Purpose

This document is intended to provide a shared understanding of the conceptual requirements and the data model to be employed in V1.

Overview

In order to develop and evaluate a data model it is crucial to first establish a set of conceptual guidelines and/or requirements. As with the V1 requirements specification, the guidelines and requirements assist in defining the problem to be solved.

This document is broken into two major sections. The first section establishes what are believed to be the conceptual requirements for modeling data in V1[1]. That is, the types of entities that need to be represented and the types of relationships between those entities. The second section of the document then deals with organizing these conceptual entities into an implementable data model.

Conceptual Entities

At the highest level we deal with conceptual entities. In V1, we have two main clusters of entities representing two very different concerns that need to be addressed.

The first cluster deals with the representation of music and media. Here we explore the abstract notions of a musical work as well as the concrete items on which it is manifested, such as CDs or MP3 files. The creation and manifestation of music, however, is not just at random, so we carefully provide for identifying the contributors associated with creating music as well its concrete containers.

The second cluster of entities represents our need to provide and track access to interact with the music metadata and media as well as our need to restrict access. Users and groups of users are provided access to a service or sets of services. These services provide the means for interacting with the musical metadata and media. By identifying users and the services with which they are allowed to interact we provide a framework for the necessary control of access.

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[1] It should be kept in mind that these requirements are a SUBSET of functionality that desired for the system by the end of the project term, but must enable the requirements that have been explicitly stated for V1 (see DML Requirements Specification, V1).

Music, Media, and Contributors

 The following entities are proposed in order to represent the abstract and concrete forms of music.

Work: Represents the abstract concept of a musical piece or set of pieces.

Instantiation: Represents a manifestation of a work as a performance or a score.

Container: Represents the physical item or set of item(s) on which instantiations of works can be found.

Media Object: Represents a piece of digital media content, such as a sound file or score image.

As noted earlier, an important part of any of these concepts is attribution of the person/groups responsible.

Contributor: Represents persons or groups that contribute to a Work, Instantiation, or Container.

Descriptive Concerns

In order for the entities in the system to have any real meaning, there must be a mechanism for adequately describing an entity. Without adequate description the user will not be able to efficiently identify entities of interest when searching and browsing. That is, appropriate metadata is necessary for all entities to be distinguished from one another as well as to group them by their similarities. Common means of describing entities would include names or titles (e.g. Grand Funk Railroad), as well as dates associated with the creation or modification of the entity (e.g. date of composition for a musical work). Within the context of music we also have an entire array of musical style, genre, form, and period descriptors that can be applied.

Vocabularies

In order to deal with potential ambiguity (terms having multiple possible interpretations) and redundancy (multiple terms with the same interpretation), controlled vocabularies will be employed. These vocabularies constrain the set of possible descriptive values to remove ambiguity and redundancy that will in turn allow us to more easily deal with the data.   These controlled vocabularies come two basic forms: those that are sponsored/controlled by outside agencies (*e.g.* Uniform Names/Titles from Library of Congress Name Authority Records), and those that are created internally for the specific purpose of supporting our needs.

Work

- **Type (required):** Specifies the type of work represented (i.e. Collective or Single)

- **Uniform Title (required):** Specifies the uniform title taken from existing authority records or generated according to AACR2 rules.
- **Variant Title(s):** Alternative titles of the work.
- **Date of Composition**
- **Place of Composition**
- **Date of First Performance**
- **Place of First Performance**
- **Date of First Publication**
- **Original Text Title:** Complete title of the non-musical work text used in the musical work.
- **Language(s):** Language used in the work or associated creative materials (e.g. programs written by the composer).
- **Related Resource(s):** Resources that have content relevant to the study of the work.
- **Note:** Additional information about the work. Should have the ability to be categorized.

Within the Work entity there is also a need to categorize and describe the musical properties of the Work. It is important to keep in mind that actual manifestations of music are represented by Instantiations, and these manifestations may deviate somewhat from properties generally associated with the abstract Work. Descriptions of Work properties should be thought of as guidelines or defaults that may be deviated from in any particular Instantiation of a Work.

- **Class Number:** Appropriate class number for this work based on Library of Congress guidelines.
- **Subject Heading(s):** Library of Congress subject headings appropriate for this work.
- **Genre, Form and Style:** Descriptors identifying the work's genre, form and style attributes controlled via the Music Thesaurus.
- **Instrumentation:** Quantity and type of instrumentation/voices utilized.
- **Key**

Instantiation
- **Title (required):** Title as presented on the parent container
- **Language(s):** Language(s) utilized in this instantiation
- **Place of Performance:** For performed music, specifies the location of performance.
- **Date of Performance:** For performed music, specifies the date of performance.
- **Extent (required):** Extent (duration/length) of the instantiation.
- **Document Description (required):** Identifies the type and format of the document from which the instantiation is taken.
- **Notation:** For printed music, specifies the notation in which the instantiation appears. Must be one of the following values: Tablature, Modern Staff, or …
- **Note:** Additional information about the instantiation or instantiation record. Should have the ability to be categorized.

The Instantiation is the authority on the properties of the manifested musical piece. When creating Instantiation metadata, the metadata stored in the Work will be consulted, but portions may be removed, replaced, and/or augmented with properties particular to the Instantiation.

- **Class Number:** Appropriate class number for this instantiation based on Library of Congress guidelines.
- **Subject Heading(s):** Library of Congress subject headings appropriate for this work.
- **Genre, Form and Style:** Descriptors identifying the work's genre, form and style attributes controlled via the Music Thesaurus.
- **Instrumentation:** Quantity and type of instrumentation/voices utilized.
- **Key**

Container
- **Display Title (required):** Title presented on container to be used in displays.
- **Additional Title(s):** Additional title(s) presented on the container.
- **Date of Publication**
- **Place of Publication**
- **Language(s):** Language(s) utilized in the container.
- **Document Description(s) (required):** Identifies the document types and formats found in this container. As well as documents' physical description and any additional notes about the document.
- **Publisher (required):** Name of the publisher.
- **Publisher Label/ Plate Number(s):** Publisher label, plate numbers as they appear on the container.
- **Edition:** Number or other Identifier representing the particular edition of this container.
- **Uniform Series Title**
- **Provenance:** Known history of ownership for the container.
- **Note:** Additional information about the container. Should have the ability to be categorized.

Contributor
- **Type (required):** We identify two types of contributor: person or group.
- **Uniform/Preferred Name (required):** Full uniform name of the contributor. Formatting controlled by AACR2.
- **Variant Name(s):** Alternate names for the contributor.
- **Contributor Date(s):** Date range associated with the contributor (birth-death, flourished, etc.). End points of the range may not always be known, however. E.g. Date of death is known, but date of birth is not
- **Variant Date(s):** For some contributor dates there may be multiple opinions on the "true" value. This element stores alternative dates associated with the contributor.
- **Place of Origin:** Location of birth (for persons) or foundation (for groups).
- **Related Resource(s):** Resources that have content relevant to the study of the contributor.
- **Note:** Additional information about the contributor. Should have the ability to be categorized.

Structural Concerns

Both the Work and Container can be further described by specifying their structural make-up. Each can be thought of as having a hierarchical breakdown that can be useful both for navigation within that particular entity as well as allowing finer grained search than would be provided using entity level descriptive metadata alone.

Work

The structural declaration of a musical work involves identifying and properly nesting the sections found within the Work. Examples of sections might be movements found in symphonies or acts and scenes in an opera. Work structure should allow for labeling of structural elements for display as well as optionally associating a searchable value.

Container

Within a particular Container there may be one or more physical items (e.g. CDs, LPs, score volumes) and within these physical items there may be additional sections (e.g. sides, tracks, pages). The structural elements can be labeled as in the Work structure.
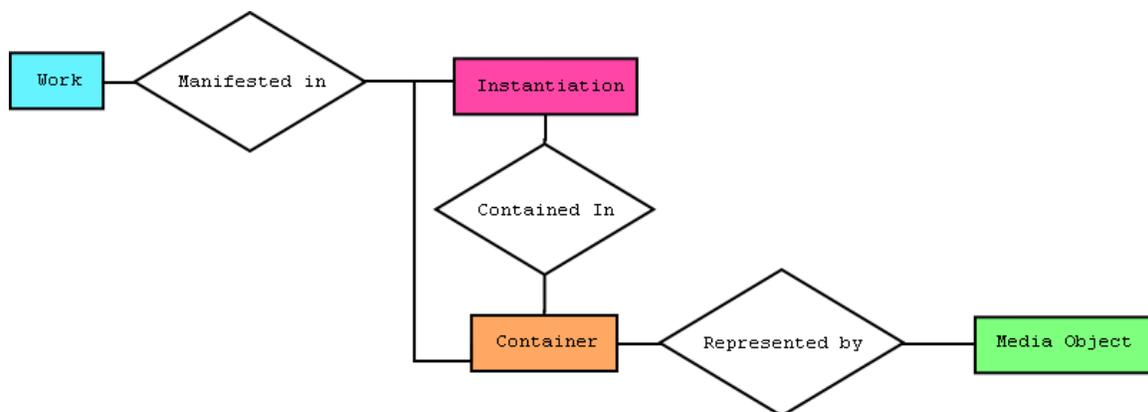
Relationships

In addition to describing the entities themselves we also need to describe their relationship(s) to one another. We need to first indicate how entities will be identified and then the mechanisms in V1, in which those IDs can be referenced by other entities.

IDs

In order to locate and manipulate records stored within the system it is necessary to uniquely identify them to prevent ambiguity. The ID serves no other purpose than to provide a robust mechanism for identifying entities that is completely independent of the metadata that describes the entity.

Simple Relationships

Contributions

One of the most important relationships in our model is the relationship between a contributor and the target of his/her contribution. For our purposes it is insufficient to simply relate the Contributor and Work/Instantiation/Container entities. We require the ability to further describe the nature of the contribution that was made. To handle this we provide for the notion of Contribution, which

can embody both the relationship as well as information about the type of the relationship.

Related Works

In order to model the relationships between works, we again need something slightly more sophisticated than a simple relationship tying the works together. The nature of the relationship between works may be of many types (e.g. derivative/original, collective/member, etc.) and this type needs to be stored with the relationship.

Structural Relationships

Both Container and Work entities have mechanisms to describe their own structure. In addition, however, there must be a binding or linking made between these structural descriptions and the media objects that contain relevant content. These bindings specify a mapping between the structure and particular offsets into relevant media objects. Container structure and bindings are located within the Container entity itself.
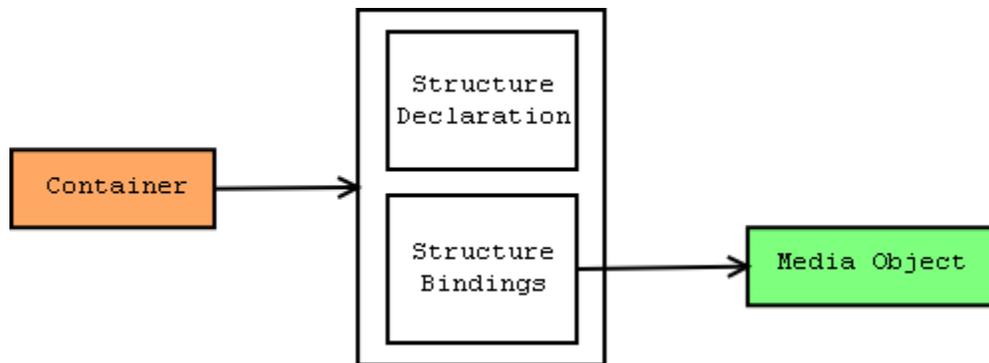
Work structure and bindings work in a similar way, but because there are many potential instantiations of a single work, the Work structure bindings must be stored in the Instantiation.
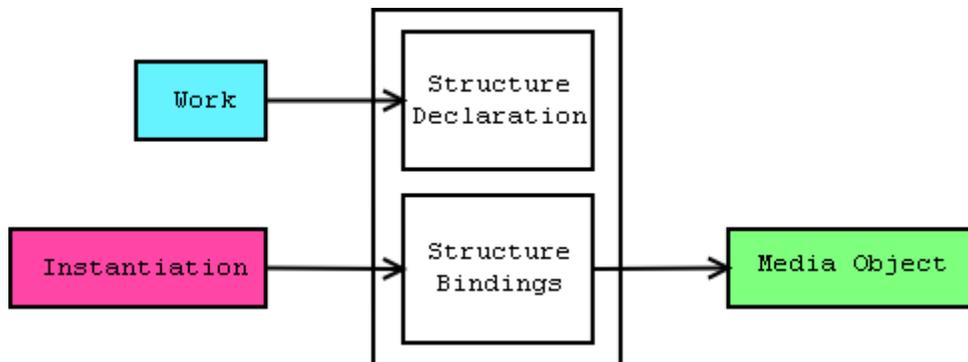
Administrative Concerns

Source and Vocabulary Tracking

In the process of cataloging entities, external sources will invariably be used for decisions on formatting (e.g. different types of subject headings may have different forms) as well as to indicate the original source of the data. The original source might be the physical item(s) represented by the container itself (e.g. for instantiation titles) or a more formal source such a particular authority record (local or otherwise). In any case, it is desirable to track these sources as the cataloging is carried out so there is always a trail back to the original source.

Digitized Media Information

In addition to just providing digital content, it is useful to store information about the nature of the digitized media as well as the process in which it was generated. This area of metadata may become more sophisticated as we add additional versions of content.

- **File format:** MIME type for the file
- **Compression:** Was compression of any sort used? If so, what was the nature of the compression?
- **Bit Depth:** (images)
- **Resolution:** (images)
- **Number of Channels:** (sound)
- **Sample Size:** (sound)
- **Sample Rate:** (sound)
- **Digitization Information:** Date(s) and Names/IDs for digitization technicians responsible for creating the digital content.
- **Hardware/Software used:** Description of the hardware and software employed in the digitization process.

Each media object has the potential to store more than one actual media file. This is most commonly the case with images stored to represent scores. In any case we need a mechanism to identify and verify the integrity of the files associated with the media object.

- **Sequence Number:** Indicates where this file falls within the sequencing of the media object.
- **File location:** URL to locate the file.
- **File Size:** File size in kilobytes.
- **Checksum:** 128 bit MD5 checksum.

Linkage to Existing System(s)

There is a natural relationship between our Container entity and the MARC records stored in IUCAT or OCLC. Given that as much content as possible will be imported from current MARC records, its useful to keep references back to these original sources.

- **Other system IDs (control numbers):** OCLC and IUCAT.

- **Physical Identification:** Location, call number, and copy information associated with the original physical item(s) represented by the Container.

Workflow/Status Information

As the metadata representing entities is actually entered in records, it is important to keep track of the status of the record. In the simplest case the status possibilities would be "available for public access" and "not available for public access". The system should however allow for a mechanism to add more fine grained status descriptors should these prove necessary/useful.

Interaction and Access Control

This category might be rightly called even more administrative issues. It is distinguished by its focus purely upon users, their interaction with the system, and how that interaction is regulated.

Users and Groups

Service: A record representing an access-controlled resource. Services include streamed audio content and images (controlled to the Container level), the metadata repository, directory services, and content management. Services regulate access by specifying which Groups are allowed and which Groups are denied access privileges.

User: A record representing a user of the DML system. User records contain references to Groups they are members of. Additionally Users may contain references to services to which they are allowed or denied access.

Group: Groups aggregate Users to make Service access control specifications easier to maintain.

IP List: Stores information to allow access based on the IP address of the client.

The authorization process is (conceptually) a three-step process. It is initiated with a request for access to a service in the system. The service request is a duple made up of a User and Service. A request to listen to a Container might look like:

{mjadud, "They Might Be Giants"},

Whereas a request to update the metadata repository with a new Work record might look like:

{mjadud, "Metadata Repository"}

The authorization process begins by locating the records for both the user (the User record) and the content the user is interested in (the Service record). Three steps follow to determine whether access will be granted.

Service Request → Load User and Service Info → Allow/Deny User Services → Allow/Deny Group Services → Allow/Deny Location Services → DENY FROM ALL
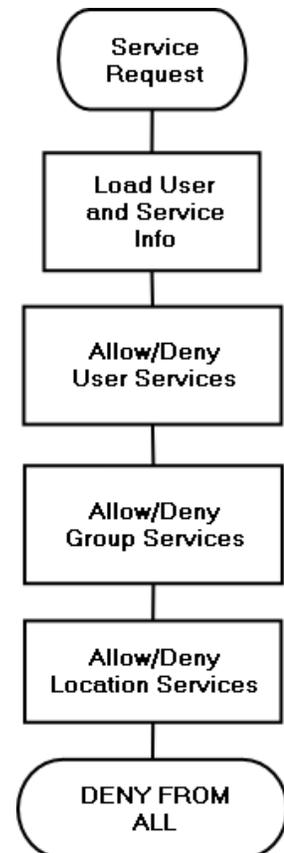
1. If the User is specifically denied or allowed access to the Service in question, they are either permitted access or denied, and the process ends.
2. The group membership of both the User and Service are checked; if they are both members of the same group, access is permitted; otherwise, we progress on to step three.
3. If the IP address the user is connecting from is considered "privileged," access is granted. Otherwise, access is denied, and the process ends.

Step three is primarily intended to give full access to all machines in the Music Library. While other uses might be found, it is not intended for broad application

Access Information

For each type of record that is stored within the system we wish to track activity using that record. The creation and last update are considered special activities that we especially wish to track so they are stored independently as well as being reflected in the generic, last access.

- **Creation Information:** Date, time, and ID of user that created the record.
- **Last Update Information:** Date, time, and ID of user that last updated the record.

Additionally for media objects useful information can be obtained by keeping track of the last access and number of accesses. This information can be an indicator of the utility/usage/popularity of the media object and may allow for optimization in later versions (e.g. store less used media objects on "slow", cheap storage devices).

- **Last Access Information:** Date, time and ID of user that last accessed the record.
- **Number of Accesses:** Number of times the record has been accessed.

Copyright

As has often come up in discussions about restricting access to content, the desire to be able to make these access decisions by drawing upon information known about the copyright ownership suggests that we need to store information that can assist in making this determination.

- **Copyright Declaration(s):** Copyright date(s) and holder(s) associated with the work/instantiation/container. Also indicates the type or domain of the copyright declaration (e.g. Music, Text, Recording, etc.)
- **Public Domain Status:** Indicates whether this work is known to be in the public domain, known NOT to be in the public domain, or is unknown.

External Unique Identifiers

- **ISMN:** International Standard Music Number. References: http://www.ismn.spk-berlin.de/
- **MRC/EAN/UPC:** Media Catalog Number, European Article Number, and Universal Product Code. MRC and EAN have 13 numeric digits. UPC only has 12 and a leading

zero. These numbers provide unique identifiers for the physical item(s) represented by the Container. References: http://www.ean-int.org/, http://www.uc-council.org/

- **ISBN:** For printed sources, specifies the International Standard Book Number provides a unique identifier.
- **Performing Rights Society Work Number:** By identifying the performing rights society and work number associated with a particular work we may be able to more easily track current copyright owners.
- **International Standard Recording Code:** The ISRC provides a mechanism for tracking particular recordings of works across publications.

Data Model

The discussion of an actual data model which we believe will support the conceptual requirements stated above starts with a discussion of the common element types found in entities and how these may be implemented in a uniform way. By doing so we reduce the amount of work and confusion necessary to support the conceptual elements.

As a final step, we integrate these data-types into records that will represent the high-level conceptual entities with which we began.

Data types

Date

In current practice, lots of information is associated with "dates". Certainty and precision qualifiers (e.g.? and circa) are used to further indicate the nature of the date. Multiple possible dates may be listed where the exact date is not known. Less precise units may be used (centuries, decades) where exact years are not known. Finally, dates that are incorrect (e.g. due to publishing error) are annotated along with the correct date.

Clearly we need quite a bit of flexibility to support all these activities, but we cannot simply allow the date to be free form if we wish to normalize (descriptions for the same date should be the same) and convert the date to an internal numeric form for sorting/searching purposes. To support these activities as much of the date specification must be as regular as possible.

To illustrate how this might be accomplished a particular representation is given, but any representation that addresses the needed functionality could be used.

Valid Date Base forms:
> **YY*uu*** -- Century
> or **YYY*u*** -- Decade
> or **YYYY** -- Year
> or **YYYY**-**MM** -- Year/Month
> or **YYYY**-**MM**-**DD** -- Year/month/Day

Valid Date Base form connectors and qualfiers:

? -- Date may be incorrect, follows date
circa --Actual date is near or equal to this date, precedes date

early (approx. YY00-YY33)
or **middle** (approx. YY34-YY66)
or **late** (approx. YY67-YY99) – additional precision for century-based dates[2]

/ --OR, used provide multiple **possible** dates
to – range, specifies begin and end dates

Additionally we provide a mechanism for specifying date related descriptive content that will not be convertible or should not be used when sorting using dates.

Valid date comment (follows date base): **[*comment*]**

A few examples:
- 1977-02-25, 1977-02-27 [container also specifies 1977-02-29]
- early 12uu
- ca. 197u
- 1978/1979
- 1954-12 to 1955-01

It is worth noting that this formatting does NOT imply a particular format when presenting data to the user (e.g. in a result set display). By creating a format that can easily be disassembled it is straight-forward to translate into any presentation format we desire.

Typed Date

In some situations (namely Contributor dates), it is more convenient to have a single field capable of storing different types of dates rather than attempting to specify and allocate space for all the different types of dates up front. To support this we create a typed date type that stores information on the type as well as the date.

Field	Mult.	Type
Date	1	Date
Type	1	Date type descriptor

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[2] These are included to handle the situation where sources do not provide more precise date information. If a more precise range is given in the source, that should be used over the less precise form.

Text

In its most simple form this data type allows the storage of textual characters. More specifically it must support storage of the ANSI/ANSEL character sets (or an equivalent) that are currently used by IU's current MARC system.

Name

Text data type that uses a simple delimiter to separate the Last Name/Surname from other parts of the name (e.g. Pendleton, William R.)

Place

Text data type that uses a simple delimiter to separate the country designation from other parts of the place.

Title

From outward appearances titles are just another piece of text, but they have in current practice an additional "hidden" functionality. When titles are sorted, articles at the beginning of the title are not taken into account. In order to support this, we provide for an indicator to be specified that provides an offset that specifies the number of characters to skip from the beginning of the title[3].

Field	Mult.	Type
Title	1	Text
Non-filing indicator	1	Number

Descriptor

A descriptor represents a type of textual data that has an internally defined, controlled vocabulary. An example would be the role descriptor used to define the type of contribution that is made to a work/instantiation/container. The descriptors in a vocabulary will be fixed in general (i.e. new descriptors shouldn't be created on a whim), but additions and deletions will be possible if necessary. At the current time not all these vocabularies are fully defined, but these will be generated and be used as indicated in the record descriptions that follow.

Note

For each entity type we have the ability to describe further any details that don't "fit" into any other place. Notes can be categorized so that, for example, administrative notes intended for library staff and administrators are not displayed in typical user interfaces.

Field	Mult.	Type
Note Content	1	Text
Note Type	1	Descriptive, Administrative, etc.

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[3] White-space before the first non-article character should also be included in this offset.

Contribution

The contribution data type is used in the representation of the typed relationship between a contributor and the target of their contribution (e.g. a Container, Work or Instantiation). In addition, the contribution can store a name to be associated with the contributor that is specific to that contribution. In general, these will be contributor names as indicated on the Container materials.

Field	Mult.	Type
Contributor	1	ID
Name Used	0…1	Text
Role Type	1	Role Descriptor

Work Relation

Used to represent types of relationships between Works. Examples being collective work-member work and original work-derived work relationships.

Field	Mult.	Type
Related Work	1	ID
Relation Type	1	Relationship Descriptor

Document Info

The document description data type is used in the representation of the Container in order to describe its associated document(s)

Field	Mult.	Type
Document Type	1	Document Type Descriptor (Sound, Score)
Document Format	1	Document Format Descriptor (LP, CD, Tape, Vocal Score, Full Score, Parts)
Physical Description	1	Text

Language Use

Description of language(s) used occurs in Work, Instantiation, and Containers. In each case there may be desire to indicate the nature or context in which the particular language is being used.

Field	Mult.	Type
Language	1	Language Descriptor
Location/Context of Use	0…1	Text

Instrumentation Info

Field	Mult.	Type

Quantity	1	Number
Instrumentation Descriptor	1	Instrumentation Descriptor

Resource

Field	Mult.	Type
Title	1	Text
Description	1	Text
Location	1	URL

Access Info

Typically automatically generated by the system, this data-type records the date and time of a particular access as well as the ID of the user involved.

Field	Mult.	Type
User	1	User ID
Access Timestamp	1	Timestamp

File Info

File Info provides a mechanism for storing the administrative metadata to be associated with each file found within a media object.

Field	Mult.	Type
Sequence Number	1	Number
File Size	1	Number
File Location	1	URL
Checksum	1	Text
Creation	1	Access Info
Last Update	1	Access Info

Physical ID Info

Information that identifies the physical items that make up a given Container.

Field	Mult.	Type
Location	1	Location Descriptor
Call Number	1	Text
Copy Number	1	Number

Copyright Declaration

Work, Instantiation, and Container each could indicate various copyright declarations that we need to store for later review. For V1, we will store this information by identifying the copyright holder, the copyright domain, and the copyright date if available.

Field	Mult.	Type
Copyright Owner	1	Text
Copyright Domain	1	Text
Copyright Date	0…1	Date

Container Structure and Bindings

Element	Description
	Attributes
	Contents
Container	Outer most containing element for all Container structures.
	No attributes
	Must contain one or more Item elements.
Item	Represents an item found within the container.
	Label (required): Used in navigational display
	Can contain Div or Chunk elements
Div	Non-leaf node representing the hierarchical structure of the item
	Label (required): Used in navigational display **ISRC (optional):** Used to record the ISRC for track on a CD
	Can contain other Div or Chunk elements.
Chunk	Leaf node of the container structure representing a discrete section.
	Label (required): Used in navigational display
	May contain one or more Bind elements
Bind	Element used to bind the section of the container structure to one or more sections of digital content stored in one or more media objects
	Reference (required): ID of the media object to be bound **Begin (required):** Starting offset into the media object **End:** Ending offset into the media object. If not provided End is equal to Begin.
	No contained elements are allowed.

Work Structure

Element	Description
	Attributes
	Contents
Work	Outer most containing element for all Work structures
	ID (required): Identifier for this structural element. **Label (required):** Used in navigational display
	Must contain one or more Sections
Section	A discrete section of the work
	ID (required): Identifier for this structural element. **Label (required):** Used in navigation display **Title:** Used in searching **Type:** Work section type descriptor (e.g. movement, act, scene)
	May contain one or more Sections

Work Structure Bindings

Element	Description
	Attributes

	Contents
Bindings	Outer most containing element for all Work Structure Bindings
	StructureID (required): Work structure ID against which these bindings are made.
	Contains one or more Target elements
Target	Identifies the section of the work to which the bindings are relevant
	Targeted (required): ID of the Section in the work structure
	Contains one or more Bind elements
Bind	Contains information necessary to link nodes in the work structure to the appropriate section(s) of media object(s)
	Reference (required): ID of the media object to be bound. **Begin (required):** Starting offset into the media object. **End:** End offset within the media object. If not provided, End equals Begin.
	No contained elements are allowed.

Music, Media and Contributor Records

Yellow	Descriptive
Tan	Structural
Blue	Relational/Connective
Green	Administrative

Note: For the sake of brevity, the inclusion of source and vocabulary information with each descriptive field has been omitted.

Contributor Record

Field	Mult.	Type
Type	1	Person or Group
Uniform Name	1	Name
Variant Name(s)	0…Many	Name
Date(s)	0…Many	Typed Date
Variant Date(s)	0…Many	Typed Date
Place of Origin	0…1	Place
Note(s)	0…Many	Note
Related Resource(s)	0…Many	Resource
ID	1	ID
Record Creation	1	Access Info
Last Record Update	1	Access Info
Record Status	1	Status Descriptor

Work Record

Field	Mult.	Type
Type	1	Single or Collective

Uniform Title	1	Text
Variant Title(s)	0…Many	Text
Date of Composition	0…1	Date
Place of Composition	0…1	Place
Date of First Performance	0…1	Date
Date of First Publication	0…1	Date
Original Text Title	0…1	Text
Language(s)	0…Many	Language Use
Subject Heading(s)	0…Many	Text
Class Number	0…1	Text
Instrumentation	0…Many	Instrument Info
Genre, Form, and Style	0…Many	Genre, Form, Style descriptor
Key	0…1	Key Descriptor
Note(s)	0…Many	Note
Related resource(s)	0…Many	Resource
Work Structure	0…1	Structure Declaration
ID	1	ID
Contribution(s)	0…Many	Contribution
Related Work(s)	0…Many	Work Relation
Copyright Declaration(s)	0…Many	Copyright Declaration
Performing Rights Society Work Number	0…1	Text
Public Domain	1	Unknown, Known Public Domain, Known NOT Public Domain
Record Creation	1	Access Info
Last Record Update	1	Access Info
Record Status	1	Status Descriptor

Instantiation Record

Field	Mult.	Type
Title	1	Text
Document Description	1	Document Info
Subject Heading(s)	0…Many	Text
Class Number	0…1	Text
Instrumentation	0…Many	Instrument Info,
Genre, Form, and Style	0…Many	Genre, Form, and Style descriptor
Language(s)	0…Many	Text
Notation	0…1	Notation Descriptor
Date(s) of Performance	0…Many	Date
Place of Performance	0…1	Place
Extent	1	Number
Note(s)	0…Many	Note
ID	1	ID

Contribution(s)	0…Many	Contribution
Manifested Work	1	ID
Completeness Indicator	1	Complete or Incomplete
Parent Container	1	ID
Structural Binding	0…1	Structural Binding
Copyright Declaration(s)	0…Many	Copyright Declaration
Public Domain	1	Unknown, Known Public Domain, Known NOT Public Domain
Record Creation	1	Access Info
Last Record Update	1	Access Info
Record Status	1	Status Descriptor

Container Record

Field	Mult.	Type
Title(s)	1…Many	Text
Uniform Series Title	0…1	Text
Publisher	0…1	Text
Edition	0…1	Text
Publisher/Plate Numbers	0...Many	Text
Document Description(s)	1…Many	Document Info
Language(s)	0…Many	Text
Date of Publication	0…1	Date
Date of Copyright	0…1	Date
Place of Publication	0…1	Place
Note(s)	0…Many	Note
Container Structure	0…1	Structural Declaration
ID	1	ID
Contribution(s)	0…Many	Contribution
Contained Collective Works	0…Many	ID
Contained Media Objects	0…Many	ID
Contained Instantiations	0…Many	ID
Structural Binding	0…1	Structural Binding
Physical Identification	1	Physical ID Info
Condition	0…1	Condition Descriptor
Holding Status	0…1	Circulating, Non-circulating, Not Retained
ISBN	0…1	Text
MRC/EAN/UPC	0…1	Number
ISMN	0…1	Text
Copyright Declaration(s)	0…Many	Copyright Declaration
Public Domain	1	Unknown, Known Public Domain, Known NOT Public Domain

Record Creation	1	Access Info
Last Record Update	1	Access Info
Record Status	1	Status Descriptor

Media Object

Field	Mult.	Type
ID	1	ID
Parent Container	1	ID
File Format	1	Text
Compression	1	Text
Bit Depth	1	Text
Resolution	1	Text
Number of Channels	1	Number
Sample Size	1	Number
Sample Rate	1	Number
Hardware/Software	1	Text
Date Digitized	1	Date
Digitized By	1	Text
Record Creation	1	Access Info
Last Record Update	1	Access Info
Record Status	1	Status Descriptor
Number of Accesses	1	Number
Contained File(s)	1...Many	File Info

User, Group, and Service Records

User

Field	Mult.	Type
ID (Username)	1	Text
First Name	1	Text
Last Name	1	Text
Expiration Date	1	Date
Allowed Services	0…Many	ID
Disallowed Services	0…Many	ID
Group Membership	0…Many	Group ID
Record Creation	1	Access Info
Last Record Update	1	Access Info

Group

Field	Mult.	Type
ID	1	Group ID
Name	1	Text
Expiration Date	1	Date
Record Creation	1	Access Info
Last Record Update	1	Access Info

IP List

Field	Mult.	Type
ID	1	IP List ID
Name	1	Text
IP Address(es)	0...Many	IP Address (IP descriptor or range descriptor)
Record Creation	1	Access Info
Last Record Update	1	Access Info

Service

Field	Mult.	Type
ID	1	ID
Name	1	Text
Location	1	URI
Expiration	1	Date
Allowed Groups	0…Many	Group ID
Disallowed Groups	0…Many	Group ID
IP List	0…1	IP List ID
Record Creation	1	Access Info
Last Record Update	1	Access Info