource."
Comment: "Used with Work or Instance"
Range: rdfs:Literal
Dcterms:modified: "2016-04-21 (New)" .

agent (object property)

Label: Associated agent
URI: http://id.loc.gov/ontologies/bibframe/agent

Definition: "Entity associated with a resource or element of description, such as the name of the entity responsible for the content or of the publication, printing, distribution, issue, release or production of a resource."
Comment: "Used with Unspecified"
Range: http://id.loc.gov/ontologies/bibframe/Agent
Dcterms:modified: "2016-04-21 (New)" .

arrangement (object property)

Label: Organization and arrangement
URI: http://id.loc.gov/ontologies/bibframe/arrangement
Definition: "Information about the organization and arrangement of a collection of resources." .
Comment: "Used with Work or Instance"
Range: http://id.loc.gov/ontologies/bibframe/Arrangement
Dcterms:modified: "2016-04-21 (New)" .

contribution (object property)

Label: Contributor role
URI: http://id.loc.gov/ontologies/bibframe/contribution
Definition: "Agent and its role in relation to the resource."
Comment: "Used with Work, Instance or Item" .
Range: http://id.loc.gov/ontologies/bibframe/Contribution .
Dcterms:modified: "2016-04-21 (New)" .

capture (object property)

Label: Capture of content
URI: http://id.loc.gov/ontologies/bibframe/capture
Definition: "Information about place and date associated with the capture (i.e., recording, filming, etc.) of the content of a resource."
Range: http://id.loc.gov/ontologies/bibframe/Capture .
Dcterms:modified: "2016-04-21 (New)" .

copyrightDate (Data Property)

Label: Copyright date
URI: http://id.loc.gov/ontologies/bibframe/copyrightDate
Subproperty of: http://id.loc.gov/ontologies/bibframe/date
Definition: "Date associated with a claim of protection under copyright or a similar regime."
Comment: Used with Work or Instance
Range: rdfs:Literal
Dcterms:modified: "2016-04-21 (New)" .

bf:place (Object property)

Label: Place
URI: http://id.loc.gov/ontologies/bibframe/place

Description: "Geographic location or place entity associated with a resource or element of description, such as the place associated with the publication, printing, distribution, issue, release or production of a resource, place of an event."
Range: bf:Place

productionMethod (Object property)

Label: Production method
URI: http://id.loc.gov/ontologies/bibframe/provisionActivityStatement
Definition: "Process used to produce a resource."
Domain: http://id.loc.gov/ontologies/bibframe/Instance
Range: http://id.loc.gov/ontologies/bibframe/ProductionMethod
Dcterms:modified: "2016-04-21 (New)" .

provisionActivity (object property)

Label: Provider
URI: http://id.loc.gov/ontologies/bibframe/provisionActivity
Definition: "Place, name, and/or date information relating to the publication, printing, distribution, issue, release, or production of a resource."
Domain: http://id.loc.gov/ontologies/bibframe/Instance
Range: http://id.loc.gov/ontologies/bibframe/ProvisionActivity
Dcterms:modified: "2016-04-21 (New)" .

provisionActivityStatement (datatype property)

Label: Provider statement
URI: http://id.loc.gov/ontologies/bibframe/provisionActivityStatement
Definition: "Statement relating to providers of a resource; usually transcribed."
Comment:
Domain: http://id.loc.gov/ontologies/bibframe/Instance
Range: rdfs:Literal
Dcterms:modified: "2016-04-21 (New)" .

role (datatype property)

Label: Agent role
URI: http://id.loc.gov/ontologies/bibframe/role
Definition: "Specific role of agent."
Comment:
Domain: http://id.loc.gov/ontologies/bibframe/Contribution
Range: rdfs:Literal
Dcterms:modified: "2016-04-21 (New)" .

owl:imports of MARC Code List of Relators

URI: http://id.loc.gov/vocabulary/relators

Description: Relator terms and their associated codes designate the relationship between an agent and a bibliographic resource. The relator codes are three-character lowercase alphabetic strings that serve as identifiers. Either the term or the code may be used as controlled values.

bibliotek-o Approach to Activities

Illustration
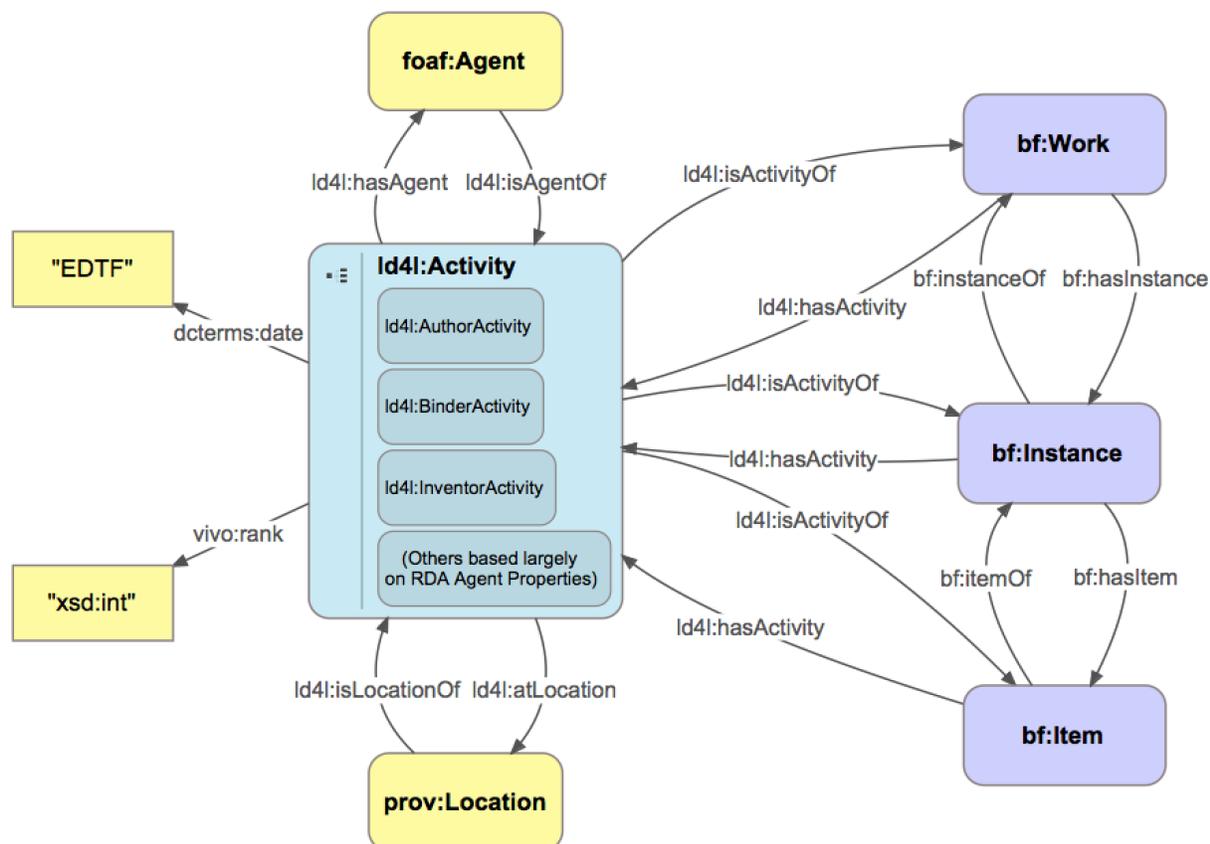
Involved Classes

Activity (new in bibliotek-o)

Label: Activity
URI: bib:Activity
Definition: "An activity or contribution by a single agent that affects or alters the existence or state of a resource."

Proposed bib:Activity Subclasses Based on MARC Relators:

bib:AbridgeActivity	bib:DraftsmanActivity	bib:PhotographerActivity
bib:ActorActivity	bib:EditorActivity	bib:PlatemakerActivity

bib:AcquisitionActivity*	bib:EngraverActivity	bib:PresenterActivity
bib:AdaptingActivity	bib:EtcherActivity	bib:PrinterActivity
bib:AddresseeActivity	bib:FacsimilistActivity	bib:PrintmakerActivity
bib:AnalystActivity	bib:FieldDirectorActivity	bib:ProducerActivity
bib:AnimatorActivity	bib:FilmDirectorActivity	bib:ProductionActivity
bib:AppellantActivity	bib:FilmDistributorActivity	bib:ProgrammerActivity
bib:AppelleeActivity	bib:FilmEditorActivity	bib:ProofreaderActivity
bib:ApplicationActivity	bib:FilmProducerActivity	bib:ProviderActivity
bib:ArchitectActivity	bib:FilmmakerActivity	bib:PublicationActivity
bib:ArrangementActivity	bib:ForgerActivity	bib:PuppeteerActivity
bib:ArtCopyistActivity	bib:HonoreeActivity	bib:RecorderActivity
bib:ArtDirectorActivity	bib:HostActivity	bib:RendererActivity
bib:ArtistActivity	bib:IlluminationActivity	bib:ReporterActivity
bib:ArtisticDirectorActivity	bib:IllustrationActivity	bib:RepositoryActivity
bib:AssigneeActivity	bib:InscriberActivity	bib:ResearcherActivity
bib:AttributionActivity	bib:InstrumentalistActivity	bib:ReviewerActivity
bib:AuthorActivity	bib:IntervieweeActivity	bib:ScientificAdvisorActivity
bib:BinderActivity	bib:InterviewerActivity	bib:ScreenwriterActivity
bib:BindingDesignerActivity	bib:InventorActivity	bib:ScribeActivity
bib:BroadcasterActivity	bib:IssuingBodyActivity	bib:SculptorActivity
bib:BorrowerActivity	bib:LenderActivity	bib:SecretaryActivity
bib:CaptureActivity*	bib:LibrettistActivity	bib:SetDesignerActivity
bib:CartographerActivity	bib:LicenseeActivity	bib:SettingActivity
bib:ChoreographerActivity	bib:LicensorActivity	bib:SignerActivity
bib:CinematographerActivity	bib:LightingDesignerActivity	bib:SingerActivity
bib:CollectorActivity	bib:LithographerActivity	bib:SoundDesignerActivity
bib:CollectionRegistarActivity	bib:LyricistActivity	bib:SpeakerActivity
bib:CollotyperActivity	bib:ManufacturerActivity	bib:SponsorActivity
bib:ColoristActivity	bib:MarblerActivity	bib:StageDirectorActivity
bib:CommentatorActivity	bib:MetalEngraverActivity	bib:StageManagerActivity
bib:CompilerActivity	bib:MinuteTakerActivity	bib:StereotyperActivity
bib:ComposerActivity	bib:ModeratorActivity	bib:StorytellerActivity
bib:ConductorActivity	bib:MonitorActivity	bib:SurveyorActivity
bib:ConservatorActivity	bib:MusicCopyistActivity	bib:TeacherActivity
bib:ConsultantActivity	bib:MusicalDirectorActivity	bib:ThesisAdvisorActivity
bib:ContributorActivity	bib:MusicianActivity	bib:TranscriberActivity
bib:CopyrightActivity	bib:NarratiorActivity	bib:TranslatorActivity
bib:CorrespondentActivity	bib:OfferActivity	bib:TypographerActivity
bib:CoverDesignerActivity	bib:OpponentActivity	bib:VideographerActivity
bib:CreationActivity	bib:OrganizerActivity	bib:VoiceActorActivity
bib:CurationActivity	bib:OriginatorActivity	bib:WitnessActivity
bib:DancerActivity	bib:OwnerActivity	bib:WoodEngraverActivity
bib:DedicateeActivity	bib:PanelistActivity	bib:WoodcutterActivity
bib:DedicatorActivity	bib:PapermakerActivity	

bib:DepositorActivity bib:DesignerActivity bib:DirectorActivity bib:DistributionActivity bib:DonorActivity	bib:PatentActivity bib:PatronActivity bib:PerformerActivity	

*A bib:Activity subclass without a corresponding MARC relator code

Involved Properties

bib:atLocation (object property)

Label: At location
URI: bib:atLocation
Definition: "A location can be an identifiable geographic place (ISO 19112), but it can also be a non-geographic place such as a directory, row, or column. As such, there are numerous ways in which location can be expressed, such as by a coordinate, address, landmark, and so forth."
Comment: "Used with Unspecified"

dcterms:date (Data 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 [W3CDTF]."
Range: rdfs:Literal

hasActivity (Object property)

Label: has Activity
URI: bib:hasActivity
Description: "Relates bibliographic resource to an activity that affects the resource's state."
Inverse: bib:isActivityOf

isActivityOf (Object property)
Label: is Activity of
URI: bib:isActivityOf
Description: "Relates an activity that affects the resource's state to bibliographic resource."
Inverse: bib:hasActivity

bib:isAgentOf (Object property)

Label: Agent for
URI: bib:isAgentOf
Description: "Relates an Agent to an Activity they participated in.

Domain: bf:Agent
Inverse: bf:agent

vivo:rank (Data property)

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

Side by Side Examples

Work is by author Edna O'Brien and a co-author, written in 1960 while she was in Dublin.

```
# BIBFRAME2
:w1 a bf:Work ;
    bf:contributor <http://id.loc.gov/rwo/agents/n78091520> ;
    bib:Activity :c1 , :c3 ;
    bf:hasInstance :i1 .
:c1 a bib:Activity ;
    bf:agent <http://id.loc.gov/rwo/agents/n78091520> ;
    bf:role "author" ;
    bf:date "1960" ;
    bf:place :dublin .
:c3 a bib:Activity ;
    bf:agent :Agent1
    bf:role "author"
    bf:date "1960" ;
    bf:place :dublin .
:i1 a bf:Instance ;
    bf:provisionActivity :c2 .
:c2 a bf:ProvisionActivity ;
    bf:role "publisher"
    bf:date "1960" ;
    bf:place :London .

# A bib:Activity can be used instead of the bf:contributor property to record role, if
known.
# The range of bf:role is currently rdfs:Literal, but LOC has discussed making it an object
property to relate to MARC Relators.
# BF 2.0 doesn't preclude using vivo:rank to order :c1 and :c3, but it doesn't include it in
the ontology.
# The "athor" typo in :c3's bf:role is to make the point that we should avoid data
properties. Other typos in this document were unintentional.
```

```
# bibliotek-o version 2 (Activity)
:w1 a bf:Work ;
    bib:hasActivity :c1 , :c3 ;
    bf:hasInstance :i1 .
:i1 a bf:Instance ;
    bib:hasActivity :c2 .
:c1 a bib:AuthorActivity ;
```

```
    bf:agent <http://id.loc.gov/rwo/agents/n78091520> ;
    vivo:rank "1" ;
    dc:terms:date "1960" ;
    bib:atLocation :London .
:c3 a bib:AuthorActivity ;
    bf:agent :Agent1 .
    vivo:rank "2" ;
    dcterms:date "1960" ;
    bib:atLocation :dublin .
:c2 a bib:PublishingActivity ;
    bf:agent <Publisher1> ;
    dc:terms:date "2016-07-30" .
bib:AuthorActivity rdfs:subClassOf bf:Activity .
bib:EditorActivity rdfs:subClassOf bf:Activity .
bib:PublishingActivity rdfs:subClassOf bf:Activity .
```

Co-authorship modeling

Two broad types of co-authorship can be distinguished:

3. Collaboration: multiple authors collaborate on the entire work.
   ○ Make new Activity resource for each author. Follow cases above if specific author fits one of them.
4. Individual, independent contributions (e.g., chapters) to a whole work
   ○ Break Work into parts (new Works).
   ○ Have an Activity resource for each part (new Works)

Note that the distinction is **only** relevant where the parts are defined as individual entities. Where this is not the case, the contribution to a part will necessarily be stated in relation to the whole.

Model 1: Collaboration

```
:work1 a bf:Work ;
   bib:hasActivity :activity1 , :activity2 .
:activity1 a bib:AuthorActivity[2] ;
   bf:hasAgent :agent1 .
:activity2 a bib:AuthorActivity ;
   bf:hasAgent :agent2 .
```

Model 1 is straightforward and requires no further discussion.

Individual contributions can be modeled as Activities on parts of a Work.

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[2] We use bib:AuthorActivity for illustration, but of course the model applies equally to other types of Activity.

Model 2: Individual contributions to parts of a Work

```
:work1 a bf:Work ;
   rdfs:label "Some textbook"  ;
   dcterms:hasPart :part1 , :part2 .
:part1 a bf:Work ;
   rdfs:label "Chapter 1" ;
   bib:hasActivity :activity1 .
:activity1 a bib:AuthorActivity ;
   bf:hasAgent :agent1 .
:part2 a bf:Work ;
   rdfs:label "Chapter 2" ;
   bib:hasActivity :activity2 .
:activity2 a bib:AuthorActivity ;
   bf:hasAgent :agent2 .
```

Suppose for the sake of argument that whenever we have an Activity on the part, we also have an Activity on the whole:

Model 3: Individual contributions to parts of a Work imply contributions on the whole

```
:work1 a bf:Work ;
   rdfs:label "Some textbook"  ;
   dcterms:hasPart :part1 , :part2 ;
   bib:hasActivity :activity3, :activity4 .
:part1 a bf:Work ;
   rdfs:label "Chapter 1" ;
   bib:hasActivity :activity1 .
:activity1 a bib:AuthorActivity ;
   bf:hasAgent :agent1 .
:part2 a bf:Work ;
   rdfs:label "Chapter 2" ;
   bib:hasActivity :activity2 .
:activity2 a bib:AuthorActivity ;
   bf:hasAgent :agent2 .
:activity3 a bib:AuthorActivity ;
   bf:hasAgent :agent1 .
:activity4 a bib:AuthorActivity ;
   bf:hasAgent :agent2 .
```

This model has the practical advantage of simplifying queries for contributions on a work: it is not necessary to query whether the work has parts, and if so, to drill down into the parts to get the full list of contributors to the whole.

If this were true, ideally we would want to *infer* rather than *assert* the agent-to-whole relationship; that is, the bolded statements in Model 4 would be inferred.

Model 3: Individual contributions to the whole are inferred based on contributions to the whole

```
:work1 a bf:Work ;
   rdfs:label "Some textbook" ;
   dcterms:hasPart :part1 , :part2 ;
   bib:hasActivity :activity3, :activity4 .
:part1 a bf:Work ;
   rdfs:label "Chapter 1" ;
   bib:hasActivity :activity1 .
:activity1 a bib:Activity ;
   bf:hasAgent :agent1 .
:part2 a bf:Work ;
   rdfs:label "Chapter 2" ;
   bib:hasActivity :activity2 .
:activity2 a bib:Activity ;
   bf:hasAgent :agent2 .
:activity3 a bib:Activity ;
   bf:hasAgent :agent1 .
:activity4 a bib:Activity ;
   bf:hasAgent :agent2 .
```

There are two problems here:
- Technical obstacles to stating such an inference. An OWL property chain axiom hasPart/hasActivity => hasActivity cannot work unless we want the *same* Activity for the part and the whole, which seems odd. Even if the inference could be stated in other rules systems, such as SWRL, if an application does not support such reasoning, the triples won't exist.
- In fact, this assumption does not mirror the complexity of relationships between contributions to the part and contributions to the whole.

Consider some different cases of independent contributions:
1. **Book chapters or sections** independently written by different but coordinate authors with the same degree of participation and/or credit. In this case, all contributors are listed as authors of the work, so we would want to express a relationship between each agent and the work as a whole (via bib:AuthorActivities, of course). For example we would have separate bib:AuthorActivities for Hans Augusto Rey and Margret Rey to capture their contributions to the whole of a Curious George book.
2. **Book chapters or sections** where one author is considered the author of the work as a whole and others are subordinate contributors to individual sections. Example: *Patterns of Enterprise Application Architecture*. On the book cover and title page: by Martin Fowler, with contributions by David Rice, Matthew Foemmel, Edward Hieatt, Robert Mee, and Randy Stafford. In the table of contents and within the book, each individual contributor is associated with an individual section.

3. **Journal articles and essay collections**. In this case, there may be only an editorial Activity on the entire work, and the authors are related only to the individual essays (via an bib:AuthorActivity), or we may want a direct contribution to the whole, in addition to the contribution to the part. Certainly the author of a journal article is *not* an author of the journal issue, nor of the journal in its entirety. But the author of a journal article may be considered a *contributor*, in some other sense, to both the journal issue and the journal in its entirety. (The nature of the contribution may be left unspecified by using just the superclass bib:Activity, or we could define a new subclass for this case.)
4. **Introduction or preface** written by an agent other than the author of the body of the work.

So the question is:
- In which cases is there an Activity on the whole as well as on the part?
- Where such a relationship exists, what is the type of the Activity? Is it the same type of Activity as exists on the part, or different? E.g., a journal article author is probably not considered an author of the issue or the journal.
- And how should these be modeled?

Case 1 is clear: we want to directly assert the relationship between the work as a whole and each agent by instantiating another Activity node relating the two. This is shown as Model 3 above, repeated here for clarity.

Case 1 = Model 3: Individual contributions to parts of a Work imply contributions to the whole

```
:work1 a bf:Work ;
   rdfs:label "Some textbook" ;
   dcterms:hasPart :part1 , :part2 ;
   bib:hasActivity :activity3, :activity4 .
:part1 a bf:Work ;
   rdfs:label "Chapter 1" ;
   bib:hasActivity :activity1 .
:activity1 a bib:Activity ;
   bf:hasAgent :agent1 .
:part2 a bf:Work ;
   rdfs:label "Chapter 2" ;
   bib:hasActivity :activity2 .
:activity2 a bib:Activity ;
   bf:hasAgent :agent2 .
:activity3 a bib:Activity ;
   bf:hasAgent :agent1 .
:activity4 a bib:Activity ;
   bf:hasAgent :agent2 .
```

The modeling of cases 2-4 is less clear, and may differ from case to case:

- In some cases we want a direct authorial connection (i.e., an bib:AuthorshipActivity) between author of parts and the whole work.
- In some cases we want a direct connection, but not an authorial connection, between the authors of parts and the whole work. We could leave the type of connection unspecified (using the superclass bib:Activity) or we could define one or more new subclasses for these cases.
- In some cases we want an editorial Activity on the whole work, with the agents of the parts not directly related to the whole work.
- In some cases we want no relationship between the whole work and the contributor of the part.
- In the case of journals, there are three tiers involved: the article, the journal issue, and the journal itself.

Conclusions

- Because the modeling differs from case to case, the relationship of an author of a part to the work as a whole **cannot** be inferred from the relationship to the part.
- It *might* be possible to identify specific types of works where the inference would be valid, but, as above, such inferences are outside the scope of OWL.
- We thus refer the decision about whether a contribution to a part is also a contribution to the whole to content standards and implementation recommendations.
- It *may* be possible to state these in terms of broad classes of Works, such as essay collections, journals, journal issues, etc. (this would be preferred); it may truly be a work-by-work modeling decision; or it may be some combination of the two.

Future Work

- Work out recommendations for when bib:Activities, and bf:Events have overlapping agents, places, dates, and resulting Work/Instances/Items, e.g. A CreationActivity for an Album and a Recording Session Event.
- Consider subclassing hierarchy possibilities of the newly minted bib:Activity subclasses.
- Consider alignment with cidoc-crm:E7_Activity and/or other existing Activity/Action classes, e.g. schema:Action and VIVO ISF patterns.
- Consider a better model for ordering Activities: Previously considered "If important, to order multiple bib:Activities (especially bib:Activities with the same role), use vivo:rank on the appropriate activities."
- Analyze whether it's possible to state that contributions to parts of a work should be considered contributions to the whole in terms of broad classes of Works, such as essay collections, journals, journal issues, etc. (this would be preferred); it may truly be a work-by-work modeling decision; or it may be some combination of the two.
- Consider making associative relationships between MARC Relator Properties and corresponding Activities, through e.g. bf:reifies/bf:reifiedBy, or http://smiy.sourceforge.net/prv/spec/propertyreification.html