

Definition of a FRBR-based Metadata Model for the Indiana University Variations3 Project

September 10, 2007

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Introduction

The Variations2 Digital Music Library Project, a research project undertaken at Indiana University with funding from the National Science Foundation from 2000-2005, developed and implemented a work-based metadata model for music. This metadata model allowed for the easier linking of points in any recording of a musical work to any notational representation of it, and for work-level discovery of recordings and scores in the system. This model has been described as “FRBR-like” and is mentioned in various discussions of FRBR-based systems, but it is not technically a FRBR implementation.

While the Variations2 model shares many features with the FRBR model, the Variations2 model was not explicitly designed with FRBR in mind, but rather was more heavily influenced by the work of Richard Smiraglia¹. The following rough mapping can be made between Variations2 entities and FRBR Group 1 entities:

Variations2 Entity	FRBR Group 1 Entity
Work	Work
Instantiation	Expression
Container	Manifestation
Media Object	Item

Some significant differences exist between the loosely mapped entities presented here. These include:

- The Variations2 Work is more concrete than the abstract FRBR Work, with the Work in Variations2, for example, consisting of a specific number of measures.
- The Variations2 Instantiation can appear on only one container; the same performance appearing on two different Containers is still two different Instantiations. The FRBR Expression by definition can appear on any number of Manifestations.
- The Variations2 Container is closely analogous to the MARC bibliographic record in that it contains data common to all copies of the Container and also data about a specific copy held by the library. The FRBR Manifestation contains attributes common to all Items only, and reserves copy-specific attributes for the Item entity.
- The Variations2 Media Object is by definition a digital file created from a physical library holding. The FRBR Item can be in any format.

¹ Smiraglia, Richard. *The Nature of “A Work”: Implications for the Organization of Knowledge*. Lanham, MD: Scarecrow Press, 2001.

The Variations² project was a research initiative, focused on developing tools for using digital music materials in an academic environment. In putting these new tools into production at Indiana University, Variations² project staff realized the need for a concerted effort towards making the software sustainable into the future. The Institute of Museum and Library Services (IMLS) has generously funded a follow-on project, Variations³, with sustainability of the software as its overarching goal. Variations³ project activities fall into two main categories. The first is software development aimed at generalizing the Variations² application so that it can be implemented in environments other than Indiana University. The second is metadata research aimed at making creation of work-based metadata for music economically feasible, and includes four defined research areas: better derivation of Variations² data from MARC bibliographic and authority records, cooperative cataloging, incorporation of metadata from sources outside the library environment, and user-contributed metadata.

As the Variations³ project team and the project Advisory Board² undertook discussions of the sustainability of both the software and of the metadata model, questions about the relationship of the Variations³ metadata model to FRBR recurred. What would the benefits to harmonizing the Variations³ model with FRBR be? Would the benefits be worth the significant development costs to make this change? Can the FRBR model meet the needs for both “discovery” and “use” metadata needed by the Variations³ system? What does it really mean to “implement” FRBR? Would a fully FRBR-based metadata model for Variations³ be more sustainable, as library catalogs move towards FRBR-like structures?

As a first step towards answering these and related questions, a subset of Variations³ project staff, including members from both the project Metadata and Development teams, undertook a study in Summer 2007 to define what a FRBR-based metadata model for digital musical audio recordings, bitmapped score images, and encoded score notation would look like. Accompanying materials such as liner notes, video, librettos, and other forms of material held by music libraries were considered out of scope at this time. The team also determined early on that technical and rights metadata would be modeled separately from FRBR. The remainder of this report outlines the results of that study, describing a metadata model that complies with the concepts outlined in the FRBR report, indicating attributes and relationships from the FRBR report that would be implemented in Variations³ as part of a FRBR-based software redesign, and defining metadata outside the scope of FRBR that would be needed by the Variations³ application. Our study focused almost exclusively on FRBR Group 1 entities, assuming that if these met Variations³ project needs, Group 2 and Group 3 entities would as well.

² Variations 3 Advisory Board Members are: Linda Barnhart, University of California, San Diego; Richard Griscom, University of Pennsylvania; Jerome McDonough, University of Illinois at Urbana-Champaign; Pat Riva, Bibliothèque et Archives nationales du Québec; and MacKenzie Smith, Massachusetts Institute of Technology

Group 1 Entities

Work

Definition for Variations3

The FRBR report defines a Work as “a distinct intellectual or artistic creation.” A Work in Variations3 will be an abstract entity, independent of any specific performance or notation. For Western art music, the Work is what is commonly known as the “composition.” For jazz, the Work is defined as the “tune,” regardless of how far from it a performance might deviate, or how different performances might be from one another. For popular music, the Work is defined as the “song.” An album might in some cases also be a Work, if it represents a cohesive whole. For “world” music emerging from oral traditions, consider whether or not two bits of content were recorded at the same time, what ethnic group the performance comes from, and the location and context to help determine where the boundary between one Work and the next lies.

Two Expressions (defined below) are of the same Work when the second is an *arrangement* of the first, possibly with a new medium of performance or in a new key. This category would also include orchestrations and covers. The composer would be connected to the Work, while the arranger or orchestrator would be connected to the Expression. When one Work is an *adaptation* of another, a new Work is created. Creation of this new Work involves a significant creative contribution. In this case the adaptor would be connected to the new Work. Suites fall into this category for Variations3, as do sampled Works. Titles by which Works are known can be a clue to help the cataloger determine if an Expression is of the same or a different Work.

Relationships needed

The following Work-to-Work relationships will be needed in the Variations3 setting:

- Successor
- Adaptation
- Imitation
- Whole/part

Relationships not needed

The following Work-to-Work relationships will *not* be needed in the Variations3 setting, as they are unlikely to appear between Works of purely musical content to which the scope of Variations3 is limited:

- Supplement

- Complement
- Summarization
- Transformation

Attributes needed

- title of the work [may need several]
- form of work
- date of the work [will likely have to guess these based on expression dates]
- other distinguishing characteristic
- context for the work [where culture, etc. information will go for non-Western music]
- medium of performance (musical work)
- numeric designation (musical work)
- key (musical work)

Attributes not needed

- intended termination
- intended audience
- coordinates (cartographic work)
- equinox (cartographic work)

Additions to FRBR needed

In addition to the Work attributes from the FRBR report needed for the Variations3 system, we will need several additional attributes. Some of these might be considered to fall in scope of one of the FRBR-defined attributes, but the following additional attributes are important enough to musical works to warrant inclusion under a more specific label:

- language³
- identifier
- place of composition
- genre/form/style

³ Language does not appear at the Work level in the FRBR report, assuming that a textual work only achieves a specific language once it is fixed in an Expression. For musical works, however, any text present is a re-use of an existing text, even if written for use specifically in the musical Work. With this in mind, we consider the language of the text to be a part of the abstract Work, but also to record language at the Expression level, to accommodate translations.

Variations3 will also need structural metadata at the Work level. A *work structure* will be used as a middle ground between synchronized recording and score Manifestations, so that we can more easily bind structural points between multiple recordings and scores. Time points in each Manifestation will be “bound” to time points in the abstract work structure, rather than directly to other Manifestations. Time points between any two Manifestations of the same Work can then be deduced from their common bindings to time points in the work structure. Our operational definition of a Work ensures that the work structure will apply to all Expressions of that work, even when two different performances of a Work may vary considerably. For example, performances of jazz music frequently bear little resemblance to one another, but our definition of the work as the “tune” in jazz suggests little internal structure is needed. For non-Western music that is likely to have a complicated structure that would vary among performances, it is unlikely multiple performances of the same Work will be recorded.

Expression

Definition for Variations3

The FRBR report defines an Expression as “the intellectual or artistic realization of a *work*.” As discussed above, arrangements are generally new Expressions of the same Work, unless they are highly transformative and reflect a significant creative contribution. Every Expression has a defined form; for Variations3, scores and recordings are therefore separate Expressions. Expression-to-Expression relationships, as noted below, are used to collocate all Expressions representing the same arrangement.

When new Expressions are created, the system should look for matches on selected Expression attributes, and suggest possible instances of Expressions of the same arrangement to the cataloger. Expression attributes to be examined include: contributors and their roles, title, extent (number of measures), key, and instrumentation.

In Variations3, we will treat original performances of Works as Expressions worth keeping track of, even if we do not hold a recording of that performance. This will allow us to record dates, performers, etc., associated with that original performance, regardless of whether it occurred in 1589, 1789 or 1989. To accomplish this in an efficient manner will require good interface design for the cataloging utility so that it is not necessary for the cataloger to manually create this Expression.

Relationships needed

The following Expression-to-Expression relationships, between expressions of the *same Work* will be needed in the Variations3 setting:

- Arrangement (music)
- Whole/part

The following relationship, both Expression-to-Expression between expressions of *different Works*, and Expression-to-Work, will be needed in the Variations3 setting:

- Imitation

Relationships not needed

The following Expression-to-Expression relationships, between Expressions of the *same Work* will *not* be needed in the Variations3 setting:

- Translation [not needed due to decision to include language as a Work attribute]
- Abridgement [under the Variations3 Work definition, abridgements are new Works]
- Revision [under the Variations3 Work definition, significant revisions are new Works, and revisions that are arrangements would have the arrangement Expression-to-Expression relationship]

The relationships defined in the FRBR report between Expressions of *different Works*, and between Expressions and Works, mirror Work-to-Work relationship types. Variations3 will not need to support most of these, as we expect it will rarely, if ever, be known which Expression of a Work should be the target of such a relationship. We will instead as a matter of policy create Work-to-Work relationships instead in the categories listed here. The following Expression-to-Expression relationships, between expressions of *different Works* will therefore *not* be needed in the Variations3 setting:

- Successor
- Supplement
- Complement
- Transformation
- Summarization
- Adaptation

Attributes needed

- title of the expression
- form of the expression
- date of the expression
- language of expression
- other distinguishing characteristic
- extent of the expression [includes number of measures]
- context for the expression [an event associated with the expression]
- critical response to the expression

- type of score (musical notation)
- medium of performance (musical notation or recorded sound)

Attributes not needed

- extensibility of expression
- revisability of expression
- summarization of content
- use restrictions on the expression
- sequencing pattern (serial)
- expected regularity of issue (serial)
- expected frequency of issue (serial)
- scale (cartographic image/object)
- projection (cartographic image/object)
- presentation technique (cartographic image/object)
- representation of relief (cartographic image/object)
- geodetic, grid, and vertical measurement (cartographic image/object)
- recording technique (remote sensing image)
- special characteristic (remote sensing image)
- technique (graphic or projected image)

Additions to FRBR needed

In order to facilitate the connection between Expressions that represent the same arrangement of a Work, Variations3 will record an Expression-to-Expression relationship defined as “has notation/is a performance of.” All performance Expressions that have a known arrangement will have this relationship to the score Expression representing that arrangement. Performance Expressions of the same arrangement will not have relationships to one another; rather, this relationship will be inferred from their common relationship to the score Expression. This will be possible by implementing a policy of creating a score Expression for all known arrangements, even if the score is not held at the Variations3 institution.

In addition to the Expression attributes from the FRBR report needed for the Variations3 system, we will need several additional attributes. Some of these might be considered to fall in scope of one of the FRBR-defined attributes, but the following additional attributes are important enough to musical works to warrant inclusion under a more specific label:

- place of performance
- key
- genre/form/style

Manifestation

Definition for Variations3

The FRBR report defines a Manifestation as “the physical embodiment of an *expression* of a *work*.” Any change in physical properties results in a new Manifestation; therefore, for the purposes of Variations3, the physical recording held by the Libraries is an Item (described below) representing one Manifestation, and the file created by digitization from that physical recording, and each derivative made from it at a different bit rate or in a different format, represents a new Manifestation and Item. With this representation, all Manifestations of the same Expression are assumed to have the “alternate” relationship between them.

By policy, we will always create Manifestations representing the entirety of a publication. If there are meaningful sub-parts of a Manifestation that both do not mirror the Expressions on it, such as multiple volumes, and are determined to be useful to track separately, Manifestation records representing those parts can be created that have a part/whole relationship to the larger Manifestation record.

Relationships needed

The following Manifestation-to-Manifestation relationships will be needed in the Variations3 setting:

- Alternate
- Part/whole

Relationships not needed

The following Manifestation-to-Manifestation relationship will *not* be needed in the Variations3 setting, as this data will be recorded as an Item-to-Item relationship:

- Reproduction

The following Manifestation-to-Item relationship will *not* be needed in the Variations3 setting, as this data will be recorded as an Item-to-Item relationship:

- Reproduction

Attributes needed

- title of manifestation
- edition/issue designation
- place of publication/distribution

- publisher/distributor
- date of publication/distribution
- series statement
- form of carrier
- extent of the carrier
- physical medium
- dimensions of the carrier
- manifestation identifier
- playing speed (sound recording)
- tape configuration (sound recording)
- kind of sound (sound recording)
- file characteristics (electronic resource)

Attributes not needed

- statement of responsibility
- fabricator/manufacturer
- capture mode
- source for acquisition/access authorization
- terms of availability
- access restrictions on the manifestation
- typeface (printed book)
- type size (printed book)
- foliation (hand-printed book)
- collation (hand-printed book)
- publication status (serial)
- numbering (serial)
- groove width (sound recording)
- kind of cutting (sound recording)
- special reproduction characteristic (sound recording)
- colour (image)
- reduction ratio (microform)
- polarity (microform or visual projection)
- presentation format (visual projection)
- system requirements (electronic resource)
- mode of access (remote access electronic resource)
- access address (remote access electronic resource)

Additions to FRBR needed

One additional attribute of the Manifestation, seen below, is needed in Variations3, as a result of limiting the scope of the FRBR application to musical content. Should

Variations3 move in the future to representing accompanying materials, such as liner notes, as separate Expressed Works that appear on Manifestations, this attribute will no longer be necessary. The additional needed attribute is:

- language of accompanying materials

Variations3 will also need structural metadata at the Manifestation level. A *manifestation structure* will be used for user navigation within the Manifestation. This structure will be taken directly from the Manifestation itself, providing users with the same navigation experience in the Variations3 system as they would have with the physical item in hand. This structure may or may not resemble the work structure for Works that appear on this manifestation. The manifestation structure will be recorded in the physical Manifestation for the CD, LP, score, etc., and replicated in the Manifestation(s) representing the digital files if necessary for efficient system performance.

Item

Definition for Variations3

The FRBR report defines an Item as “a single exemplar of a *manifestation*.” For Variations3, every *copy* of a given Manifestation will represent a separate Item. Duplicate copies of CDs or LPs will therefore be separate Items, as will multiple copies of otherwise identical digital files, such as a copy on a streaming server and a backup copy for safekeeping. While there currently is no strong use case for the Variations system to manage multiple copies of identical digital files, making this distinction now will better allow this flexibility in the future.

An Item representing the entirety of a Manifestation will be needed for all Variations3 Manifestations. In addition, when this entirety requires multiple digital files, such as for multiple-CD sets, and all scores consisting of more than a single page, Items may be recorded by the system for each individual digital file, with part/whole relationships to the larger Item. Items in general will not need to be manually managed by catalogers; the recording of this and other Item information will best be handled “under the covers” by the system, and not require any human intervention to create.

Relationships needed

The following Item-to-Item relationships will be needed in the Variations3 setting:

- Reproduction
- Part/whole

Relationships not needed

The following Item-to-Item relationship will *not* be needed in the Variations3 setting:

- Reconfiguration

Attributes needed

- item identifier
- provenance of the item
- marks/inscriptions
- condition of the item

Attributes not needed

- fingerprint
- exhibition history
- treatment history
- scheduled treatment
- access restrictions on the item

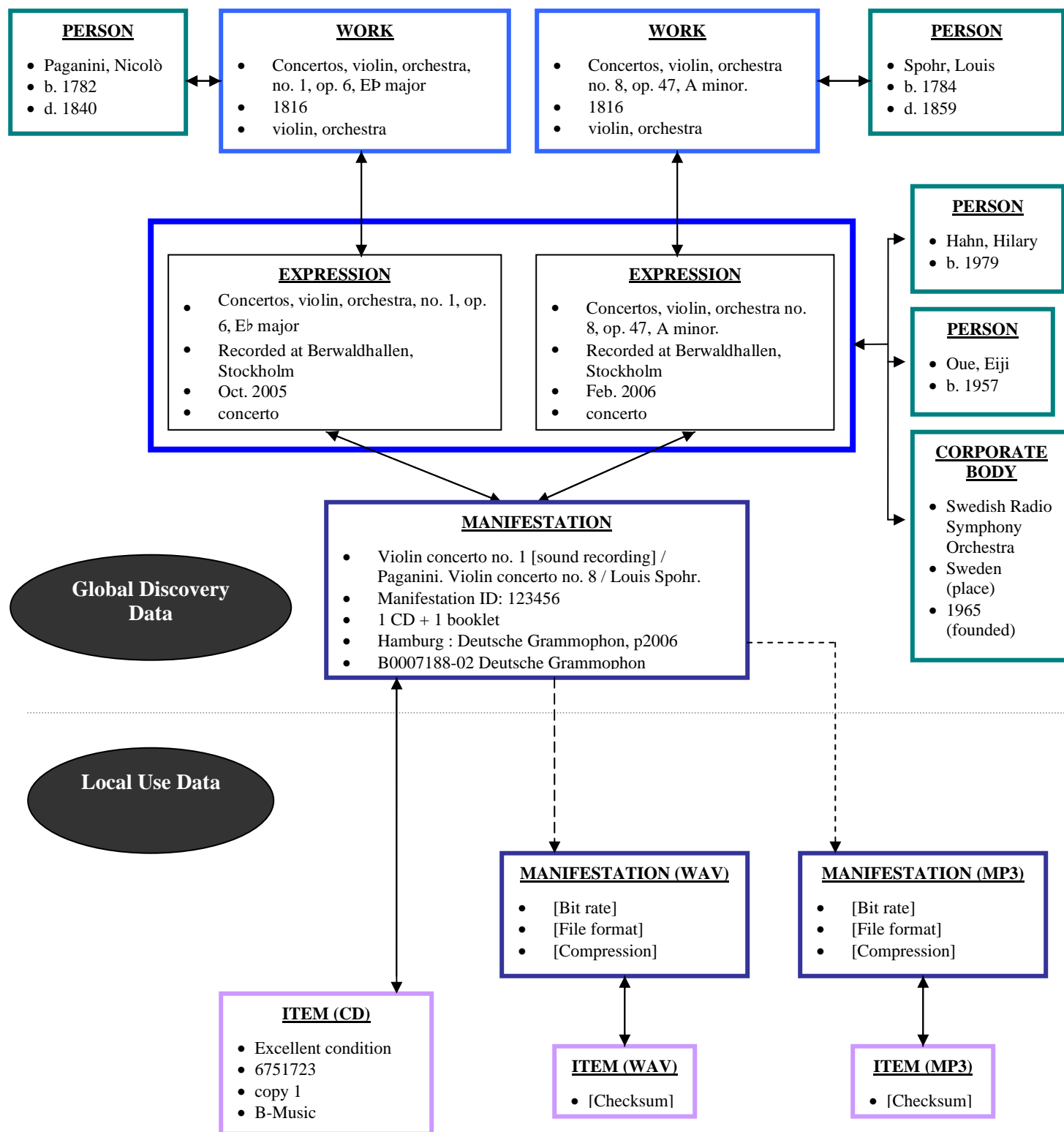
Additions to FRBR needed

In addition to the Item attributes from the FRBR report needed for the Variations3 system, we will need several additional attributes. Some of these might be considered to fall in scope of one of the FRBR-defined attributes, but the following additional attributes are important enough to management of library holdings to warrant inclusion under a more specific label:

- location
- call number
- copy number

While some attributes in the FRBR model might be used to record technical or rights metadata, they do not represent full-scale management of these types of metadata, which are largely out of scope of the FRBR model. The Variations3 system will therefore implement full technical and rights management metadata on all Items in the system for file management and delivery.

Sample FRBR Representation



Supplemental Materials

Information on the Variations Projects

Variations3 home page <<http://www.dlib.indiana.edu/projects/variations3/>>

Variations2 papers and presentations <<http://www.dml.indiana.edu/papers.html>>

Variations2 metadata documentation <<http://www.dml.indiana.edu/metadata.html>>

Some Relevant Readings

Le Boeuf, Patrick. (2005) "Musical Works in the FRBR Model or 'Quasi la Stessa Cosa': Variations on a Theme by Umberto Eco." *Cataloging & Classification Quarterly* 39, 3/4: 103-124.

Miller, David and Patrick Le Boeuf. (2005) "'Such Stuff as Dreams Are Made On': How does FRBR Fit Performing Arts?" *Cataloging & Classification Quarterly* 39, 3/4: 151-178.

Smiraglia, Richard. (2002) "Further Reflections on the Nature of a Work: An Introduction." *Cataloging and Classification Quarterly* 33, 3/4: 1-11.

Smiraglia, Richard. (2002) "Musical Works and Information Retrieval." *Notes* 58, 4: 747-764.

Smiraglia, Richard. (2002) "Musical Works as Information Retrieval Entities: Epistemological Perspectives." In *ISMIR 2001: Proceedings of the Second Annual International Symposium on Music Information Retrieval*, October 15-17, 2001, Bloomington, IN, ed. J. Stephen Downie and David Bainbridge, p. 85-92.

Vellucci, Sherry. (2007) "FRBR and Music." In *Understanding FRBR: What It Is and How It Will Affect Our Retrieval Tools*. Libraries Unlimited: forthcoming.