Standards and Best Practices related to the Publication, Exchange, and Usage of Open Data

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Mark Needleman
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ASIS&T 2017
Standards Committee

The Standards Committee shall advise the Board of Directors and shall represent the Association’s interest in matters pertaining to standards. It shall actively identify potential new standards needed by the information community and shall take the necessary steps to initiate development of such needed standards with the appropriate organizations. The Chair, after consultation with the full committee, may vote or comment in accordance with the majority opinion of the committee in the name of the Association on all proposed standards submitted by organizations with which the Association affiliates. All such action and comment must be promptly reported to the Board of Directors; actions and comments proposed should be reported to the board in advance whenever possible.

Co-Chair: Mark Needelman
Co-Chair: Timothy Dickey
Board Liaison: Fidelia Ibekwe-SanJuan, IRSIC – Aix-Marseille University
Standards Committee Activities 2017

1. Voted **YES** N921, NWIP, Guidelines for Bibliographic reference and citations to information

**Question:**

Do you approve, disapprove, or abstain on this NWIP (New Work Proposal) – ISO TC 46-SC 9, N921, Guidelines for Bibliographic reference and citations to information resources?

**Description:**

This International Standard gives guidelines for the preparation of bibliographic references. It also gives guidelines for the preparation of bibliographic references in works that are not themselves primarily bibliographical. It is applicable to bibliographic references and citations to all kinds of information resources, including but not limited to monographs, serials, contributions, patents, cartographic materials, electronic information resources (including research datasets, computer software and social media), music, recorded sound, photographs, graphic and audiovisual works, and moving images, applicable to machine- parsable citations. It is also not applicable to machine-parsable citations, which have their own standards.

42. Voted **APPROVE** on ISO TC 46/SC 4, ISO/FDIS 18626 (Ed 2) – Information and documentation, Interlibrary loan transactions

**Question:**

Do you approve the technical content of the final draft?

**Description:**

This document specifies the transactions between libraries or libraries and other agencies to handle requests for library items and the following exchange of messages.


**Question:**

Based on this recommendation, should TC46/SC9 withdraw the project to revise ISO 15707 and disband TC46/SC9/WG2?

**Description:**

...
Standards and Best Practices related to the Publication, Exchange, and Usage of Open Data

- Data On The Web
- Image-based Resources

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ASIS&T 2017
The openness and flexibility of the Web have created

- new opportunities &
- new challenges

Data publishers and data consumers may be unknown to each other.

How to represent, describe, and make data available (by publishers) in a way that it will be easily found, understood, used and re-used (by consumers)?

Are there standards and best practices?
Providing some information about the datasets and distributions will contribute to trustworthiness and reuse of:

• structural metadata,
• descriptive metadata,
• access information,
• data quality information,
• provenance information,
• license information, and
• usage information.

http://reusabledata.org/logo-circle.png
1. Data On The Web Best Practices
W3C Recommendation 31 January 2017

- Best Practices related to the publication and usage of data on the Web designed to help support a self-sustaining ecosystem.

Image source: https://www.w3.org/TR/dwbp/
6. Best Practices Template

This section presents the template used to describe Data on the Web Best Practices.

Best Practice Template

Short description of the BP

Why

This section answers two crucial questions:

• Why this is specifically relevant to publishing or reusing data on the Web?
• How does this encourage publication or reuse of data on the Web?

A full text description of the problem addressed by the Best Practice may also be provided. It can be any length but is likely to be no more than a few sentences.

Intended Outcome

What it should be possible to do when a data publisher follows the Best Practice.

Possible Approach to Implementation

A description of a possible implementation strategy is provided. This represents the best advice available at the time of writing but specific circumstances and future developments may mean that alternative implementation methods are more appropriate to achieve the intended outcome.

How to Test

Information on how to test the BP has been met. This might or might not be machine testable.

Evidence

Information about the relevance of the BP. It is described by one or more relevant requirements as documented in the Data on the Web Best Practices Use Cases & Requirements document [DWBP-URC]

Benefits

A benefit represents an improvement in the way how datasets are available on the Web. A Best Practice can have one or more benefits.
Benefits that data publishers will gain with adoption of the Best Practices

**REUSE**
All Best Practices

**ACCESS**
- Provide bulk download
- Provide Subsets for Large Datasets
- Use content negotiation for serving data available in multiple formats
- Provide real-time access
- Provide data up to date
- Make data available through an API
- Use Web Standards as the foundation of APIs
- Provide Complementary Presentations

**PROCESSABILITY**
- Provide metadata
- Provide structural metadata
- Use machine-readable standardized data formats
- Provide data in multiple formats
- Reuse vocabularies, preferably standardized ones
- Provide Subsets for Large Datasets
- Make data available through an API
- Use Web Standards as the foundation of APIs
- Enrich data by generating new data

**INTEROPERABILITY**
- Use persistent URIs as identifiers of datasets
- Use persistent URIs as identifiers within datasets
- Reuse vocabularies, preferably standardized ones
- Choose the right formalization level
- Make data available through an API
- Use Web Standards as the foundation of APIs
- Avoid Breaking Changes to Your API
- Provide Feedback to the Original Publisher

https://www.w3.org/TR/dwbp/
Benefits that data publishers will gain with adoption of the Best Practices

DISCOVERABILITY
- Provide metadata
- Provide descriptive metadata
- Use persistent URIs as identifiers of datasets
- Use persistent URIs as identifiers within datasets
- Assign URIs to dataset versions and series
- Use Web Standards as the foundation of APIs
- Cite the Original Publication

TRUST
- Provide data license information
- Provide data provenance information
- Provide data quality information
- Provide a version indicator
- Provide version history
- Assign URIs to dataset versions and series
- Reuse vocabularies, preferably standardized ones
- Provide an explanation for data that is not available
- Provide complete documentation for your API
- Avoid Breaking Changes to Your API
- Preserve identifiers
- Assess dataset coverage
- Gather feedback from data consumers
- Make feedback available
- Enrich data by generating new data
- Provide Complementary Presentations
- Provide Feedback to the Original Publisher
- Follow Licensing Terms
- Cite the Original Publication

LINKABILITY
- Use persistent URIs as identifiers of datasets
- Use persistent URIs as identifiers within datasets
- Provide Subsets for Large Datasets
- Use Web Standards as the foundation of APIs

COMPREHENSION
- Provide metadata
- Provide descriptive metadata
- Provide structural metadata
- Provide data provenance information
- Use locale-neutral data representations
- Reuse vocabularies, preferably standardized ones
- Choose the right formalization level
- Gather feedback from data consumers
- Enrich data by generating new data
- Provide Complementary Presentations
- https://www.w3.org/TR/dwbp/
Best Practice 1: Provide metadata

Provide metadata for both human users and computer applications.

Why

Providing metadata is a fundamental requirement when publishing data on the Web because data publishers and data consumers may be unknown to each other. Then, it is essential to provide information that helps human users and computer applications to understand the data as well as other important aspects that describes a dataset or a distribution.

Intended Outcome

Humans will be able to understand the metadata and computer applications, notably user agents, will be able to process it.

Possible Approach to Implementation

Possible approaches to provide human-readable metadata:

- to provide metadata as part of an HTML Web page
- to provide metadata as a separate text file

Possible approaches to provide machine-readable metadata:

- machine-readable metadata may be provided in a serialization format such as Turtle and JSON, or it can be embedded in the HTML page using [HTML-RDFa] or [JSON-LD]. If multiple formats are published separately, they should be served from the same URL using content negotiation and made available under separate URIs, distinguished by filename extension. Maintenance of multiple formats is best achieved by generating each available format on the fly based on a single source of the metadata.

- when defining machine-readable metadata, reusing existing standard terms and popular vocabularies are strongly recommended. For example, Dublin Core Metadata (DCMI) terms [DCTERMS] and Data Catalog Vocabulary [Vocab-DCAT] can be used to provide descriptive metadata. Such vocabularies are designed to be very flexible so it is often helpful to use a specific profile of a vocabulary such as the European Commission's DCAT-AP [https://www.w3.org/TR/dcat/].
2. WEB ANNOTATION

Web Annotation Data Model

- W3C Recommendation 23 February 2017
- a structured model and format to enable annotations to be shared and reused across different hardware and software platforms.

https://www.w3.org/TR/annotation-model/

Web Annotation Vocabulary

- W3C Recommendation 23 February 2017
- specifies the set of RDF classes, predicates and named entities that are used by the Web Annotation Data Model.

Web Annotation Protocol

- W3C Recommendation 23 February 2017
- The Protocol describes the transport mechanisms for creating and managing annotations in a method that is consistent with the Web Architecture and REST best practices.

Annotations are typically used to convey information about a resource or associations between resources. Simple examples include a comment or tag on a single web page or image, or a blog post about a news article.
3.3.5 Motivation and Purpose

In many cases it is important to understand the reasons why the Annotation was created, or why the Textual Body was included in the Annotation, not just the times and agents involved. These reasons are provided by declaring the motivation for the Annotation's creation or the purpose for the inclusion of the Textual Body in the Annotation; the "why" rather than the "who" and "when" described in the previous sections.

Example Use Case: Noelle annotates a resource intending to bookmark it for future reference, and provides a description and a tag to make it easier to find again. Her client adds the right motivations to the Annotation and the Textual Body resources to capture this.

<table>
<thead>
<tr>
<th>Term</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>motivation</td>
<td>Relationship</td>
<td>The relationship between an Annotation and a Motivation.</td>
</tr>
<tr>
<td>purpose</td>
<td>Relationship</td>
<td>The reason for the inclusion of the Textual Body within the Annotation.</td>
</tr>
</tbody>
</table>

There should be exactly 1 motivation for each Annotation, and not more than one.

There may be 0 or more purposes associated with a Textual Body.

Motivation | Class | The Motivation for an Annotation is a reason for its creation, and things like Replying to another annotation, Commenting on a related resource.

Example: **EXAMPLE 15: Motivation and Purpose**

- **annotation**
- **target**
- **related to**
3. OTHER NOTABLE W3C RECOMMENDATIONS

3.1 Webmention

- W3C Recommendation 12 January 2017
- -- a simple way to notify any URL when you mention it on your site.
- -- From the receiver's perspective, it's a way to request notifications when other sites mention it.

3.2 Micropub

- W3C Proposed Recommendation 13 April 2017
- -- the protocol is used to create, update and delete posts on one's own domain using third-party clients.
- -- Web apps and native apps (e.g., iPhone, Android) can use Micropub to post and edit articles, short notes, comments, likes, photos, events or other kinds of posts on your own website.
3.3 Linked Data Notifications

W3C Recommendation 2 May 2017

- a protocol that describes
  - how servers (receivers) can have messages pushed to them by applications (senders),
  - how other applications (consumers) may retrieve those messages.
- Any resource can advertise a receiving endpoint (Inbox) for the messages.
- Messages are expressed in RDF, and can contain any data.

3.4 Subresource Integrity

W3C Recommendation 23 June 2016

- a mechanism by which user agents may verify that a fetched resource has been delivered without unexpected manipulation.
4. International Image Interoperability Framework (IIIF)

http://iiif.io/

The following slides are based on:

- Cramer, Tom (2017) “03 Introduction to IIIF” https://www.youtube.com/watch?v=EE1YskDrzPs
- IIIF Website specifications & showcases and https://www.youtube.com/channel/UClcQlkLdYra7ZnOmMJnC5OA
**International Image Interoperability Framework**

**Image-based Resources**

- Books
- Manuscripts
- Newspapers
- (Sheet) Music
- Art / Vis. Resources
- Archival Materials
- Maps
- Scrolls
- Architecture
- STEM Imagery

**IIIF Vision**

Create a global framework by which image-based resources (images, books, maps, scrolls, manuscripts, musical scores, etc.)

...from any participating institution can be delivered in a standard way

...via any compatible image server

...for display, manipulation and annotation in any application,

...to any user on the Web.
IIIF APIs

http://iiif.io/technical-details.html

API = application programming interface, a set of routines, protocols, and tools for building software applications.

1. Image API
   Get images via a simple, RESTful, web service.
   Support for tiles needed for pan-zoom viewers.

2. Presentation API
   Just enough metadata to drive a remote viewing experience.
   (e.g. sequence, labels, attribution, license)

3. Authentication API
   A set of workflows for guiding the user through an existing access control system.

4. Content Search API
   Searching annotation content, not metadata.
Facilitate distributed access over standard APIs

Allowing distributed access over standard APIs allows users to reuse and remix content, and supports an ecosystem of applications. Strong IIIF community: national libraries, research institutions, museums, aggregators, projects.
IIIF Image API
- specifies a web service that returns an image in response to a standard HTTP or HTTPS request.

The URI can specify the region, size, rotation, quality characteristics and format of the requested image.
The IIIF Image API URI for requesting an image must conform to the following URI Template:

```
{scheme}://{server}{/prefix}/{identifier}/
{region}/{size}/{rotation}/{quality}.{format}
```

```
http://iiif.io/api/image/2.1/
```
Order of Implementation

http://www.example.org/image-service/abcd1234/80,15,60,75/pct:80/345/grey.jpg

Original Image (175 x 131)
region: 60 x 75 at 80,15
size: 80%
rotation: 345°
quality: grey
Not just scanned pages: Images of 3D objects

Photo: Jeffrey Emanuel
Thanks to Harvard’s Fogg Museum and Rashmi Singhal

http://www.slideshare.net/simeonwarner/2015-01-cornellvrwgiiif
IIIF PRESENTATION API

2.1. Basic Types

This specification makes use of the following primary resource types:

**Manifest**
The overall description of the structure and properties of the digital representation of an object. It carries information needed for the viewer to present the digitized content to the user, such as a title and other descriptive information about the object or the intellectual work that it conveys. Each manifest describes how to present a single object such as a book, a photograph, or a statue.

**Sequence**
The order of the views of the object. Multiple sequences are allowed to cover situations when there are multiple equally valid orders through the content, such as when a manuscript's pages are rebound or archival collections are reordered.

**Canvas**
A virtual container that represents a page or view and has content resources associated with it or with parts of it. The canvas provides a frame of reference for the layout of the content. The concept of a canvas is borrowed from standards like PDF and HTML, or applications like Photoshop and Powerpoint, where the display starts from a blank canvas and images, text and other resources are "painted" on to it.

**Content**
Content resources such as images or texts that are associated with a canvas.

Just enough metadata to drive a remote viewing experience. (e.g. sequence, labels, attribution, license)

http://iiif.io/api/presentation/2.1/#basic-types
COLLECTIONS, MANIFESTS

A Manifest

Collections
Mirador viewer showing images from 16 institutions, each serving their own images.

Zoom to compare features from images provided by different institutions.
Each part is identifiable; transcription can be conducted for each part.
Each part is identifiable; transcription can be conducted for each part. Annotations by experts or other contributors can be added into the canvas.
Digital Resources
- Description of fishman marginalia
- Scholarly commentary
- Transcription
- Tunc exuilebant omnia ligna... etc.
- Description of lower marginalia
- Scholarly commentary

Canvas

"Real World" Manuscript (Lutrell Psalter)

Digital Image

http://www.shared-canvas.org
mix overview images, descriptions, page views, detail views etc.
Shared Canvas -- all resources:

- Collection
  - manifests
  - structures
  - sequences

- Manifest
  - ranges
  - canvases
  - contentLayer
  - layers

- Range
  - sequences
  - canvases
  - contentLayer
  - layers

- Sequence
  - canvases
  - contentLayer
  - layers

- Layer
  - within
  - otherContent
  - resources

- AnnoList
  - resources
  - contentLayer
  - layers

- Canvas
  - images
  - on
  - resource

- Anno
  - resource
  - contentLayer
  - layers

- Content
  - resource
  - contentLayer
  - layers

Additional types:

- List of Objects and Collections
- Full Object
- Order of all Pages
- List of Pages
- Set of Lists
- Single Page
- List of Associations
- Association
- Digital Content

*N.B. These properties will be deprecated in 3.0*

[Additional types](http://iiif.io/api/presentation/2.1/#additional-types)
### B. Summary of Metadata Requirements

<table>
<thead>
<tr>
<th>Field</th>
<th>Meaning</th>
<th>Required</th>
<th>Recommended</th>
<th>Optional</th>
<th>Not Allowed</th>
</tr>
</thead>
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</tr>
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</table>

#### Descriptive and Rights Properties

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<th>Property</th>
<th>label</th>
<th>metadata</th>
<th>description</th>
<th>thumbnail</th>
<th>access</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collection</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manifest</td>
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<tr>
<td>Sequence</td>
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<td>Canvas</td>
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<td>AnnotationList</td>
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<td>Range</td>
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<td>Image Content</td>
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<tr>
<td>Other Content</td>
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</tr>
</tbody>
</table>

### Technical Properties

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<th>@id</th>
<th>@type</th>
<th>format</th>
<th>height</th>
<th>width</th>
<th>viewingDirection</th>
<th>viewingHint</th>
<th>navDate</th>
</tr>
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<td>Annotation</td>
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<td>AnnotationList</td>
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<td>Image Content</td>
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<td>Other Content</td>
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</tr>
</tbody>
</table>

See more properties for **linking, paging, structural, protocol behavior**, at the website [http://iiif.io/api/image/2.1/](http://iiif.io/api/image/2.1/)
Recommended URI Patterns

<table>
<thead>
<tr>
<th>Resource</th>
<th>URI Pattern</th>
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</thead>
<tbody>
<tr>
<td>Collection</td>
<td>{scheme}://{host}/{prefix}/collection/{name}</td>
</tr>
<tr>
<td>Manifest</td>
<td>{scheme}://{host}/{prefix}/{identifier}/manifest</td>
</tr>
<tr>
<td>Sequence</td>
<td>{scheme}://{host}/{prefix}/{identifier}/sequence/{name}</td>
</tr>
<tr>
<td>Canvas</td>
<td>{scheme}://{host}/{prefix}/{identifier}/canvas/{name}</td>
</tr>
<tr>
<td>Annotation</td>
<td>{scheme}://{host}/{prefix}/{identifier}/annotation/{name}</td>
</tr>
<tr>
<td>AnnotationList</td>
<td>{scheme}://{host}/{prefix}/{identifier}/list/{name}</td>
</tr>
<tr>
<td>Range</td>
<td>{scheme}://{host}/{prefix}/{identifier}/range/{name}</td>
</tr>
<tr>
<td>Layer</td>
<td>{scheme}://{host}/{prefix}/{identifier}/layer/{name}</td>
</tr>
<tr>
<td>Content</td>
<td>{scheme}://{host}/{prefix}/{identifier}/res/{name}.{format}</td>
</tr>
</tbody>
</table>

http://iiif.io/api/image/2.1/
Format
The Shared Canvas data model and JSON-LD are leveraged to create an easy-to-implement, JSON-based format.

Example: Sequence

6.2. Sequence
Recommended URI pattern:

{scheme}://{host}/{prefix}/{identifier}
/sequence/{name}

The sequence conveys the ordering of the views of the object. The default sequence (and typically the only sequence) MUST be embedded within the manifest, and MAY also be available from its own URI. The default sequence MAY have a URI to identify it. Any additional sequences MUST be referred to from the manifest, not embedded within it, and thus these additional sequences MUST have an HTTP URI.

The new (name) parameter in the URI structure MUST distinguish it from any other sequences that may be available for the physical object. Typical default names for sequences are "normal" or "basic". Names SHOULD begin with an alphabetical character.

```json
// Metadata about this sequence
"@context":"http://iiif.io/api/presentation/2/context.json",
"@id":"http://www.example.org/iiif/book1/sequence/normal",
"@type":"sc:Sequence",
"label":"Current Page Order",
"viewingDirection":"left-to-right",
"viewingHint":"paged",
"startCanvas": "http://www.example.org/iiif/book1/canvas/p2",

// The order of the canvases
"canvases": [
  {
    "@id": "http://www.example.org/iiif/book1/canvas/p1",
    "@type": "sc:Canvas",
    "label": "p. 1"
  }, ...
],
{
  "@id": "http://www.example.org/iiif/book1/canvas/p2",
  "@type": "sc:Canvas",
  "label": "p. 2"
  // ...
},
{
  "@id": "http://www.example.org/iiif/book1/canvas/p3",
  "@type": "sc:Canvas",
  "label": "p. 3"
  // ...
}
]```
IIIF Authentication API

Table of Contents

1. Introduction
   1.1. Terminology
   1.2. Authentication for Content Resources
   1.3. Authentication for Description Resources
   1.4. Security

2. Authentication Services
   2.1. Access Cookie Service
      2.1.1. Service Description
      2.1.2. Interaction with the Access Cookie Service
      2.1.3. Login Interaction Pattern
      2.1.4. Clickthrough Interaction Pattern
      2.1.5. Kiosk Interaction Pattern
      2.1.6. External Interaction Pattern
   2.2. Access Token Service
      2.2.1. Service Description
      2.2.2. The JSON Access Token Response
      2.2.3. Interaction for Non-Browser Client Applications
      2.2.4. Interaction for Browser-Based Client Applications
      2.2.5. Using the Access Token
      2.2.6. Access Token Error Conditions
   2.3. Logout Service
      2.3.1. Service Description
      2.3.2. Interaction
      2.4. Example Description Resource with Authentication Services

3. Interaction with Access-Controlled Resources
   3.1. All or Nothing Access
   3.2. Tiered Access

4. Workflow from the Browser Client Perspective

Appendices
Table of Contents

1. Introduction
   1.1. Use Cases
   1.2. Terminology

2. Overview

3. Search
   3.1. Service Description
   3.2. Request
      3.2.1. Query Parameters
      3.2.2. Example Request
   3.3. Presentation API Compatible Responses
      3.3.1. Simple Lists
      3.3.2. Paging Results
      3.3.3. Target Resource Structure
   3.4 Search API Specific Responses
      3.4.1. Ignored Parameters
      3.4.2. Search Term Snippets
      3.4.3. Search Term Highlighting
      3.4.4. Multi-Annotations Hits

4. Autocomplete
   4.1. Service Description
   4.2. Request
      4.2.1. Query Parameters
      4.2.2. Example Request
   4.3. Response

5. Property Definitions

Appendices
   A. Request Parameter Requirements
   B. Versioning

Related:

Web Annotation Data Model
W3C Recommendation 23 February 2017
Learn more: https://www.youtube.com/channel/UClcQlkLdYra7ZnOmMjnC5OA/videos
Standards and Best Practices related to the Publication, Exchange, and Usage of Open Data

- Data On The Web
- Image-based Resources

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