NISO Work Item Title:
Develop Standard Metadata for Remediation of Content for Accessibility

Short Title:
Accessibility Remediation Metadata (ARM)

Proposal for Consideration by the NISO Voting Membership
Approval Ballot Period: April 12 – May 12, 2023

The following proposed work item is submitted by:
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Background and Problem Statement

Many books, articles, videos, and other resources are often inaccessible or not sufficiently accessible to people with perceptual, cognitive, physical, or other disabilities. A significant percentage of the population has disabilities such as blindness, low vision, dyslexia, deafness, motor impairments, and other conditions that make it difficult or impossible for them to fully perceive and consume resources to the extent people without those disabilities can.

Schools, colleges, and universities are typically required by law to provide accessible versions of resources that students need. Similarly, government documents and other resources in the United States and elsewhere are required to be accessible. Unfortunately, most published resources are not yet provided by their publishers in fully accessible forms. This requires what is known as *remediation*: acquiring a publication in some available format and altering it to make it accessible, typically to a single individual needing a particular type of remediation. For example, a blind person (and those with other print disabilities) may need markup added to a digital resource such as a PDF or an EPUB to enable proper navigation with a screen reader, as well as providing image descriptions for images that lack them.

Most colleges and universities have what are usually called Disability Services Offices (DSOs) which use a combination of a small staff, student workers, and available software and other tools to remediate course materials and other resources each semester. There are also commercial services that do this work, typically outside of education.

Historically, the resulting remediated resource was rarely shared between DSOs: it was created for and only provided to a particular student. When another student at another university needed the same resource remediated in the same way, the DSO at that university would repeat the same remediation done at the first university—typically labor-intensive work. This results in a significant amount of duplication, cost, and delay.
In order to facilitate the sharing of remediated resources, The Andrew W. Mellon Foundation has funded a project known as FRAME: Federating Repositories of Accessible Materials for Education. FRAME's mission is to eliminate as much as possible of that wasteful redundant work. That meant developing a unified search based on indexing the millions of resources available in the participating repositories (Bookshare, the Internet Archive, and HathiTrust), enabling DSOs to discover available resources needed by their clients, and an infrastructure by which DSOs could deposit the subsequently remediated resources so that they would be available to others.

In the course of this work, it was determined that no standard metadata describing the process and results of remediation for accessibility in sufficient detail existed. The FRAME metadata model was developed to enable both the discovery and deposit functions. DSOs need to find available resources required by students, as well as knowing what features in those resources might require remediation (such as images, tables, or equations) and whether a particular available resource has been remediated to some extent, and if so, how.

Likewise, upon obtaining an appropriate resource and then remediating it for a recipient, DSOs need to be able to specify what they had done. For a blind recipient requesting a PDF, they might have added structural tagging and image descriptions. A dyslexic recipient might require an EPUB so that they could alter the font and line spacing of the text, and the DSO might have had to add page break markers so that the student could access the pages referred to by the professor or fellow students, as well as to cite pages in their coursework.

The FRAME metadata model was developed through a facilitated collaboration of the DSOs at the six original universities participating in the project (there are now seven), along with the academic libraries at those institutions. It also involved the participation of technical staff from the participating repositories as well as a key developer at the University of Virginia (UVA), where a fourth repository (known as EMMA–Educational Materials Made Accessible) has been created to provide access to resources that did not originate in one of the three original repositories. EMMA work also involved the development of a unified search, based on technology from Benetech's Bookshare, that enables discovery across all four repositories as well as a user interface that facilitates the provision and consumption of metadata for deposit or discovery.

Particularly in the context of that development work at UVA, the FRAME metadata model has been "road tested" by DSO and library users depositing over a thousand remediated resources via EMMA into one of the four repositories and informing the discovery process across them. The model has proven to be sufficiently expressive and robust to meet the needs of the DSOs who depend on it–and to use terminology that is natural to them. It is therefore mature enough to be offered to NISO to generalize it beyond the FRAME project and make it openly available as a NISO (and, ideally, ANSI) standard.

A non-technical report documenting the FRAME metadata model accompanies the proposal.

Statement of Work

1. *Project Goals*

   To extend and refine the FRAME metadata model to meet the needs of the broader accessibility community, focused on individuals and organizations involved in the remediation of content for accessibility and the consumption of remediated content.

2. *Specific Deliverables and Objectives*

   A common issue in the development of a metadata model like this is the extent to which it is human readable and the extent to which it is machine processable. In the context of FRAME, the priority was given to being human readable, while providing sufficient specificity to enable or at least facilitate machine processing. This was done by first polling the DSOs about the terminology they use and then, where possible, providing controlled vocabularies (CVs) of permissible values for certain metadata properties. It is our objective, subject to the discussions in the Working Group that we propose to form, to maintain this balance.

This will require at least two deliverables:

a. *Written documentation* that clearly defines and describes the properties in the model, the values they can use, and the relationships between them. This documentation should include concrete examples for clarity.

b. *A schema* that enables validation of content conformance to the model. This schema will be deliberately flexible, adaptable, and extensible so that it can be useful in as many different contexts as possible. While certain properties will be required, and where the relationships between properties will be specified, the presence of most properties will be optional and the values of some properties will be free text.

3. *Process*

A Working Group (WG) will be formed consisting of representatives from a variety of organizations that remediate content or consume remediated content. (See *Partners and Participation* below.) It is expected that the WG will meet via Zoom for an hour biweekly.

The WG will analyze and discuss the FRAME model as submitted and raise issues about properties that are not clear, candidate properties to add or remove, and potential changes to values. Wherever possible, the WG will operate by consensus, providing an open platform for issues to be discussed and debated until consensus is achieved.

The first deliverable will be the draft of the written documentation. This will be circulated to a group of reviewers external to the organizations represented by the Working Group in order to obtain feedback. The written documentation will be revised accordingly and recirculated for subsequent review.

When it has been determined that the written documentation is sufficiently complete, clear, and stable, the schema will be developed. Concurrently, the written documentation will be submitted to copyediting according to standard NISO practice. Only when both the documentation and the schema have been completed and are determined to be in agreement will they be published.

4. *Partners and Participation*

We propose to include representatives from the following types of organizations in the Working Group:
–Representatives from at least two of the DSOs participating in the FRAME project.
–Representatives from at least two DSOs who did not participate in FRAME.
–A representative from Benetech.
–A representative from the DAISY Consortium.
–An academic librarian or metadata specialist.
–Representatives from at least one each of the following: a scholarly publisher, a higher education publisher, an STM publisher, and a trade publisher.
–Representatives from two commercial service providers who offer remediation services.

We propose the following co-chairs:
–Bill Kasdorf, Principal, Kasdorf & Associates. Bill has been the principal consultant to the FRAME project from the beginning, and he is the primary author of the FRAME Metadata Specification.
–J. Stephen Downie, Co-Principal Investigator, FRAME; Professor, iSchool, University of Illinois

Champaign-Urbana; principal developer of the accessibility curriculum for an MS in Information Science as part of the FRAME work.
–Jacob Jett, Research Librarian; PhD, MSLIS, and CAS (Digital Libraries), Association of State Flood Plain Managers; developer and expert in the semantic web and metadata; Jacob has been involved in the development of the FRAME metadata and will write the schema for the resulting NISO standard.

5. *Timeline*

Month 1: Appointment of working group
Month 2: Approval and publication of charge and initial work plan (including final determination of scope)
Months 3-9: Completion of information gathering (phase 1)
Months 10-13: Completion of initial draft recommended practices document (phase 2); draft schema.
Months 14-16: Public comment period
Month 17: Evaluation of comments and updating the specification and schema
Month 18: Responses to comments and publication of final NISO Standard (target January 2024)

6. *Funding*

No need for funding is anticipated. The members of the Working Group will be volunteers.

Report

The FRAME Metadata Model

A Model for Conveying Information Relevant to the Remediation of Content for Accessibility

May 13, 2022

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Background

FRAME—Federating Repositories of Accessible Materials for Higher Education—is a Mellon-funded initiative whose mission is to facilitate the interchange and reuse of accessible resources. It involves the academic libraries and disability services offices (DSOs) at seven U.S. universities and three major repositories of content important to the education and research missions of those universities: HathiTrust, the Internet Archive, and Benetech's Bookshare. In the course of the project, a fourth repository was developed—EMMA, Educational Materials Made Accessible—for accessible resources not originating in the three contributing repositories.

DSOs exist to provide accessible versions of resources to students, faculty, and staff at their university who are unable to effectively access and consume the standard formats of print or digital resources because of a perceptual, physical, or cognitive disability such as blindness, low vision, dyslexia, or hearing loss. They do this by obtaining an available format of a required resource and performing what is known as remediation.

Remediation is the process of altering a standard format to add features that make the resource accessible to a particular recipient. So, for example, the DSO may need to add image descriptions, or markup to enable proper navigation, for a blind student. Historically, the resulting remediated resource was rarely shared: it was created for and only provided to a particular student. When another student at another university needed the same resource remediated in the same way, the DSO at that university would repeat the same remediation done at the first university—typically labor-intensive work.

FRAME's mission is to eliminate as much as possible of that wasteful redundant work. That meant developing a unified search based on indexing the millions of resources available in the participating repositories, enabling DSOs to discover available resources needed by their clients, and an infrastructure by which DSOs could deposit the subsequently remediated resources so that they would be available to others.

The FRAME metadata model was developed to enable both the discovery and deposit functions. DSOs need to find the specific resources required, typically as provided in the syllabus of the classes their clients attend, as well as knowing what features might require remediation (such as images, tables, or equations) and whether a particular available copy might have been remediated to some extent, and if so, how.

Likewise, upon obtaining an appropriate resource and then remediating it for a recipient, DSOs need to be able to specify what they had done. For a blind recipient requesting a PDF, they might have added structural tagging and image descriptions. A dyslexic recipient might require an EPUB so that they could alter the font and line spacing of the text, and the DSO might have had to add page break markers so that they could access the proper pages referred to by the professor or fellow students.

Finding that no standard metadata model appropriately addressed these needs, the FRAME project created the model that is documented here.

The FRAME Metadata Model

The properties in the FRAME Metadata Model are organized into four categories:

- Identifiers
- Bibliographic Metadata
- Administrative Metadata
- Remediation Metadata

As the EMMA infrastructure was being developed, it became clear that there are significant differences in how certain metadata properties are expressed in the three participating repositories, as well as significant differences in how DSOs have characterized their work in the past.

The FRAME Metadata Model was developed in collaboration with the three repositories and the six DSOs participating in the initial phase of the project, as well as academic librarians from some of the participating universities, to come to consensus regarding the terms to use for the properties; the definitions of the properties; and the specification of any required values for the properties.

The initial properties and their values were then modified based on the development of the EMMA infrastructure, and on the results of piloting and refining that infrastructure, as DSOs began to use the system to search for resources to remediate, and to deposit remediated resources.

The resulting properties and values are documented below. It will be clear that some of them would be of general use in the discovery and interchange of accessible resources, while some are very specific to FRAME and EMMA.

It should also be noted that the terms used are the user-friendly terms that would be presented in a user interface. They are not necessarily the properties required by the technologies on which the development of the system was based.

Identifiers

Party ID
String (system generated)
Identifies the DSO or library associated with obtaining or remediating the resource.

User ID
String (system generated)
Identifies the person obtaining or depositing the resource or its metadata.

End User ID
String (system generated based on DSO input)
Identifies the qualified recipient of a remediated file; controlled by the DSO.

Repository ID
Controlled Vocabulary: Bookshare, HathiTrust, Internet Archive, EMMA
Identifies the repository from which a resource is obtained and to which it is then deposited after remediation.

Collection
String
Identifies a set of works within a repository.

Repository Record ID
String (URI)
Identifies a resource within a repository.

Record ID
String (system generated)
Identifies a specific transaction (retrieving a resource, depositing a remediated resource).

Title ID
String
Serves as a "work identifier" enabling the grouping of resources that are all the same work.

Public Identifier
String (e.g., ISBN, DOI, OCN, LCCN, EIDR)
Persistent identifier of the resource.

Related Identifier
String (e.g., ISBN, DOI, OCN, LCCN, EIDR)
Another identifier of the same work, e.g., an ISBN of a different edition/format of a book.
Enables searching, e.g., by the hardcover ISBN of a book and locating the EPUB or PDF, which have different ISBNs.

Bibliographic Metadata

Work Type
Controlled Vocabulary: Book, Article, Video, Podcast
The type of resource, which determines the nature of its metadata and remediation.

Series Type
Free text (e.g., book, journal, newspaper, podcast, program)
Applies if the work is part of a series.

Series
Free text (e.g., Nature, Harry Potter, The Daily)
Name of the periodical, book, podcast, or other series the work is a part of, if applicable.

Series Position
Free text (e.g., Issue 26, Book 2, Volume II, Episode 5)
Position of the work within the series, if applicable.

Title
Free text
The title of the work.

Creator
Free text
Name(s) of authors, editors, or other named contributors to the work.

Publisher
Free text
The name of the publisher of the work.

Publication Date
String (ISO-8601 as YYYY-MM-DD or four-digit year)
The date the work (i.e. of the specific version of the work, such as "Third Edition," required by the syllabus) was published.

Version
Free Text (e.g., Second Edition, 2e, Student Edition, Preprint, InitialPub, VoR, CVoR, AVoR)
The specific version of the resource.

Language
String (ISO 639-2)
List of codes of the primary language(s) of the resource.

Rights
Controlled Vocabulary: Public Domain, Copyright, CC0, CC BY, CC BY-SA, CC BY-NC, CC BY-ND, CC BY-NC-SA, CC BY-NC-ND, Embargo, License, Other
The type of rights associated with the work.

Copyright Date
Date (as YYYY)
Copyright date if applicable. May be the same as Publication Date.

Subject
Free Text
Lists subjects pertaining to the work.

Description
Free Text
A description of the work unconstrained by any specific descriptive properties.

Administrative Metadata

Retrieval Link
String (URI)
Link to download a resource from a repository.

Web Page Link
String (URI)
Link to a web page that describes a work from a repository.

Date Accepted
String (Date in ISO 8601 format, YYYY-MM-DD)
Date remediated file was accepted into the repository.

Remediated By
Party ID
Identifies the DSO that performed the remediation.

Submitted By
Party ID
Identifies the party that made the submission of the resource and its metadata.

Update Date
String (Date in ISO 8601 format, YYYY-MM-DD)
Records the date of the most recent change to the source repository entry for the resource.

Remediation Metadata

Resource Type
Controlled Vocabulary: Text, Sound, Collection, Dataset, Event, Image, Interactive Resource, Service, Physical Object, Still Image, Moving Image
Distinguishes specific types of resources.

Format
Controlled Vocabulary: BRF, Braille [*other than BRF*], DAISY [*DTB, Digital Talking Book*], DAISY Audio, EPUB, PDF, Word, Tactile, Kurzweil, RTF
Format of the resource to be remediated or in which the remediated resource is provided.

File Type
Free text (e.g., .epub, .pdf, .doc, .docx, .mp3, .mp4, .rtf)
File extension or other such designation of the resource file(s)—not of a container like .zip.

File Size
Free text (in KB, MB, or GB)
Records the size of the file being retrieved or deposited.

Source
Controlled Vocabulary: Bookshare, HathiTrust, Internet Archive, EMMA, Access Text Network, Publisher, Purchased, Faculty Student, Library, Other DSO, Other
Records where the resource to be remediated was obtained.

Metadata Source
Free text
Records who or what provided the metadata associated with the remediated resource.

Complete?
Binary (Yes or No)
Records whether the whole resource or a portion of it was remediated.

Portion Description
Free text (e.g., Unit One, Chapters 2-5)
Documents what was remediated if the answer to Complete? is No.

Content Features
Controlled Vocabulary: Text, Audio, Images, Tables, Equations, Linked TOC
Alerts DSO to aspects of the content needing special attention.

Number of Images
Integer
Documents the number of images needing descriptions or description review.

Text Quality
Controlled Vocabulary: Raw OCR, Cleaned OCR, Rekeyed, Proofread, Published
Indicates how much cleanup may be required.

Remediation Status
Controlled Vocabulary: Not Remediated, Remediated, Born Accessible
Indicates need for remediation.

Remediated Aspects
Controlled Vocabulary: Scanned and OCR'd, Proofread and Corrected OCR, Added Bookmarks, Tagged the PDF, Added Image Descriptions, Structured Headings, Linked TOC, Fixed Tables, Added MathML, Foreign Language Markup, Transcriber's Notes, Annotations, Transcript, Captions
Records what was done in the remediation process.

Remediation Comments
Free text
Enables the DSO to record any comments helpful to a future user of the remediated resource.

Remediation Date
String (Date in ISO 8601 format, YYYY-MM-DD)
Records when the remediation work was completed.

The following are properties in EPUB Accessibility Metadata and schema.org:

Accessibility Feature
Free text (e.g., Extended Descriptions, Captions, Transcript, Linked TOC)
Documents accessibility features present in the resource.

Access Mode
Controlled Vocabulary: Textual, Visual, Auditory, Tactile
Documents the sensory mode or modes by which the resource can be consumed.

Access Mode Sufficient
Access Mode vocabulary (e.g., Textual + Visual for text for Text-to-Speech but lacking image descriptions; Textual if image descriptions are provided)
Documents the ways in which the resource can be consumed without loss of information.

Accessibility Hazard
Controlled Vocabulary: Flashing, No Flashing Hazard, Motion Simulation, No Motion Simulation Hazard, Sound, No Sound Hazard
Documents aspects of the resource that might be problematic for certain users.

Accessibility Summary
Free text
Human readable explanation of the accessibility of the resource. (The previous properties were designed for machine processing; there is a UX guide for how to present them.)

Accessibility Control
Controlled Vocabulary: Full Audio Control, Full Keyboard Control, Full Mouse Control, Full Touch Control, Full Video Control, Full Switch Control, Full Voice Control
Documents how navigation of the resource can be controlled.