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To: Joint Steering Committee for Development of RDA
From: Alan Danskin, Chair, JSC
Subject: Mapping ISBD and RDA element sets; briefing/ discussion paper

The following paper has been received from Gordon Dunsire.

Mapping ISBD and RDA element sets: briefing/discussion paper

Gordon Dunsire, Oct 2011

Background

"The need to integrate data produced using RDA into existing databases developed using AACR and related standards has been recognized as a key factor in the design of RDA." - RDA Toolkit 0.2.

"The ISBD Review Group considered that it was essential for IFLA to clarify the relationship between the ISBDs and the FRBR model." – Introduction to the consolidated edition of ISBD.

The JSC and the ISBD Review Group have published mappings between the ISBD and RDA elements.

ISBD: Mapping ISBD Elements to FRBR Entity Attributes and Relationships

<http://www.ifla.org/files/cataloguing/isbd/isbd-frbr-mapping.pdf>

JSC: RDA Toolkit, Appendix D.1: *ISBD presentation*

Both documents need to be updated to take into account the final consolidated edition of ISBD.

JSC and ISBD RG have a mutual interest in:

- Mapping appropriate parts of the ISBD and RDA element sets.
- Developing mappings in RDF to improve interoperability of linked data in the Semantic Web.
- Using the Open Metadata Registry (OMR) as a vocabulary management tool.

Mapping constraints

Note: examples of triples are given as three-part statements: first part is the subject, second part is the property or predicate, third part is the object; subject and property must be URIs, while the object may be a "literal" or a URI.

There are two basic ways of relating one RDF class to another:

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- ClassA rdfs:subClassOf ClassB – all instances/members of ClassA are also members of ClassB, but not the other way round.
- ClassA owl:equivalentClass ClassB – ClassA and ClassB have the same members.

Similarly, the two basic ways of relating one RDF property to another are:

- propertyA rdfs:subPropertyOf propertyB – anything that has propertyA with value X also has propertyB with value X, but not the other way round.
- propertyA owl:equivalentProperty propertyB – all things with propertyA also have propertyB, with the same values.

Note that owl:sameAs can be used to declare that two classes or properties are identical. This is a strong ontological assertion which may result in logical contradictions between two namespaces if used incorrectly. Unless it is known that the context of both namespaces is exactly the same, it is better to use the weaker assertion of equivalence.

Mappings between RDF classes and properties must be semantically and logically consistent, taking into account:

- Implicit semantics in element definitions and scope notes.
- Explicit semantics in property and class declarations, including domains, ranges, and sub-property and sub-class relationships.

For implicit semantics, there needs to be agreement between JSC and ISBD that two properties or classes have the same or near-equivalent definitions, or that one is completely subsumed by the other (i.e. is a sub-class or sub-property).

Explicit semantics denote inferences that can be made from instance triples using a specific property or class:

If propertyA has domain classA, and propertyB has domain classB, then if we declare propertyA to be a sub-property of propertyB, we imply that classA is a sub-class of (or the same class as) classB. If this is not the case, then we cannot declare propertyA to be a sub-property of propertyB.

Similarly, if propertyA has range classA and propertyB has range classB, then declaring propertyA to be a sub-property of propertyB implies that classA is a sub-class of classB.

ISBD and RDA constraints

Explicit semantics for ISBD and RDA namespaces are:

- All ISBD properties have domain isbd:Resource.
- No ISBD properties have ranges.
- All "bounded" RDA properties have a domain of rdafrbr:Work, rdafrbr:Expression, rdafrbr:Manifestation, or rdafrbr:Item.
- Some RDA properties, based on relationships between FRBR entities, have ranges.

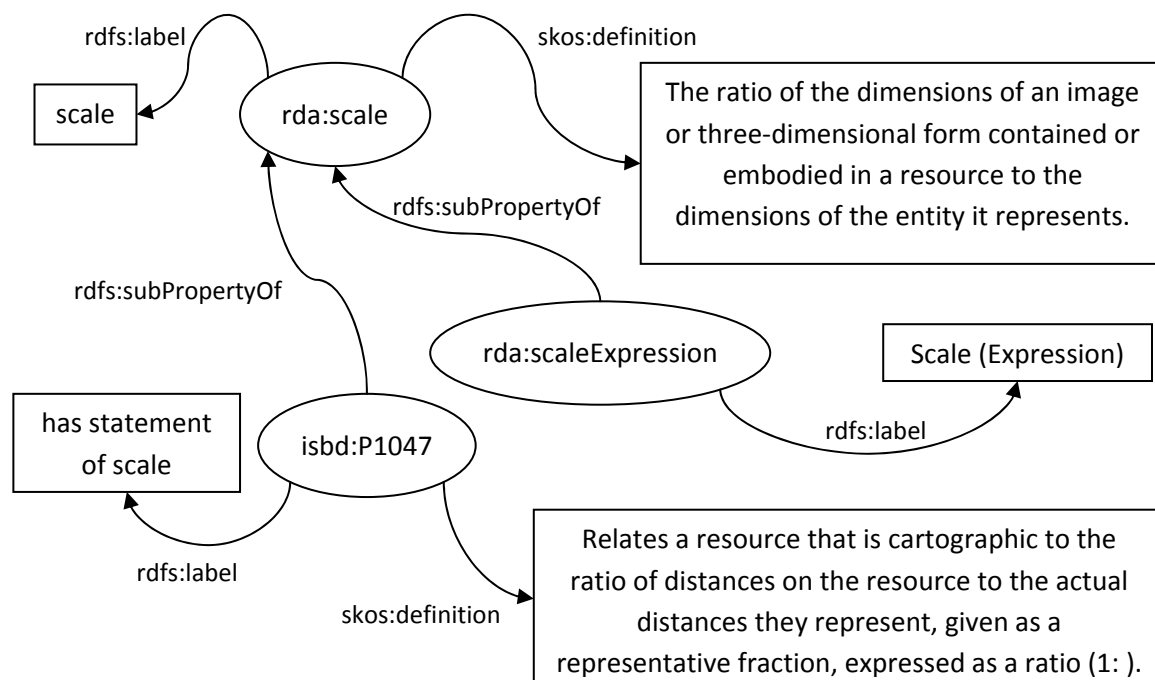
The RDAFRBR Work, Expression, Manifestation, and Item classes are not sub-classes of the ISBD Resource class, or vice-versa.

Therefore RDA properties cannot be sub-properties or super-properties of, or equivalent to, ISBD properties.

This implies that RDA and ISBD properties are sub-properties of properties which have neither RDA nor ISBD classes as domains or ranges. A set of such properties, the so-called unbounded RDA properties, has been created as part of the RDA namespace in the OMR. Each RDA bounded property is a sub-property of an unbounded version of the same property.

e.g. `rda:scale` has the same definition as `rda:scaleExpression`, but without the domain of `rda:Expression`; see the *Scale* mapping example below.

The OMR already has `rda:scaleExpression rdfs:subPropertyOf rda:scale`. We can add the mapping triple `isbd:P1047 rdfs:subPropertyOf rda:scale` to produce the RDF graph:



This graph can be applied to ISBD and RDA instance triples.

E.g. URI `isbd:P1047 "1:25000"` and URI `rda:scaleExpression "1:15"` imply:

- URI is an `isbd:Resource` (from the domain of `isbd:P1047`)
- URI is an `rda:scale` "1:25000" (from the sub-property relationship)
- URI is an `rda:Expression` (from the domain of `rda:scaleExpression`)
- URI is an `rda:scale` "1:15" (from the sub-property relationship)

Aggregated statements

Both ISBD and RDA contain elements which are aggregations of other elements. For example, both have a publication statement which aggregates the place of publication, name of publisher, and date of publication.

Both namespaces are using the modelling approach to aggregated statements outlined in RDA Vocabularies: Process, Outcome, Use:

<http://www.dlib.org/dlib/january10/hillmann/01hillmann.html>

Specifically, there is a property declared for each aggregated statement, with a range of a class for a syntax encoding scheme (SES) for the aggregation. An ISBD SES gives the component elements, their sequence, and the punctuation which separates them within the aggregation; this detail has not yet been added to the OMR. The ISBD SES is, generally, just one of the possible encodings for an RDA aggregated statement, so it should not be regarded as equivalent to the corresponding RDA SES (although it is possible that the ISBD SES is a sub-class of the RDA SES).

RDA has unbounded versions of its aggregated statements, which can be declared as super-properties of the ISBD statements. See the *Publication statement* mapping example.

The unbounded versions do not declare SES ranges, so no inferences can be made about the relationship between the ISBD and RDA SESs, which require further investigation.

Further work

- Identify equivalent ISBD and RDA properties and aggregated statements and agree that they have the same intrinsic semantic.
- Identify properties that do not fit the general pattern described above, and investigate suitable alternate mappings.
- Agree on a protocol for developing, publishing, and maintaining mappings between ISBD and RDA: Who maintains? Which namespace are mappings published in? When are changes to either standard synchronized with the other?
- Use upgraded OMR to publish and maintain mappings.
- Investigate mappings between ISBD/RDA and other related namespaces.

Example mappings

The examples contain triples taken from the RDA and ISBD namespaces, giving additional explanatory annotations and samples of multi-lingual annotations. The **proposed mapping relationships** are highlighted. Other highlights show linked **domain** and **range** classes, and linked **properties**.

The examples are in ttl (terse triple language) format: the extended URI is the subject of a set of triples, each separated by a semi-colon, with an indented URI for each predicate followed by the URI of the object, or a literal value. Each set of triples with a common subject is terminated by a full-stop.

Scale

```
isbd:P1047
  a rdf:Property;
  rdfs:label "has statement of scale"@en;
```

rdfs:label "tiene mención de escala"@es;
 skos:definition "Relates a resource that is cartographic to the ratio of distances on the resource to the actual distances they represent, given as a representative fraction, expressed as a ratio (1:)."@en.

rdfs:domain **isbd:C2001**;
 rdfs:subPropertyOf **rda:scale**.

isbd:C2001

a owl:Class;
 rdfs:label "Resource"@en;
 skos:definition "An entity, tangible or intangible, that comprises intellectual and/or artistic content and is conceived, produced and/or issued as a unit, forming the basis of a single bibliographic description."@en.

rda:scaleExpression

a rdf:Property;
 rdfs:label "Scale (Expression)"@en;
 skos:definition "The ratio of the dimensions of an image or three-dimensional form contained or embodied in a resource to the dimensions of the entity it represents."@en;
 rdfs:domain **rdafrbr:Expression**
 rdfs:subPropertyOf **rda:scale**.

rda:scale

a rdf:Property;
 rdfs:label "Scale"@en;
 skos:definition "The ratio of the dimensions of an image or three-dimensional form contained or embodied in a resource to the dimensions of the entity it represents."@en.

rdafrbr:Expression

a owl:Class;
 rdfs:label "Expression"@en;
 skos:definition "The intellectual or artistic realization of a work in the form of alpha-numeric, musical, or choreographic notation, sound, image, object, movement, etc., or any combination of such forms."@en.

Equinox

isbd:P1052

a rdf:Property;
 rdfs:label "has equinox"@en;
 rdfs:label "tiene equinoccio"@es;
 skos:definition "Relates a resource that is cartographic to its equinox (one of two points of intersection of the ecliptic and the celestial equator, occupied by the sun when its declination is 0 degrees)."@en.

rdfs:domain **isbd:C2001**;
 rdfs:subPropertyOf **rda:equinox**.

isbd:C2001

a owl:Class;
 rdfs:label "Resource"@en;

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skos:definition "An entity, tangible or intangible, that comprises intellectual and/or artistic content and is conceived, produced and/or issued as a unit, forming the basis of a single bibliographic description."@en.

rda:equinoxWork
 a rdf:Property;
 rdfs:label "Equinox (Work)"@en;
 skos:definition "One of two points of intersection of the ecliptic and the celestial equator, occupied by the sun when its declination is 0°."@en;
 rdfs:domain rdafrbr:Work
 rdfs:subPropertyOf rda:equinox.

rda:equinox
 a rdf:Property;
 rdfs:label "Equinox"@en;
 skos:definition "One of two points of intersection of the ecliptic and the celestial equator, occupied by the sun when its declination is 0°."@en.

rdafrbr:Work
 a owl:Class;
 rdfs:label "Work"@en;
 skos:definition "A distinct intellectual or artistic creation."@en.

Fingerprint

isbd:P1075
 a rdf:Property;
 rdfs:label "has fingerprint"@en;
 rdfs:label "tiene identificador tipográfico"@es;
 skos:definition "Relates a resource that is an older monographic resource to a number of characters drawn from a number of uniform places in the text of the resource, considered as a substitute for a standard number."@en.
 skos:scopeNote "A definitive formula for fingerprint has yet to be determined by international agreement. Until such an agreement is made, various forms of fingerprint can be used.";
 rdfs:domain isbd:C2001.

isbd:C2001
 a owl:Class;
 rdfs:label "Resource"@en;
 skos:definition "An entity, tangible or intangible, that comprises intellectual and/or artistic content and is conceived, produced and/or issued as a unit, forming the basis of a single bibliographic description."@en.

rda:identifierForTheManifestation
 a rdf:Property;
 rdfs:label "Identifier for the manifestation"@en;
 skos:definition "A character string associated with a manifestation that serves to differentiate that manifestation from other manifestations."@en;
 rdfs:domain rdafrbr:Manifestation.

rdafrbr:Manifestation

a owl:Class;
 rdfs:label "Manifestation"@en;
 skos:definition "The physical embodiment of an expression of a work."@en.

Publication statement

isbd:P1162
 a rdf:Property;
 rdfs:label "has publication, production, distribution, etc area"@en;
 rdfs:label "tiene área de publicación, producción, distribución, etc."@es;
 skos:definition "Relates a resource to a statement including the place of publication, production and/or distribution; the name of publisher, producer, and/or distributor; the date of publication, production, and/or distribution; the place of printing or manufacture; the name of printer or manufacturer; and the date of printing or manufacture."@en;
 rdfs:domain isbd:C2001;
 rdfs:range isbd:C2007;
 rdfs:subPropertyOf rda:publicationStatement.

isbd:C2007

a owl:Class;
 rdfs:label "Publication, Production, Distribution, Etc Area Encoding Scheme"@en;
 skos:definition "Syntax Encoding Scheme for the publication, production, distribution, etc. area (Area 4)."@en.

isbd:C2001

a owl:Class;
 rdfs:label "Resource"@en;
 skos:definition "An entity, tangible or intangible, that comprises intellectual and/or artistic content and is conceived, produced and/or issued as a unit, forming the basis of a single bibliographic description."@en.

rda: publicationStatementManifestation
 a rdf:Property;
 rdfs:label "Publication statement (Manifestation)"@en;
 skos:definition "A statement identifying the place or places of publication, publisher or publishers, and date or dates of publication of a resource."@en;
 rdfs:domain rdafrbr:Manifestation.
 rdfs:range rda:PublicationStatementEncodingScheme
 rdfs:subPropertyOf rda:publicationStatement.

rda:publicationStatement

a rdf:Property;
 rdfs:label "Publication statement (Manifestation)"@en;
 skos:definition "A statement identifying the place or places of publication, publisher or publishers, and date or dates of publication of a resource."@en;

rda: PublicationStatementEncodingScheme

a owl:Class;
 rdfs:label "Publication Statement Encoding Scheme"@en;
 skos:definition "This subclass has been created to define the Syntax Encoding Scheme for the RDA Publication Statement composite string. The Publication Statement is composed of an ordered,

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concatenated list of properties: - Place of publication - Parallel place of publication - Publisher's name - Parallel publisher's name - Date of publication"@en.

rdafbr: Manifestation

a owl:Class;

rdfs:label "Manifestation"@en;

skos:definition "The physical embodiment of an expression of a work."@en.