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Declaring IFLA ISBD and FRBR family of conceptual models in RDF

Abstract

The presentation will first give a brief introduction to IFLA's bibliographic standards – ISBD and the FRBR family of conceptual models, their goals and management, specifically the procedures and processes for review and development within the IFLA Cataloguing Section's ISBD Review Group and FRBR Review Group. Background information will also be given on the declaration of the ISBD and FRBR element sets and vocabularies in RDF with reference to the problems encountered in the process, such as identifying elements, defining classes and properties, determining domains and ranges, separating semantics from syntax in the definitions of the elements, and designing application profiles.

The namespaces for the element sets and value vocabularies for ISBD and the FRBR models have been published, and are available in usable form due to the newly designed de-referencing services. Uses of these namespaces to publish linked data will be mentioned.

The final part of the presentation will discuss current activities and developments such as the harmonization of the FRBR family of conceptual models, ongoing work to extend FRBRoo to include entities, attributes and relationships defined in FRAD and FRSAD, alignments with other namespaces – ISBD/RDA and FRBR/RDA, and issues arising from such collaboration. Some thoughts about the need for defining strategy for future standards development, and their impact on the development of cataloguing rules will be mentioned.

Keywords: ISBD, FRBR family of conceptual models, FRBRoo, RDF representation, standards alignment

Introduction and Background

IFLA: International Federation of Library Associations and Institutions[1] currently performs its charge as a bibliographic standardizing body through the Cataloguing[2] and Classification and Indexing[3] Sections and their working groups, and the Core Activity UNIMARC – IFLA UNIMARC Programme (UNIMARC Core Activity: UCA)[4] which are constituencies of the Division of Library Services (Division III)[5]. The ISBD Review Group[6] and the FRBR Review Group[7] are working groups within the Cataloguing Section. The Bibliography,[8] Information Technology[9] and Knowledge Management[10] Sections are, among others, also members of Division III. Each of these, within its scope, researches, develops and promotes guidelines and best practices related to bibliographic control with an orientation towards linked data and Semantic Web technologies. We should also mention two outstanding groups that are crucial to these developments, but which are not really integrated (found strategic position) into IFLA's structure; these are the Namespaces Task Group,[11] a working group of the Classification and Indexing Section, and the Semantic Web Special Interest Group (SWSIG)[12] sponsored by Information Technology Section. The first one was instrumental in defining the requirements, selecting a vocabulary management tool/service (Open Metadata Registry: OMR[13]), and actually declaring namespaces for ISBD and the FRBR family of conceptual models, while the second one took an active role in the W3C Library Linked Data Incubator Group, and its Final report (25 October 2011)[14]. We hope, however, that the newly formed Committee on Standards[15] which started its activities in January 2012 with the mandate to review all IFLA standards, and which reports directly to IFLA's Governing Board, will indirectly have an impact on the strategy for bibliographic standards development, and facilitate the horizontal and vertical collaboration of relevant sections and working groups.

Although we will focus in this presentation on bibliographic standards and models, while pointing to some of the recent uses of their representation as namespaces in RDF, it is important to mention that these

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[1] http://www.ifla.org/
[2] http://www.ifla.org/en/cataloguing
[3] http://www.ifla.org/en/classification-and-indexing
[4] http://www.ifla.org/en/unimarc
[5] http://www.ifla.org/en/library-services
[6] http://www.ifla.org/en/isbd-rg
[7] http://www.ifla.org/en/frbr-rg
[8] http://www.ifla.org/en/bibliography
[9] http://www.ifla.org/en/it
[10] http://www.ifla.org/en/km
[11] http://www.ifla.org/en/node/5353
[12] http://www.ifla.org/en/swsig. Interest Group is a preliminary, time constrained, testing-the-field category of groups formed within IFLA.
[13] http://metadataregistry.org/
[14] http://www.w3.org/2005/Incubator/lld/XGR-lld-20111025/
[15] http://www.ifla.org/en/news/new-ifla-committee-on-standards

standardizing activities should however start looking at other services sections within Division III for possible collaboration. Let us just refer to Tim Berners-Lee's answer to the question put to him after his talk at the MIT+150 celebration on April 12, 2011:[16]

> Question: What are important questions that need to be asked and answered?
>
> Answer: If we're gonna have all these data online, how are we going to make really, really powerful interfaces to it.

ISBD and the FRBR family of conceptual models: methodology and management of their representation in RDF

ISBD: International Standard Bibliographic Description's history goes back to the 1969 IFLA International Meeting of Cataloguing Experts, held in København, when Michael Gorman presented the first draft of the structure that later became the ISBD for monographs published in 1971 – ISBD(M). This first, preliminary version was soon followed by specialized ISBDs for different types of library materials. The standards, maintained by the ISBD Review Group, have been applied and used by bibliographic agencies and national cataloguing rules worldwide, and became the basis for the development of UNIMARC[17] as well as other MARC bibliographic formats.

FRBR: Functional Requirements for Bibliographic Records is the conceptual model for bibliographic data described in the *Final report* published in 1998[18]. The Study Group, which received its charge in 1992 from the Cataloguing Section, saw its initial impetus in the 1990 IFLA Seminar on Bibliographic Records, held in Stockholm[19]. The FRBR study used this conceptual model, as well as a set of generic user tasks, as a framework for defining the data requirements for a basic level national bibliographic record. The Functional Requirements and Numbering of Authority Records (FRANAR) Working Group was launched in April 1999[20]; its final report (FRAD: Functional Requirements for Authority Data) was published in 2009[21]. To ensure ongoing maintenance of FRBR, the Cataloguing Section created a Working Group in 2002, which in 2003[22], at the IFLA Conference in Berlin, was formalized into a Review Group structure parallel to that of the ISBD Review Group. In April 2005, a third working group, the IFLA Working Group on Functional Requirements for Subject Authority Records (FRSAR), this time established by the Classification and Indexing Section, received the mandate to examine the requirements as they relate to the aboutness of works. FRSAD: Functional Requirements for Subject Authority Data,

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[16] http://mitworld.mit.edu/video/934
[17] http://www.ifla.org/en/publications/unimarc-formats-and-related-documentation
[18] http://www.ifla.org/en/publications/functional-requirements-for-bibliographic-records
[19] Madison, Olivia M. A. IFLA Study on the Functional Requirements for Bibliographic Records. // SCAT News 7 (March 1997). Available at: http://archive.ifla.org/VII/s13/scatn/news7.htm
[20] http://archive.ifla.org/VII/d4/wg-franar.htm
[21] http://www.ifla.org/publications/functional-requirements-for-authority-data
[22] http://www.ifla.org/en/about-the-frbr-review-group#historical

published in 2010,[23] completes the FRBR family of conceptual models. The revised charge[24] of the FRBR Review Group (FRBR RG), approved in 2009, includes responsibility for the maintenance and development of all three models, FRBR, FRAD and FRSAD, as well as for their consolidation.

The second general review of the ISBD standards started in 2003 with the main goal to consolidate the seven specialized ISBDs, but also, in relation to the potential impact of the FRBR conceptual model on ISBD, and Tom Delsey's ISBD/FRBR mapping document,[25] to ensure conformity between the provisions of the ISBDs and FRBR's data requirements for the "basic level national bibliographic record".[26] The current consolidated edition – *ISBD: International Standards Bibliographic Description* was published in 2011.[27]

The primary purpose of the ISBD, as stated in the 2011 edition, is to "provide the stipulations for compatible descriptive cataloguing worldwide in order to aid the international exchange of bibliographic records between national bibliographic agencies and throughout the international library and information community", with the "aims to:
- make records from different sources interchangeable [...];
- assist in the interpretation of records across the language barriers [...];
- assist in the conversion of bibliographic records to electronic form [i.e., MARC formats];
- enhance the portability of bibliographic data in the Semantic Web environment and the interoperability of the ISBD with other content standards."[28]

The fourth mentioned aim of the ISBD is the result of the activities on representing IFLA standards and models in RDF that started in 2007 during the IFLA General Conference in Durban. At its annual meeting, the FRBR RG decided to start a new project – *Namespace for FRBR entities/elements in RDF* with the specific task defined as being „to define appropriate namespaces for FRBR (entity-relationship) in RDF and other appropriate syntaxes".[29] The project was motivated by the report from the discussions at the Data Model meeting held April 30-May 1, 2007 at the British Library,[30] and the newly formed

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[23] http://www.ifla.org/node/5849

[24] http://www.ifla.org/en/about-the-frbr-review-group#terms

[25] http://www.ifla.org/files/cataloguing/isbd/isbd-frbr-mapping.pdf

[26] http://www.ifla.org/about-the-isbd-review-group#origins

[27] ISBD: International Standard Bibliographic Description / recommended by the ISBD Review Group ; approved by the Standing Committee of the IFLA Cataloguing Section. Consolidated ed. Berlin [etc.]: De Gruyter Saur, 2011. More information available at: http://www.ifla.org/en/publications/international-standard-bibliographic-description

[28] Ibid., p. 1.

[29] IFLA Cataloguing Section FRBR Review Group. Meeting Report Durban, August 21, 2007. Available at: http://www.ifla.org/files/cataloguing/frbrrg/meeting_2007.pdf. P. 4.

[30] Data Model Meeting, British Library, London 30 April - 1 May 2007. Available at: http://www.bl.uk/bibliographic/meeting.html

DCMI/RDA Task Group's charter „to define components of the draft standard "RDA - Resource Description and Access" as an RDF vocabulary for use in developing a Dublin Core application profile".[31] Gordon Dunsire, consultant to the FRBR RG, prepared the document *Declaring FRBR entities and relationships in RDF*[32] for its annual meeting in Québec in 2008 during the IFLA conference. The document was approved, and that eventually started the work on defining namespaces first for the FRBR model, and then for the complementary conceptual models for authority data – FRAD,[33] and subject authority data – FRSAD[34] in the Open Metadata Registry.[35]

At the same IFLA conference, the ISBD Review Group (ISBD RG) adopted the recommendation of its Material Designations Study Group[36] to develop an XML Schema for ISBD. As that was considered important for updating ISBD as part of the work on the consolidated edition,[37] the ISBD RG formed a new working group for that task. The ISBD/XML Study Group[38] immediately started a two year project,[39] however, during its next meeting at Milan's IFLA conference in 2009 its consultant, Gordon Dunsire, made a recommendation to re-direct the Group's goal from ISBD/XML to ISBD/RDF: "The ISBD/XML Task Group should consider declaring ISBD elements in RDF/XML (using RDF applications such as Simple Knowledge Organisation System (SKOS), RDF Schema, and Web Ontology Language (OWL)), rather than general XML".[40] The Study Group, and subsequently the ISBD Review Group and the Standing Committee of the Cataloguing Section approved the newly defined task, and the work on

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[31] Dublin Core Metadata Initiative. DCMI/RDA Task Group Wiki. Available at: http://dublincore.org/dcmirdataskgroup/. See: Hillmann, Diane; Karen Coyle; Jon Phipps; Gordon Dunsire. RDA vocabularies : process, outcome, use. // D-Lib magazine 16, 1/2 (January/February 2010). Available at: http://dlib.org/dlib/january10/hillmann/01hillmann.html. The successor to the group is the DCMI Bibliographic Metadata Task Group: http://wiki.dublincore.org/index.php/Bibliographic_Metadata_Task_Group

[32] Dunsire, Gordon. Declaring FRBR entities and relationships in RDF, 2008/07/25. Available at: http://www.ifla.org/files/cataloguing/frbrrg/namespace-report.pdf

[33] Functional Requirements for Authority Data. Available at: http://www.ifla.org/en/publications/functional-requirements-for-authority-data

[34] Functional Requirements for Subject Authority Data. Available at: http://www.ifla.org/en/publications/ifla-series-on-bibliographic-control-43

[35] Dunsire, Gordon. Interoperability and semantics in RDF representations of FRBR, FRAD and FRSAD. // Concepts in context : proceedings of the Cologne Conference on Interoperability and Semantics in Knowledge Organization July 19th-20th, 2010 / edited by Felix Boteram, Winfried Gödert and Jessica Hubrich. Würzburg : ERGON, 2011. Pp. 133-147.

[36] IFLA. Cataloguing Section. ISBD Review Group. Materials Designation Study Group. Available at: http://www.ifla.org/en/node/938

[37] IFLA. Cataloguing Section. ISBD Review Group. Summary of Meetings held in Québec, Canada, Aug. 11-13, 2008. P. 3. Available at: http://www.ifla.org/files/cataloguing/isbdrg/meeting_2008.pdf

[38] IFLA. Cataloguing Section. ISBD Review Group. ISBD/XML Study Group. Available at: http://www.ifla.org/en/node/1795

[39] Escolano Rodríguez, Elena; Lynne Howarth; Mirna Willer; Boris Bosančić. News of ISBD. Project Development of ISBD/XML Schema: Goals and Objectives. // World Library and Information Congress: 75th IFLA General Conference and Assembly "Libraries create futures: Building on cultural heritage", 23-27 August 2009, Milan, Italy. Available at: http://www.ifla.org/files/hq/papers/ifla75/107-escolano-en.pdf

[40] Dunsire, Gordon. Report to the ISBD/XML Task Group, World Library and Information Congress 2009, Milan, Italy, 9 Aug 2009. Available at: http://www.ifla.org/files/cataloguing/isbdrg/isbd-in-xml_20090806.pdf

defining ISBD elements for their representation in RDF started.[41] The results of that endeavour are, besides leading to the previously mentioned fourth, newly added aim defined for the ISBD, the published list of elements in the ISBD consolidated edition,[42] and, based on that, the published namespaces for ISBD elements[43] and vocabularies[44] in the OMR.

As of March 2012, the ISBD and FRBR namespaces in the OMR are providing de-referencing services to the individual class and property level. This enhancement to the OMR was realized via the IFLA Namespaces Task Force; de-referencing of the IFLA namespaces has been a goal of the FRBR RG since its earliest plans for the establishment of the namespaces.

During the ISBD/XML Study Group's work on representing ISBD elements and vocabularies in RDF, research into issues related to publishing translations of the vocabularies into Spanish[45] and Croatian resulted in certain decisions that took into account a broader range of problems that are related also to the representations of ISBD and FRBR elements. The result of this work is the draft guidelines – *Translations of RDF representations of IFLA standards* which is planned to be distributed to the wider community for review and comment this spring, with the prospect of its approval at the ISBD/XML Study Group's meeting in August 2012. The Study Group's work on the ISBD Application Profile, and its liaising with the DCMI brought the two communities together by using the ISBD AP as a case study to further develop DCMI's infrastructure support for application profiles[46] and consequently for ISBD AP.

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[41] See: Willer, Mirna; Gordon Dunsire; Boris Bosančić. ISBD and the Semantic Web. // JLIS.it [Journal of Library and Information Science. Italy = Rivista italiana di biblioteconomia, archivistica e scienza dell'informazione] 1, 2(2010), 213-236. DOI: 10.4403/jlis.it-4536; Dunsire, Gordon; Mirna Willer. Standard library metadata models and structures for the Semantic Web. // Library hi tech news 28, 3 (2011), 1-12. Available also at: http://www.ifla.org/files/hq/papers/ifla76/149-dunsire-en.pdf. The list of presentations, as well as detailed reports of the Study Group's activities see at the group's webpage. See specifically: Dunsire, Gordon. Said the spider to the fly: identity and authority in the Semantic Web. // Catalogue & index 157 (2009) Available also at: http://www.cilip.org.uk/get-involved/special-interest-groups/cataloguing-indexing/Documents/CandII157.pdf; Dunsire, Gordon. Semantički web i ekspertni metapodaci : rastavi pa spoji. // 12. seminar Arhivi, knjižnice, muzeji: mogućnosti suradnje u okruženju globalne informacijske infrastrukture: zbornik radova / uredila Sanjica Faletar Tanacković. Zagreb: Hrvatsko knjižničarsko društvo, 2009. Pp. 129-141. English original *The Semantic Web and expert metadata: pull apart then bring together* available at: http://eprints.rclis.org/bitstream/10760/7443/1/akm2008semanticweb.pdf

[42] ISBD, Op. cit., pp. 14-17.

[43] http://metadataregistry.org/schema/show/id/25.html

[44] http://metadataregistry.org/vocabulary/show/id/113.html for ISBD Content form, plus five more namespaces for the rest of vocabularies for Area 0 Content Form and Media Type.

[45] See for discussion on broader issues related to translations: Montiel-Ponsoda, Elena; Gordon Dunsire; Daniel Vila-Suero; Elena Escolano Rodríguez; Boris Villazón-Terrazas; Asunción Gómez-Pérez. Style Guidelines for Naming and Labeling Ontologies in the Multilingual Web. // International Conference on Dublin Core and Metadata Applications, September 21-23, 2011. Available at: http://dcevents.dublincore.org/index.php/IntConf/dc-2011/paper/view/47/15

[46] http://dublincore.org/documents/profile-guidelines/

The third important task and goal of the ISBD/XML Study Group has been defined as the alignment of the ISBD data elements and vocabularies with other namespaces, such as the RDA/ONIX Framework for Resource Categorization,[47] ISBD and newly developed cataloguing rules such as RDA, ISBD/UNIMARC for bibliographic data,[48] ISBD/Dublin Core Terms and ISBD/ISSN.[49] As the ISBD/XML Study Group is in fact charged with these so called technical matters, and liaises closely with the Namespaces Task Group, the ISBD Review Group took over some parts of their work, specifically in formulating its activities "regarding alignment of ISBD data elements and FRBR attributes within the task of consolidating the FRBR conceptual models by the FRBR Review Group; continue activities on harmonization of the ISBD, ISSN, RDA and other national and international cataloguing rules aligned with the FRBR model and the International Cataloguing Principles".[50] As to the first, the representatives of the ISBD RG will take part in the FRBR RG's meeting in 25 April 2012, while to the latter the representatives of the ISBD RG and the ISSN Network met with the Joint Steering Committee for Development of RDA (JSC) in Glasgow, 3-4 November 2011. The meeting proved to be very fruitful for all sides, and a number of issues were discussed and agreed upon.[51] The issue which we would like to emphasize as being the basic one for these, but also other content standards alignment efforts is:

> "All parties agreed that the purpose of harmonization is to make RDA, ISSN and ISBD records
> <u>functionally interoperable</u>. That is, records valid under one of the standards should be capable of
> being mapped to either of the other standards. It is recognised that some issues will take longer to
> resolve than others and a few issues may prove to be irreconcilable, but steps can be taken to limit
> the impact of such differences."

To this end, the meeting was introduced to G. Dunsire's briefing/discussion paper on the mapping model – *Mapping ISBD and RDA element sets*.[52] The model exposed the problem which has been already discussed at the theoretical level but was also approached from application levels, e.g., in practice in the

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[47] Two working documents with different approaches to the mapping have been tabled and discussed, however, further consultations are needed, especially in the light of G. Dunsire's briefing/discussion paper: Dunsire, Gordon. Mapping ISBD Area 0 vocabularies to RDA carrier and content, Oct 2011 // JSC for Development of RDA/IFLA ISBD Review Group Harmonization Meeting, Glasgow, 3-4 Nov. 2011. Available at: http://www.rda-jsc.org/docs/6JSC-Chair-5.pdf

[48] See: Dunsire, Gordon. UNIMARC, RDA and the Semantic Web. // International cataloguing and bibliographic control 39, 2 (April/June 2010). Available at: http://www.ifla.org/files/hq/papers/ifla75/135-dunsire-en.pdf; Dunsire, Gordon; Mirna Willer. UNIMARC and Linked Data. // IFLA Journal 37, 4 (December 2011), 314-326. Also available at: http://www.ifla.org/files/hq/publications/ifla-journal/ifla-journal-37-4_2011.pdf.

[49] ISBD/XML Study Group. Goals and objectives, 30 January 2012. Available at: http://www.ifla.org/en/node/1795

[50] http://www.ifla.org/about-the-isbd-review-group - Objectives

[51] ISBD / ISSN Outcomes. Available at: http://www.ifla.org/files/cataloguing/isbdrg/JSC_ISBD_ISSN_Outcomesfinal.pdf. For the report on the meeting see: Willer, Mirna; Françoise Leresche. News from the ISBD Review Group. // IFLA SCATNews: Newsletter of the Standing Committee of the IFLA Cataloguing Section 36 (December 2011). Available at: http://www.ifla.org/files/cataloguing/scatn/scat-news-36.pdf

[52] Dunsire, Gordon. Mapping ISBD and RDA element sets, Oct 2011. // JSC for Development of RDA/IFLA ISBD Review Group Harmonization Meeting, Glasgow, 3-4 Nov. 2011. Available at: http://www.rda-jsc.org/docs/6JSC-Chair-4.pdf

design of frbrized catalogues. The problem is: the "key objects that are of interest to users of information in a particular domain"[53] is for the ISBD a *resource*, while for the FRBR model, and cataloguing rules based on it like RDA, they are *work*, *expression*, *manifestation* and *item*.[54] These key objects are defined as RDF classes to serve as domains for the ISBD and FRBR element sets' properties respectively. The model proposes to define *unconstrained properties* for a list of elements – unconstrained meaning properties without declaration of domains and ranges, this list would consist of the RDA element set, but also of those ISBD elements that are not found in RDA. We consider such a proposal to be of crucial importance because such a hub of elements would be open to other content standards which have adopted one or the other approach to the information object and its description, whether from library or other heritage institutions, or from publishing, rights, government and other interested information communities. It is worth citing the decision ISBD RG took on the issue of the "key object of interest" – the *resource*:

> „ In trying to adapt ISBD terminology to the FRBR *work*, *expression*, *manifestation* and *item* and to replace terms such as *publication*, the group encountered difficulties, owing in large part to the fact that the terms used in FRBR were defined in the context of an entity-relationship model conceived at a higher level of abstraction than the specifications for the ISBDs. As a paper presented at the Frankfurt IFLA Meeting of Experts on an International Cataloguing Code (IME-ICP) has cautioned, 'FRBR terminology should *not* be merely incorporated such as it stands into the ISBDs and cataloguing rules, but these should keep their own specific terminology, and provide accurate definitions showing how each term in this specific terminology is conceptually related to the FRBR terminology." [55]

Uses

Some of uses of IFLA namespaces have already been recognized: Universitätsbibliothek Mannheim declared the use of the ISBD namespaces, but their Linked Data Service is at present under development;[56] the British Library announced to be using preliminary versions of ISBD and RDA among other namespaces,[57] while Die Deutsche Nationalbibliothek[58] FRBR entities in RDA. The Bibliothèque nationale de France is using IFLA vocabularies, among others, in its linked data service first launched in

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[53] FRBR. Op. cit., p. 9.

[54] We are dealing here only with the Group 1 entities of the FRBR model.

[55] ISBD. Op. cit., pp. xii-xiii. The citation is taken from: Le Boeuf, Patrick. Brave new FRBR world. // IFLA Cataloguing Principles: Steps towards an International Cataloguing Code: Report from the 1st Meeting of Experts on an International Cataloguing Code, Frankfurt, 2003. Available at: http://deposit.ddb.de/ep/netpub/85/61/78/967786185/_data_dyna/_snap_stand_2003_06_02/news/pdf/papers_leboeuf.pdf

[56] http://data.bib.uni-mannheim.de; the Linked Data service is at the moment under development (2012-03-23)

[57] http://www.bl.uk/bibliographic/datafree.html and http://www.bl.uk/bibliographic/datasamples.html

[58] Der Linked Data Service der Deutschen Nationalbibliothek. Version 4.1, Stand: 29. Februar 2012. Available at: http://files.d-nb.de/pdf/linked_data.pdf

July 2011.[59] Biblioteca nacional de España presented the publication of its catalogue in Linked Data in December 2011, in which the IFLA ontologies for FRBR, FRAD, FRSAD and ISBD are being used. [60] A current Canadian project is creating a proof of concept to demonstrate the power of Linked Open Data in bibliographic discovery tools. The Pan-Canadian Documentary Heritage Network's (PCDHN)[61] Linked Open Data Working Group[62] has gathered available data from 5 partners around the theme of the First World War. Existing partner metadata in a wide variety of formats (from AACR2 data encoded in MARC21 to brief descriptions in a spreadsheet, including metadata for archival material) was transformed into RDF linked data using ISBD, FRBR, RDA and other namespaces, and a discovery and visualisation interface designed. The first version of the interface named *Out of the Trenches : Linked Open Data of the First World War = Au-delà des tranchées : les données ouvertes et liées de la Première Guerre mondiale* can be consulted[63]. The power of the approach is such that the developer was able to go from a mock-up of the visualisation interface to a functioning site in two weeks.

Current FRBR Activities

The FRBR RG's priority activity is the production of a consolidated statement of the conceptual models in the FRBR family. Having three documents written over such a long period of time and by different working groups (two of which, FRANAR and FRSAR, functioned concurrently) is inconvenient for application development as there is no official statement of the interrelationships between the models. The development of the namespaces will have laid important groundwork for the consolidation as it forced the FRBR RG to carefully examine each entity, attribute and relationship defined by the three models to select appropriate domains and ranges for the properties, and to make explicit any implicit constraints (for example, disjoint classes and properties) and explicitly declare the intended semantics of the properties (such as which are inverse pairs, which are transitive, which are equivalent). The process of developing the namespaces also highlighted areas which pose particular challenges in the consolidation process. The treatment of subjects is one of these; the concept of "having a subject" is viewed as a relationship in FRBR and FRSAD, but as an attribute of the entity *work* in FRAD. Some of the conclusions reached so far include the decision to deprecate the FRBR group 3 entities, concept, object, event, place. Following IFLA's normal procedures for such documents, the draft document will be made available for world-wide review and the comments received resolved by the FRBR RG, prior to recommending its approval by the Cataloguing Section.

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[59] data.bnf.fr

[60] http://www.bne.es/es/Catalogos/DatosEnlazados/index.html and http://cultura.linkeddata.es/visualizer/

[61] The creation of the PCDHN is described here: http://www.bac-lac.gc.ca/eng/about-us/Pages/towards-a-pan-canadian-documentary-heritage-network.aspx

[62] The Linked Open Data Working Group is responsible for the linked metadata project described in point #3. http://www.bac-lac.gc.ca/eng/about-us/Pages/progress-stakeholder-and-academic-forums-november-2011.aspx

[63] Interface available at: http://www.ghamari.net:8080/canada (Use Firefox browser) The visualizations that were developed (the "happy paths") are Canadian Expeditionary Force and Events.

The discussion so far has referred entirely to the FRBR conceptual models in their original "classic" entity-relationship formulation. In parallel with these developments, in 2003 the FRBR RG formed a joint working group[64] with the International Council of Museum's Committee on Documentation (CIDOC) CRM Special Interest Group[65], with the goal of preparing an object-oriented statement of FRBR as a compatible extension of the CIDOC CRM (Conceptual Reference Model).[66] FRBRoo was approved and published in January 2010.[67] The focus of the three meetings[68] since then has been to include the entities, attributes and relationships defined in FRAD and FRSAD in FRBRoo.[69] The next meeting is 30 April-3 May 2012 in Heraklion, Crete, Greece. As with any translation process, these cross-community alignment discussions have revealed unstated assumptions, imprecise definitions, apparent inconsistencies and a myriad other issues and ideas, all of which are providing valuable input into the FRBR RG's consolidation process.

Conclusion

In five short (but very busy) years, having RDF vocabularies for IFLA bibliographic standards has gone from a nebulous idea to a reality. Indeed, for both ISBD and FRBR it has become a normal part of what it means to make these standards and models available for use in the wider Semantic Web. We are starting to see discovery tools that make use of these powerful building blocks. The steps that have taken the two IFLA groups that we chair here from there have been interrelated to the point where it has been impossible to disentangle the stages involving the FRBR Review Group from those of the ISBD Review Group. Further alignment and collaboration between communities is clearly part of the near future.

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[64] http://www.ifla.org/en/node/928

[65] http://www.cidoc-crm.org/who_we_are.html

[66] This work is described in, for instance, Riva, Pat; Martin Doerr; Maja Žumer. FRBRoo : enabling a common view of information from memory institutions. // IFLA WLIC 2008. Available at: http://archive.ifla.org/IV/ifla74/papers/156-Riva_Doerr_Zumer-en.pdf

[67] The current version of FRBRoo is 1.0.2, available in both .doc and .pdf at: http://www.cidoc-crm.org/frbr_drafts.html

[68] Minutes available at: http://www.cidoc-crm.org/special_interest_meetings.html

[69] Riva, Pat. News from the FRBR Review Group. // IFLA SCATNews: Newsletter of the Standing Committee of the IFLA Cataloguing Section 36 (December 2011). PP. 14-16. Available at: http://www.ifla.org/files/cataloguing/scatn/scat-news-36.pdf