

XMP Primer



Prepared by



Partner



Sponsors



Education



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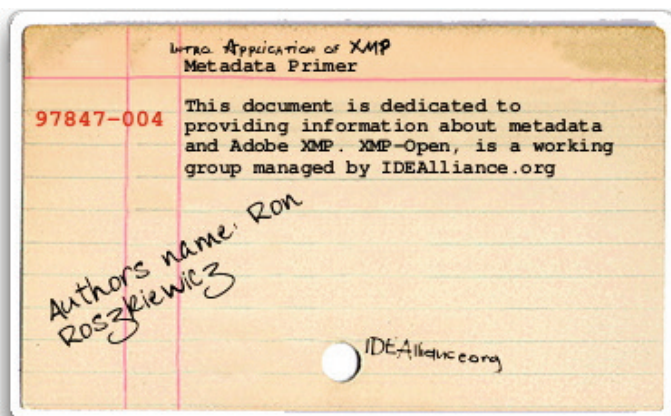
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“Context is everything. Metadata brings context to data. XMP brings structure to metadata”

Introduction to Metadata

Metadata All Around Us

Metadata has become in past few years the key element in the world of intellectual property creation and management. Most digital asset and content management system vendors now define their product by its ability to support custom metadata and in particular Adobe's XMP metadata technology. Besides being an excellent organizational tool, metadata is the essence of advertising, packaging and medical/financial/governmental record keeping and more. Every time we complete a form, we do so with metadata values in the form fields. Our Internet searches start with metadata keywords and end with information wrapped around and associated with those keywords.



Library card with the Dewey decimal system classification considered by many to be an early form of metadata classification.

The same holds true for ingredients panels on medicines and packaged foods. The metadata there is pulled from a strictly controlled list of words that may be inconsequential to some people but a stern warning to others. In some cases metadata itself is not the best carrier of information and warning labels have resorted to skull and crossbones icons to reinforce the potential danger of what is inside.

All through our lives, we've filled out forms to apply for a license or job or some other situation that required a metadata-based filter to determine our eligibility. This form of "capturing" metadata is perhaps the most enduring. Even in organizations where systems have become more automated, manually written forms provide the inception point for acquiring new data. Over recent years, companies have begun the transition from paper to digital forms by scanning, reading and adding additional document level metadata to describe the form itself and its reason for being. Today online forms are commonplace and every bit of information we feed into these forms is piped instantly into databases based on rules and the word(s), dates, numbers, true/false replies

or other criteria.

Feeding the database with raw metadata and extracting it is usually a bi-directional activity. It also common in this time of always on high bandwidth and the media's hunger for content to take the metadata and feed it into layouts on the web or into templates for print. The feeding of the database with data, massaging it and organizing it, then piping it into layouts is the very essence of database publishing. In some cases, the product is a magazine, newspaper or other printed material. In other cases, the result may be a machine-readable universal product code (UPC) or a record of information embedded in a radio-frequency identification device (RFID).

Does the ISBN have any meaning imbedded in the numbers?

The four parts of an ISBN are as follows:

1. Group or country identifier which identifies a national or geographic grouping of publishers;
2. Publisher identifier which identifies a particular publisher within a group;
3. Title identifier which identifies a particular title or edition of a title.

The application of database records worth of metadata into a seed-sized chip is one area of technology slowly gaining traction and the one that in an hybrid digital/analog sense resembles the XMP technology discussed in this booklet. In the past, we kept all of our records in monolithic servers and interacted with them through very well defined paths. We received reports and search results on screen or on paper from linked "slave" workstations attached by wires to the



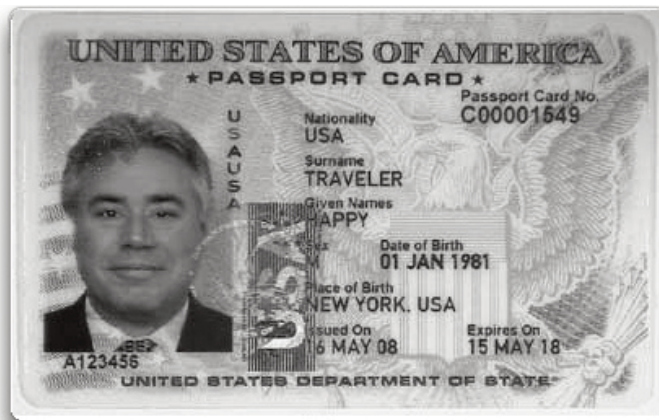
Popular publishing standard ISBN with 978 prefix and 10 digit number that identifies the product it is assigned to. Provided in machine readable form for scanners

“Controlled vocabularies are reflections of language, and they are therefore dynamic instruments.”

ANSI/NISO Z39.19-2005

Guidelines for the Construction, Format, and Management of Monolingual Controlled Vocabularies

Passport with tags for Passport Card No., Nationality, Surname, and so on with matching values.



server. While this was fine for information such as health records, insurance coverage information and other relatively static information, it didn't really support content that might be able to operate outside of the system.

For example, over 20 years ago, we had publishing systems that included databases where the digital assets (continuous tone images, text and illustrations (linework)) were managed, their sizes tracked and their positions on composite

documents such as magazine pages were identified and included in page element lists. Prior to entering the system for layout or when leaving the system for retouching the content was totally anonymous and not in any way linked back to a record, a position on a page or even a page in a document. With the internet devouring content never intended for on-screen use in such massive quantities the desire to tag and protect our content has reached critical stage. Companies are purchasing systems to hold their digital assets, linked them to their use in documents, provide

secure storage and ways to make these assets easily accessible.

Metadata In Use Today

Enter digital asset management systems (DAM) and content management systems (CMS) to save the day. These late twentieth century variant of the old records based database can now handle storing and linking via record to all kinds of multimedia objects. Some are in plain text such as XML content and others are binary like full color images. Like databases of old, these new media databases continue to rely on metadata to define who can and cannot use the system, identify stored objects to make searching easier and control the security of the vault by supporting many levels of permissions and access using metadata filters.

In the past when two databases wanted to talk to each other, it involved programming by specialists and lots of time. Thanks to metadata, values can be mapped from one system to another and thanks to standards such as SQL, previously dissimilar systems understand each other and interoperate. While standards in this case clearly provide an advantage by allowing databases to talk to each other, the process of mapping can be a problem and is not the answer for ongoing operation and for dynamically linking two or more dissimilar systems. For that we need a standard for metadata itself.

If two systems both use the same metadata standard, it is possible to make searching on both transparent. A user could sign on once, have access to a DAM system, an approved section of a procurement database, and read only access to the rights and usage database. All using the same company-approved metadata keywords. Of course, that doesn't solve the problem of identifying assets once they are out of the database nest. Gone is the association to a database record and, for example, the digital rights information or the page placement information related to it. Gone is the information about the creator of the content, where the asset was created and even the size in pixels. This is something that was not envisioned in the days of proprietary databases and captive assets.

Enter Adobe's XMP

To answer the problem of attaching metadata to free ranging digital assets, Adobe created the Extensible Metadata Platform (XMP). All the application and technology pieces of XMP will be discussed in later pages of this booklet. As a finish to the above discussion of metadata, records, databases and digital assets, we can say that Adobe's notion of providing a set of techniques to embed database records into digital content and in effect create a distributed (as opposed to central) database solve the problem of iden-

Nutrition Facts		
Serving Size 1 slice (28g)		
Servings per Container 16		
Amount per Serving		
Calories	80	Calories from Fat 30
% Daily Value*		
Total Fat	3g	5%
Saturated Fat	0g	0%
Trans Fat	0g	
Cholesterol	0mg	0%
Sodium	105mg	4%
Total Carbohydrate	11g	4%
Dietary Fiber	1g	5%
Sugars	3g	
Protein	3g	
Vitamin A	0%	Vitamin C 0%
Calcium	2%	Iron 6%
* Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.		
	Calories	2,000 2,500
Total Fat	Less than	65g 80g
Sat Fat	Less than	20g 25g
Cholesterol	Less than	300mg 300mg
Sodium	Less than	2,400mg 2,400mg
Total Carbohydrate		300g 375g
Dietary Fiber		25g 30g
Calories per gram		
	Fat 9 • Carbohydrates 4 • Protein 4	
INGREDIENTS: Water, Whole Wheat Flour, Sesame Flour, Raisins, Sprouted Wheat, Peanut Butter, Walnuts, Yeast, Vital Wheat Gluten, Molasses, Honey, Salt, Brown Sugar, Dough Conditioner, Vinegar		

Nutrition facts with tags (Calories) and values (80)

“The primary purpose of vocabulary control is to achieve consistency in the description of content objects and to facilitate retrieval.”

ANSI/NISO Z39.19-2005

Guidelines for the Construction, Format, and Management of Monolingual Controlled Vocabularies

Kingdom **Plantae** – Plants
 Subkingdom **Tracheobionta** – Vascular plants
 Superdivision **Spermatophyta** – Seed plants
 Division **Magnoliophyta** – Flowering plants
 Class **Liliopsida** – Monocotyledons
 Subclass **Commelinidae**
 Order **Cyperales**
 Family **Poaceae** – Grass family
 Genus **Achnatherum** P. Beauv. – needlegrass
 Genus **xAchnella** Barkworth – ricegrass
 Genus **Acrachne** Chiov. – goosegrass
 Genus **Acroceras** Stapf – acroceras

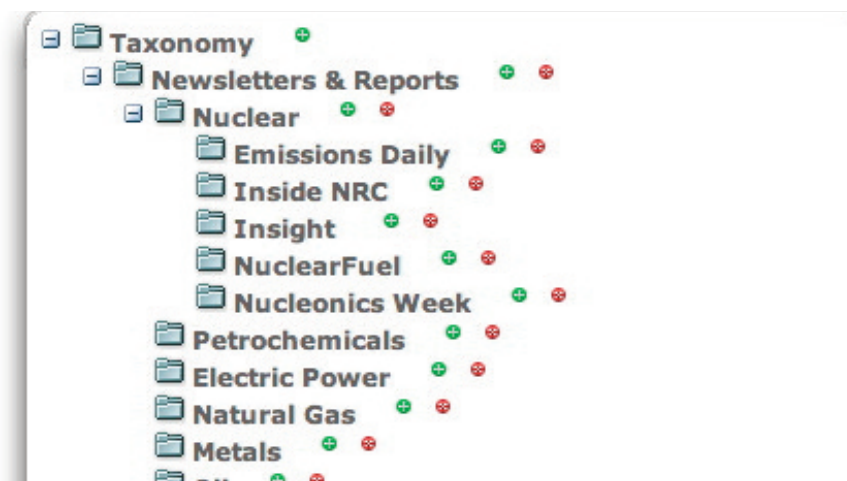
tifying assets by providing for persistence. Metadata records embedded in binary files in the same way RFID tags are embedded into packaging.

DAM systems almost universally support to one degree or another XMP technology and the core libraries are

Taxonomies are often written out in cells of a spreadsheet and displayed in a hierarchies in the illustration above. The flora classification illustrated above is perhaps similar to one we’ve seen from studying biology in school. The same hierarchical structure is used to display the relationships between terms and elements in the taxonomy of a controlled vocabulary.

built from the latest developments of the world wide web development groups.

The following Primer covers all of the different aspects of XMP from the practical applications to the underlying technology, from in the field workflow solutions to built-in support in Adobe Creative Suite applications, and includes information about how to intelligently build or buy XMP and metadata solutions today.



Metadata Terminology

Getting a Handle On Metadata Terminology: Taxonomies, Controlled Vocabularies and XMP

Defining terms is more important in metadata than perhaps anywhere else in the content creation environment. Some of the confusion is caused by the fact that the word metadata has been in use by database developers for decades. This booklet will use the following definitions which are the most commonly accepted among professionals working in the field today.

Taxonomy

Taxonomy is the typically hierarchical or poly-hierarchical structure used to organize the controlled vocabulary. The term taxonomy is often related to the structure of terms in genetic databases and the classification of flora and fauna. With metadata in general, the taxonomy is the superset from which smaller, purpose built schema are constructed. Metadata workers often use outlining and spreadsheet applications to build taxonomies. The illustrations on the opposing page shows a flora example and a modern, publication oriented taxonomy example.

As a structured organizer and container, a taxonomy can contain elements and terms such as topics, audience, format and intellectual level. Using the taxonomy to organize in this way is useful if it is many thousands of terms in size. If it is smaller, breaking it down into sections is not as necessary.

Controlled Vocabulary

There are four different types of controlled vocabulary based on complexity: List, synonym Ring, Taxonomy and Thesaurus.

Practically all metadata is part of the controlled vocabulary (CV). The CV mirrors the terms used in the business where the metadata will be used. A CV is often confused with defining only the values entered into the form fields of a metadata schema.

Generic Specification	A generic specification of the property which is agnostic to any implementation technology. Property Group (in blue): descriptive / administrative / rights related / a data type definition This property grouping is not normative, only an indicator of general semantics
Name	The reference name of the property used by this specification This name shall never be translated
Definition	A media-type agnostic definition of the semantics of this property, may be translated for localization.
Photo Definition	A photo-specific definition of the semantics of this property, may be translated for localization.
Photo Help Text	A help text for this property which may be displayed by a generic help system of the user interface, should be translated for localization.
User Note(s)	Any notes which apply to the end user of this property, should be translated for localization.
Implementation Note(s)	Any notes which apply to parties implementing this property using any technology.
Field label/title	Text which should appear next to the entry field in the user interface, should be translated for localization.
Cardinality	How often this property may appear in a set of Photo Metadata for an image. 1 = is mandatory, 0..1 = one occurrence is optional, 1..unbounded = multiple occurrences are optional
Basic data type	A recommended basic data type
Required CV	The identifier for a controlled vocabulary which must be used with this property.
XMP implementation	The technical implementation specification for Adobe XMP
XMP namespace	The XMP namespace alias, see section "Names and Identifiers" of IPTC Core and IPTC Extension.
XMP property id	The identifying name of the property
XMP Value Type	The value type as per XMP specifications
XMP qualifiers	Any applied qualifiers
Implementation note(s)	Any note regarding the XMP-specific implementation
IIM mapping	If this property is mapped to an IIM property its IIM Data Set id and name appears in this row.
IIM/XMP mapping note(s)	Any note on accessing an XMP property for mapping it to the corresponding IIM property.

The above example of a controlled vocabulary specification with notes from IPTC. The generic Specification defines the label and includes notes about what and how the value should relate.

When deciding on the makeup of a controlled vocabulary, the following two rules **must** be enforced:

1. If the same term is commonly used to mean different concepts, then its name is explicitly qualified to resolve this ambiguity.
NOTE: This rule does not apply to synonym rings.

2. If multiple terms are used to mean the same thing, one of the terms is identified as the preferred term in the controlled vocabulary and the other

terms are listed as synonyms or aliases.

There are many rules for controlled vocabulary formation and they are very important to follow if the schema created from them is used by other organizations in the same industry for example. Vocabulary control is the process of organizing a list of terms (a) to indicate which of two or more synonymous terms is authorized for use; (b) to distinguish between homographs (one or more terms that are similar in spelling but differ in pronunciation, meaning or origin); and (c) to indicate hierarchical and associative relationships among terms in the context of a controlled vocabulary or subject heading list.

There are three types of relationships used in controlled vocabularies:
Equivalency b) Hierarchy c) Association

Equivalency: UN = United Nations

Hierarchy: Ocean = Atlantic

Associative: Hops = beer

Schema

Schema is often a subset of terms drawn from taxonomy. These schema are uniquely identified and built for a specific need. The labels and field values used are often, but not always, made up of key pairs of parent and child(ren) terms drawn from the taxonomy.

The terms in a controlled vocabulary are extended by definitions and or rules in a schema. Sometimes qualifiers for the terms are important but using these “homographs” with XMP is a problem since they are usually represented within quote marks. For this reason the use of a faceted file format such as XFML allows this additional data to be stored, attached to the term in the taxonomy structure. But not used as part of the schema and embedded in a file format.

Semantic Relationships

Various types of semantic relationships *may* be identified among the terms in a controlled vocabulary. These include equality relationships, hierarchical relationships, and associative relationships, which *may* be defined as required for a particular application.

Unicode UTF-8 Support. More and more applications are being re-written to conform to extended, 2-byte character sets of Japanese, Chinese, Korean languages. An application, and the metadata management system that supports it, must be unicode compliant in order for these languages to be recognized.

Whatever application you or your consultant chooses to use may need to support

one or more of the following depending on the nature of the legacy data being imported or the type and location of the system being installed.

Position	Label	Select Type of Field	Default Metadata
1	PodCast Title	Text field	
2	Speaker Name	Taxonomy	Authors & Speakers Speakers
3	Broadcast Date	Date Field	2009 - April - 2
4	PodCast Synopsis	Text field	
5	Speaker Synopsis	Text field	

Save Cancel

Schema design form with labels, valuetypes and values

nearly the same thing. Near synonyms are different expressions for the same thing but treated as equivalent for the purpose of the controlled vocabulary.

Synonyms are terms that have the same meaning. In developing true taxonomies, developers may also deal with lexical variants and near synonyms. Lexical variants are different word forms that mean

Thesaurus (plural: thesauruses, thesauri)

A controlled vocabulary arranged in a known order and structured so that the various relationships among terms are displayed clearly and identified by standardized relationship indicators *should* be employed reciprocally.

Bulk Import and Validation Functions. Moving metadata from legacy systems is best done in bulk with the resulting data being compliant with industry standards. Validation of data means that imported data is compliant with the format, style, spelling or data type expected in the new system. Data validation is important for imported and files ingested day-to-day.

Metadata Clusters and Crosswalk Mapping. Metadata that is organized in clusters or meta-models will often require some form of crosswalk or bridge to connect them. This crosswalk in effect reflects the association of similar metadata existing in different clusters while maintaining the structure of the cluster.

Metadata Export. It's important that there is built-in functionality to export dictionaries, taxonomies, etc. Two commonly used formats are XML and Comma Separated Value file (CSV). XML means that integration into other systems that support XML is straight-forward. CSV reflects the common practice of developing and storing controlled vocabularies in text editors or Word files.

Security and Permissions. Access to metadata information often depends on a user's permission level. Companies need to be able to change

Introduction to XMP

XMP: The Concept of Intelligent Content

According to recent surveys, 80-percent of corporate organizational information is unstructured and 90-percent of it is unmanaged. For many businesses marketing collateral, investor reports, filings, packaging art, catalog copy and so many other intellectual property assets are the result of expensive development efforts. Reuse is the rule not the exception and timely access to this data is critical to the success of the business.

Traditional records-based repositories support what is known as *structured data*. The records themselves provide the structure. The desktop revolution in content creation has lead to vast amounts of *unstructured*, unmanaged assets not tied to any database record or managed in a database. Over the past ten years systems have emerged known as digital asset management systems for bringing structure to unstructured digital assets.

As the leading publisher of content creation tools, Adobe has over the years attempted to introduce technologies and workflows that would bring order to the inherent controlled chaos of content creation. The most notable with relation to XMP, the subject of this booklet, was the Portable Job Ticket Format (PJTF). Although it never caught on for obvious reasons, the concept of embedding database style records and values within the file itself lives on in XMP. If nothing else, XMP provides a way to turn unstructured digital assets into components of a distributed database with the same values embedded within the file that would be found in the records of any asset database.

Genesis of XMP

Recognizing the need to provide developers with the tools to create custom schema as the basis for embedding, Adobe provides a Toolkit with libraries of code, project examples and documentation. The Toolkit was introduced in 2001 and it has been updated and enhanced over the years. The XMP Toolkit supplied by Adobe takes the hard work out of embedding metadata. This booklet will

dive deeper into the contents of the Toolkit and describe ways to take the best advantage of it.

The development of the Toolkit did not take place in isolation. Parallel development of integrated metadata capture was also taking place in the Creative Suite. For example, Adobe had for years allowed metadata to be embedded in their files. Wire service photographs were for decades embedded with metadata defined by the International Press Telecommunications Council (IPTC). This took place prior to the availability of XMP but with Adobe's direct support. In an ad hoc way developer of digital asset management (DAM) systems used similar techniques of embedding the metadata in the header of files. Unfortunately, the result was that only their systems knew where the data was stored and could read the embedded metadata files. Adobe, through the publication of the Toolkit "standardizes" the methods for reading and embedding metadata.

Clearly a standard way to read and embed metadata in files was needed. Unlike technology schemes in the past, Adobe chose to rely on emerging web standards as components of the XMP platform. These too will be described and illustrated later in this booklet.

About the XMP Specification

Metadata Working Groups pursue the implementation of metadata in their content. In some cases industry organizations have recognized the value of standards built on the XMP platform and are pursuing standards using this technology. In some cases this has allowed Adobe to integrate practical applications of the organizations metadata capture schema directly into Creative Suite applications. In other cases it is left up to developers to create the tools that, based on guidance from the XMP Toolkit, embed XMP metadata into files or create panels for use in Creative Suite applications that do.

Introduction to XMP

In 2006 Microsoft introduced a proposal to found the Metadata Working Group (MWG). Today the MWG consists of Apple, Adobe, Canon, Microsoft, Nokia and Sony (joined in 2008). Their stated goals according to their Guidelines for Handling Image Metadata (version 1.0, September 2008) is the following:

1. Preservation and seamless interoperability of digital image metadata.
2. Interoperability and availability to *all* applications, devices, and services.
3. The organization is based on a formal legal framework and royalty free intellectual property policy that allows member companies and other industry leaders to collaborate on a solution to the above problems. The efforts of the MWG are organized into initiatives.

Publishing Requirements for Industry Standard Metadata (PRISM) – a working group of IDEAlliance that recently published the PRISM Specification which defines an XML metadata vocabulary for traditionally published content.

Worldwide Web Consortium (W3C) – is an organization responsible for developing and resource the interoperable technologies that lead to developing the web to its full potential.

W3C's Resource Description Framework (RDF) utilizes XMP.

Defining an XMP Schema

A collection of *Properties* (expressed on a metadata capture form as a label) and the *valuetypes* used for the terms that are filled into the form fields are called a schema. The illustrated form displays a number of different valuetypes including numerous text fields (Document Title:, Author: and Author Title: among others); list box (Copyright Status: allowing for a choice of three values); a date stamp; and Copyright Info URL: (allowing a link to an external location). Also available are Boolean, integer, date field and list boxes.

A number of published standards can be drawn upon to use for creating a schema. Besides the International Press Communications Council (IPTC) core set already included in the File Info... window, there are Dublin Core, PRISM, DISC and many others developed to support vertical applications in specific domains.

Creating a schema for capturing metadata in a form is for many companies the final step in a process of discovering and defining a controlled vocabulary that is unique to their business. This vocabulary is used for search terms and to populate popups and list boxes.

A schema is displayed in an application as a form that is similar to a record in a database program

XMP File Format Support

Adobe XMP currently supports many popular formats. The list is growing to include more than image and layout files. At present there seem to be two paths being followed by Adobe and their support of XMP. The first path involves support for more and more popular file formats. The second involves bringing consistent support to files *from within the applications*.

Adding new file formats to the list requires both an technological approach and a strategic approach. Obviously static image formats required a different capture and embedding approach from the one taken for video capture. Video capture required both frame and audio capture to provide the complete solution and it wasn't until their announcement of new technology to convert speech into text that a solution to tagging the audio track became more of a reality.

The list of supported file formats (as of June 2009):

Image formats

- DNG (Digital Negative)
- JPEG (Joint Photographic Experts Group)
- PNG (Portable Network Graphics)
- TIFF (Tagged Image File Format)

Dynamic media formats

- AVI (Audio-Video Interleaved)
- FLV
- MOV (QuickTime)
- MP3 (MPEG-1 Audio Layer 3)
- MPEG-2
- MPEG-4
- SWF (Flash)
- WAV (Waveform)

Video package formats

- AVCHD
- P2
- SonyHDV
- XDCAM
- XDCAM-EX

Adobe application formats

- INDD, INDT (Adobe InDesign)
- PSD (Adobe Photoshop)

Document formats

- PS, EPS (PostScript and Encapsulated PostScript)
- UCF (Universal Container Format)

Note about PDF

PDF supports XMP a little differently from the formats listed above. For PDF files, the XMP packet is embedded in a metadata stream contained in a PDF object (beginning with PDF 1.4). The XMP must be encoded as UTF-8.

PDF files that have been incrementally saved can have multiple packets that all look like the “main” XMP metadata. During an incremental save, new data (including XMP packets) is written to the end of the file without removing the old. Top-level PDF dictionaries are also rewritten, so an application that understands PDF can check the dictionary to find only the new packet.

http://www.adobe.com/devnet/pdf/pdf_reference.html

NOTE: The PDF specification is the authority for how XMP is embedded in PDF.

XMP Data Model

The XMP Data Model

Understanding the XMP data model is an important first step to matching the needs of the company with the type of metadata capture mechanism or application that must be developed. The first thing to understand is that when you define a set of metadata properties, chosen with or without the support of a taxonomy, they must follow the conventions of the XMP data model. Every schema, including PRISM, Dublin Core and IPTC follow the basic format making it easier to understand the scope of its capability and potential. For each schema there will be columns for property, value type, category and description.

Property - this is the name of the property used as a prefix. For example tiff:ImageWidth, photoshop:DateCreated, exif:colorspace, pdf:Key words. (from XMP Specification Part 2: Standard Schemas)

Value type - value types are associated with the fields where values are entered in a metadata capture form. Value types for properties can be:

Boolean - allows true false values (often represented as yes/no)

Choice - can be open or closed

Open has a list of preferred values but others can be added

Closed only allow choice from the list

(these are often represented by a popup or scrolling list of values)

Colorant - lists color values for a swatch in a document (often listed as 0-255 for RGB, 0-100 for LAB and CMYK)

Date - lists the date in one of a variety of formats (described in <http://www.w3.org/TR/Note-datetime.html>)

Dimensions - dimensions of a drawn object

Font - the characteristics of a font written in an object

Integer - a signed or unsigned numeric string used as a number representation

Lang Alt - a language alternative (XMP Specification Part 1, Data and Adobe provides a wealth of technology and tools for corporations)

XMP Toolkit

and developers to use to build applications that can scan, read, inject and-validate XMP stored in files. The main link for these tools is:

<http://www.adobe.com/devnet/xmp/>.

Version 4.4 of the Adobe XMP Toolkit SDK provides all of the documentation and libraries for working with the XMP data model. Specifically there are two libraries, XMPCore and XMPFiles.

XMPCore is provided as a C++ implementation with project files for:

- Windows Vista/XP (Including 64 bit support) using Visual Studio 2005 (VC++8)
- Mac OS X 10.4/10.5 using Xcode 2.4 or higher or Xcode 3, creating universal binaries for PPC and Intel processors.
- A makefile for building XMPCore is also provided, to be used with J2SE Version 1.4.2 or higher.
- A Java implementation of XMPCore (not XMPFiles) library is also provided, to be used with J2SE Version 1.4.2 or higher.

Project files for Eclipse 3.2 and an Ant build file are included.

XMPFiles - This library supplies an API for locating, adding, or updating the XMP metadata in a file. The API allows you to retrieve the entire XMP Packet, which you can then pass to the XMPCore component in order to manipulate the individual XMP properties.

The SDK includes sample code and command line sample applications. For more information and download instructions on the XMP Developer's Toolkit go to:

<http://www.adobe.com/devnet/xmp/pdfs/XMP-Toolkit-SDK-Overview.pdf>

Metadata and Content Lifecycle

Creation Management

Content creation is usually done by artists who then upload their work to a central server or dedicated mounted volume for controlled management. Metadata is added by hand, manually by a template or automatically with a template on the server.

If it is done automatically, that's because predefined templates of metadata were developed based on an existing taxonomy. If not, relatively small amounts of metadata are provided by the content creator. If there is a controlled vocabulary in place the manual addition of metadata to a file will not be a chore since most of the variables if not all will already have been identified and added to the company's taxonomy. A controlled vocabulary saves the user from misspellings and inadvertent inaccuracies.

There is another type of metadata coming into increased use and leading to a little confusion among graphic artists. Adobe applications such as Lightroom use metadata to store alterations made to a file. All of the details defining the changes made to an image are stored in a sidecar file while the image is being actively worked on. When the file is saved the changes defined in the metadata files are applied to the image and it is saved to disk in its new altered state.

Digital asset management, content management and other similar repositories control the movement of digital assets between the creators and users. All of the assets are online and often held in logical groups according to their place in compound documents.

Content management systems make use of metadata for a variety of reasons. Like XMP, the metadata can be used to characterize the asset, be used to trigger an action or event within the database or between the database and another system or be used to support the internal transactions of the asset management system.

DAM systems recognize and support XMP myriad ways. Some systems allow custom fields to be added to a record and later be used to embed the data within the file. Other systems provide a core set of XMP compliant metadata and restrict any further expansion of the set. Few provide the tools for developing a taxonomy, schema and using these templates to embed data within files. Most databases are record dependent. XMP represents new thinking as a *distributed database* in comparison to these systems which are *centralized databases*.



Distribution ↔ Archiving

Digital assets in the form of file formats such as JPEG or deconstructed and managed as XML files are used in print document and web pages. When any asset has metadata embedded within it the data is ready for reading with any compliant application or being acted upon by any compliant reader or script.

Metadata can be a very important element in a file. This is especially true for metadata used for digital rights management, usage rights, embargo timeframe notifications, links to the owners of the file in question, links to licensing services such as Creative Commons or the Plus Coalition. In these cases a URL link used as a datatype in a XMP metadata field links to another site for information about the copyright in question.

Files that roam on the internet from customer to source and back out again can have its core metadata inadvertently altered. Validating the terms in a schema are important on the database.

There are usually two outcomes for digital content after it has been used for a certain period. One outcome is reuse in the same or different media. The other outcome is destruction. Whatever the decision is in the short term, most assets end up in some form of repository. Since one of the key objectives of metadata is access to digital assets, regardless where they end up, being able to search directories that are online, nearline or offline is important.

DAM systems and lightbox applications normally have a browser based catalog available to carry out metadata searches on assets that have been cataloged at one time but are stored offline.

AdsML: Automating the Advertising Workflow

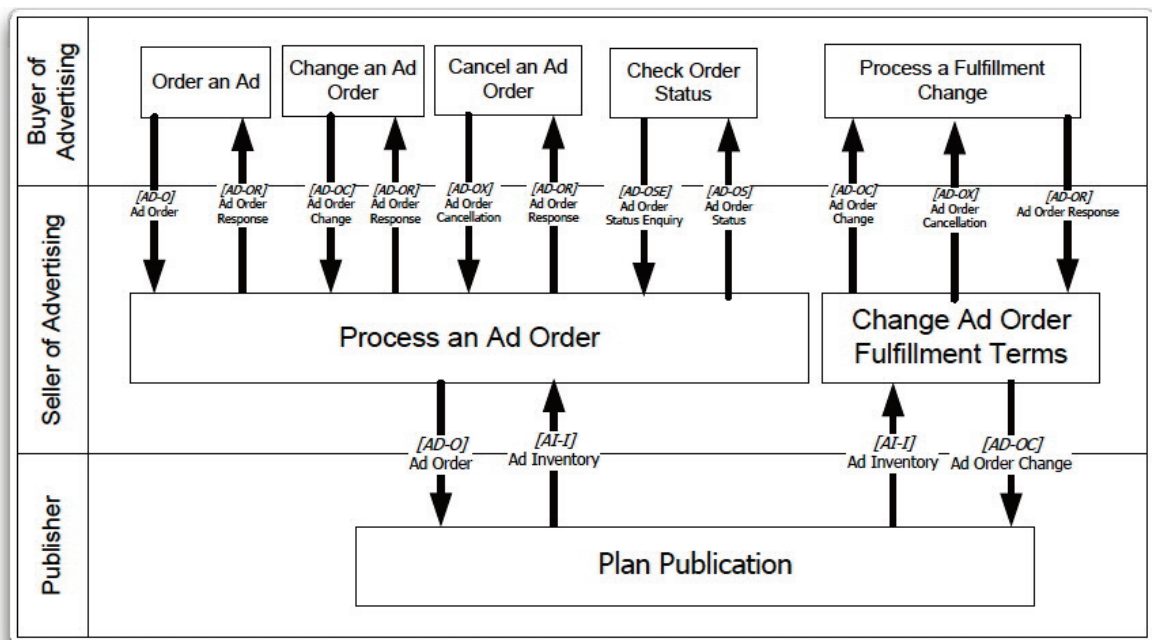
Automation is the key to reducing costs and providing the foundation for added services and increased revenue. Most of the old impediments to automation in the advertising workflow have since fallen with the emergence of standards and specifications, stable and widely accepted file formats (PDF) and lots of bandwidth. Metadata is the key to achieving automation. This was true twenty years ago as it is today. The problem is that in order to control an end-to-end workflow, a hybrid system of software applications and firmware must recognize when they are being triggered and what to do when they are triggered.

AdsML is a good example of how metadata can enable end-to-end workflow automation. According to the organization's own description of itself, "The AdsML Framework of E-commerce Business Standards is not software. It is a set of technical specifications and workflow guidelines, like a blueprint, that once implemented in software systems will enable those systems to work together to provide ecommerce capabilities to the advertising workflow, such as order taking, ad copy delivery or invoicing." AdsML is a global organization supported by Ifra, a leading international association for newspaper and media publishing, IDEAlliance, a leader in information-technology solutions for the graphic arts print industry, and the Newspaper Association of America (NAA), representing more than 2,000 newspapers in the U.S. and Canada.

In order to achieve the most efficient workflows, it is necessary to adopt technology to benefit all of the Trading Partners involved in the project. As the name AdsML indicates, the organization includes XML as a core technology. In this light schemas are available to define the e-commerce messages that are exchanged between trading partners. The AdsML Framework covers all aspects of advertising creation, delivery, billing and deployment.

One key decision made by AdsML in 2005 was to bring their schema into conformance with Adobe's XMP specification. XMP supports interchange the individual assets used in advertising and makes advertising assets more available for reuse later. The AdsML XMP AdTicket allows advertising metadata, that

AdsML seeks to achieve interoperability through the use of standardized messaging. Currently this is done using XML and XMP. The illustration depicts the flow of advertising elements between the Publisher, the Seller of Advertising and the Buyer of Advertising.



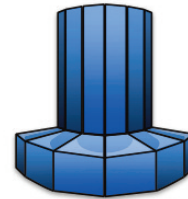
would normally be exchanged using hard copy forms, to be embedded into digital artwork files. XMP ensures that metadata content is preserved throughout advertising and creative publishing workflows.

Use Case #1: The Photo Editing Workflow

Photo studio technician

Tags photo shoot with metadata identifying people and location

Uploads photo shoot to GLOBALedit



Metadata criteria panel for embedding in selected digital assets

Match: All

CLEAR SEARCH

Criteria:

Metadata	Adobe Photoshop	Category	Contains	Advertising	-
Metadata	Adobe Photoshop	Provider	Contains	Photographer Name	-
Rating	Approved				-
Metadata	Camera Data 1	Make	Contains	Phase One	- +

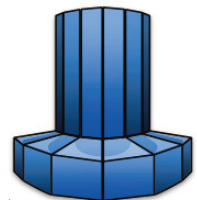
SEARCH

Upstream metadata enhancement:



Internet Cloud

The basic workflow illustrated above can be further automated by uploading images from the internet to a web server folder and embedding the images with basic project information before routing them further.



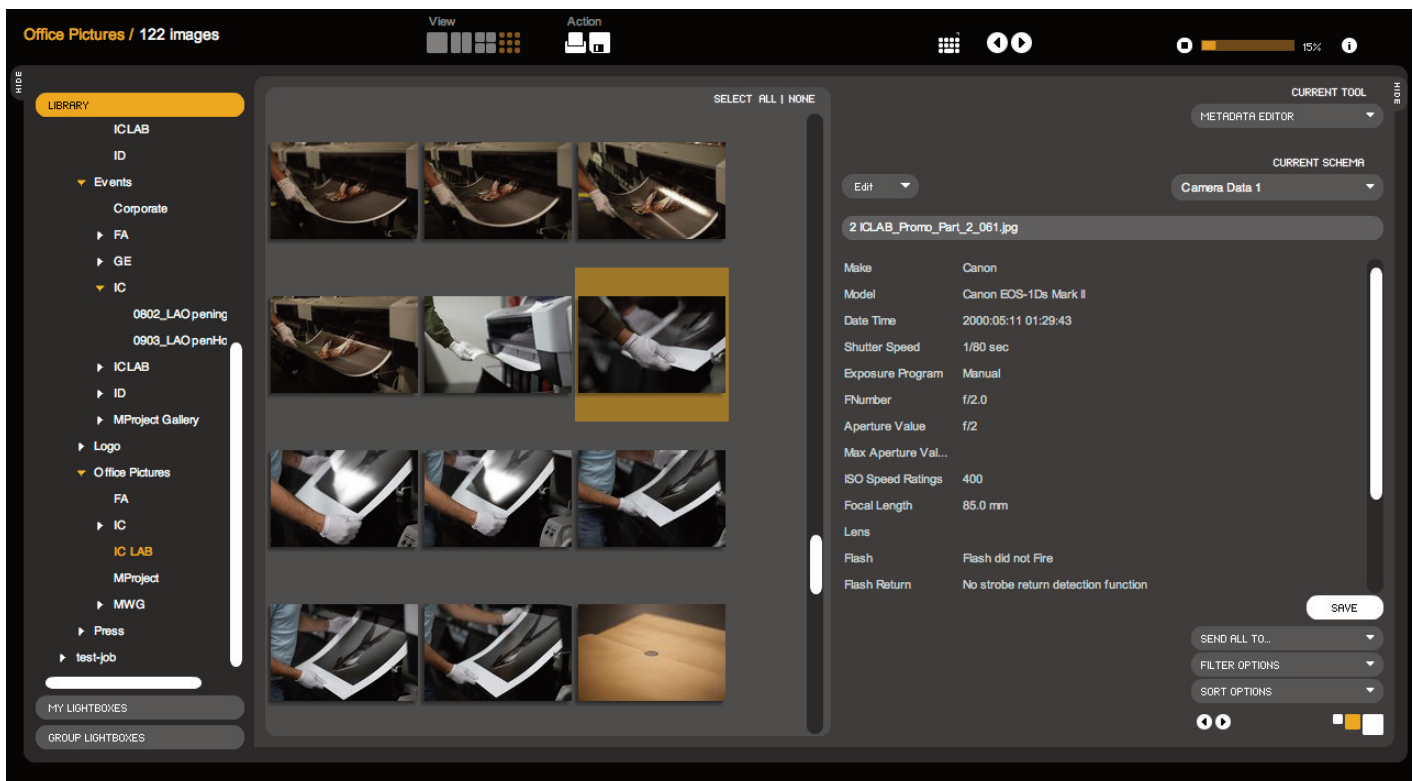
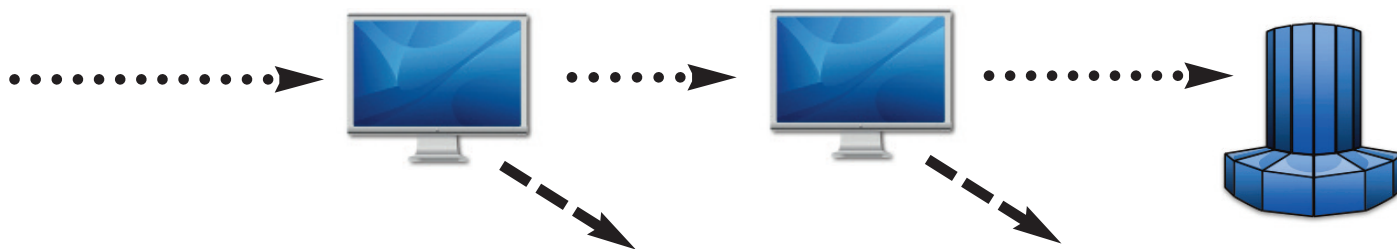
Server hot folders



Previews images individually and in batches

Enters metadata describing scene and talent

Creates collections to route photos for approval



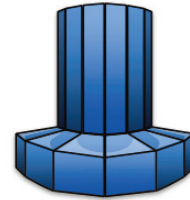
All routing and tagging performed with XMP

Use Case #2a: A Copyright Workflow

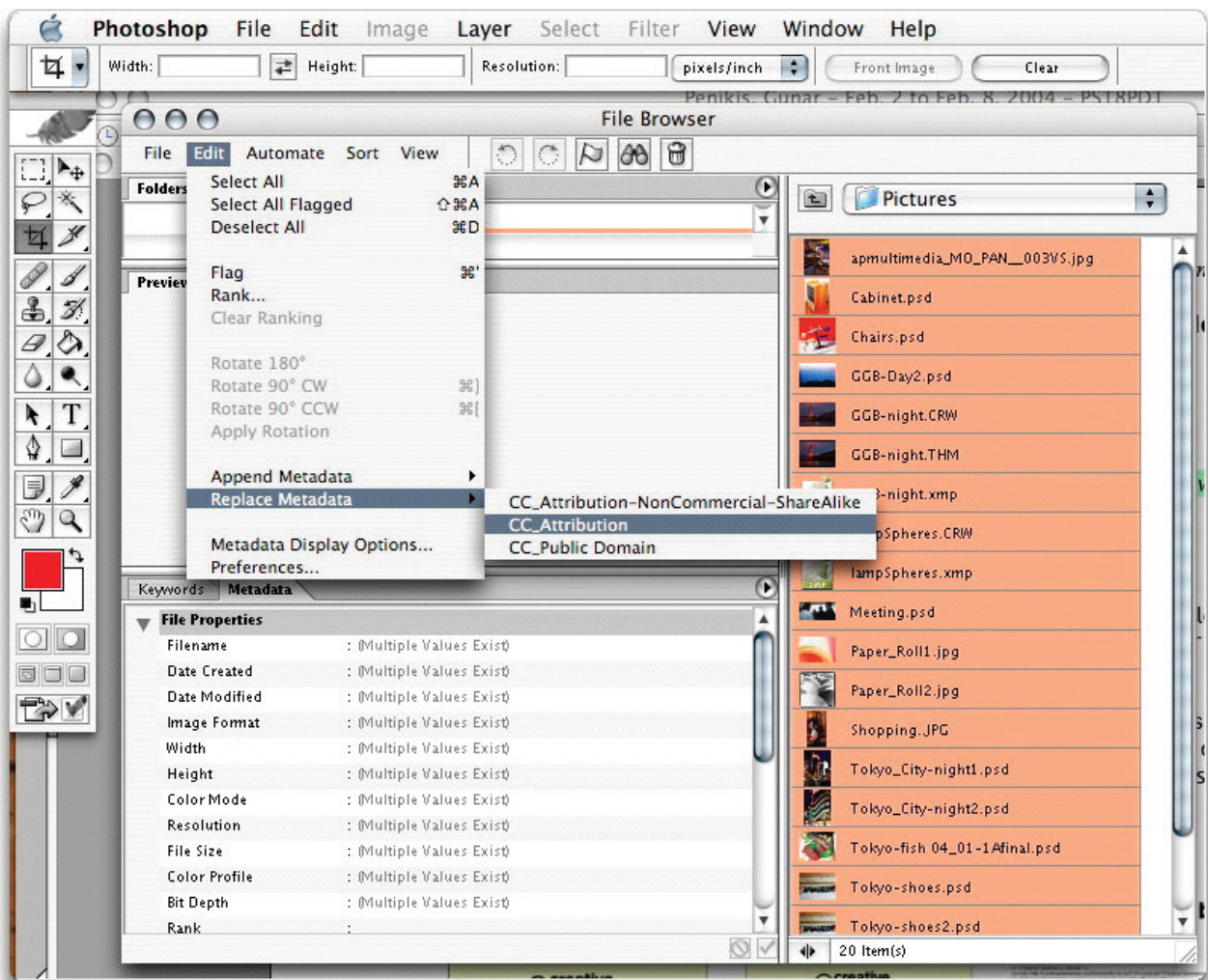
Photo studio technician

Tags photo shoot with metadata identifying people and location

Uploads photo shoot to a digital asset management system



Metadata criteria File Info panel in Photoshop for embedding in selected digital assets

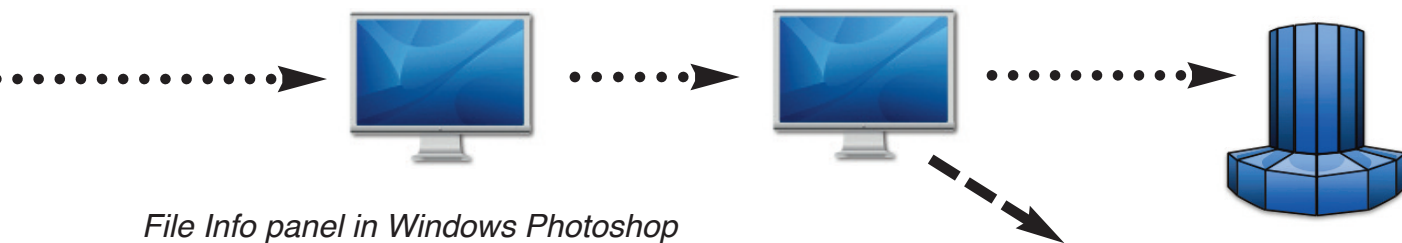


Creative Commons give everyone from individual creators to large companies and institutions a simple, standardized way to grant copyright permissions to their creative work. The Creative Commons licenses enable people to easily change their copyright terms from the default of “all rights reserved” to “some rights reserved.”

XMP is one of the ways Creative Commons recommends embedding the licenses. Full information about license choices and application contact <http://creativecommons.org>

Images are viewed and chosen or discarded

Creative Commons license is embedded in an application or repository



File Info panel in Windows Photoshop

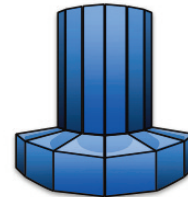
All routing and tagging performed with XMP in Adobe Photoshop

Use Case #2b: Another Copyright Workflow

Photo studio technician

Tags photo shoot with metadata
identifying people and location

Uploads photo shoot to GLOBALedit



Metadata criteria panel for embedding in selected digital assets

PLUS License Generator, Embedder & Reader

(The current beta application is shown to the right)

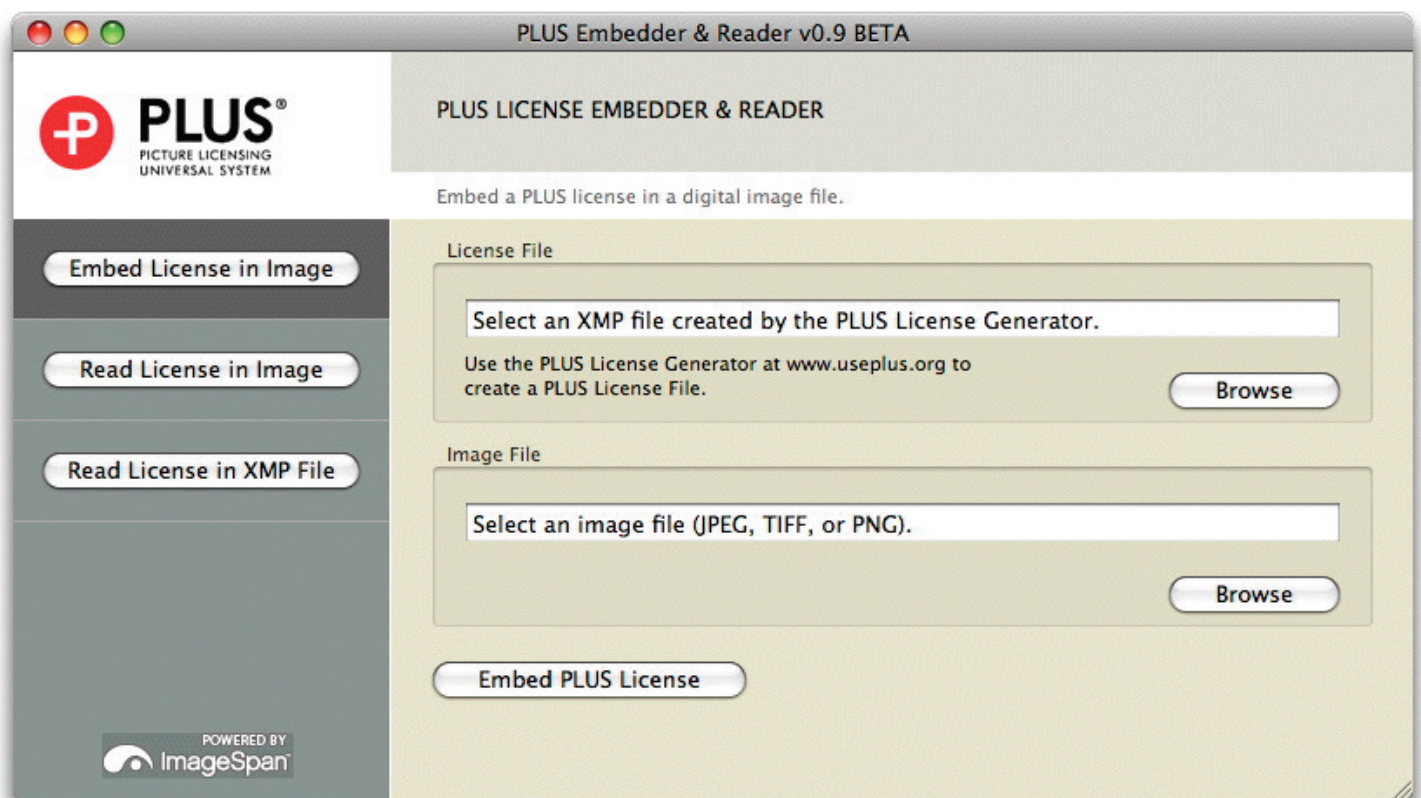
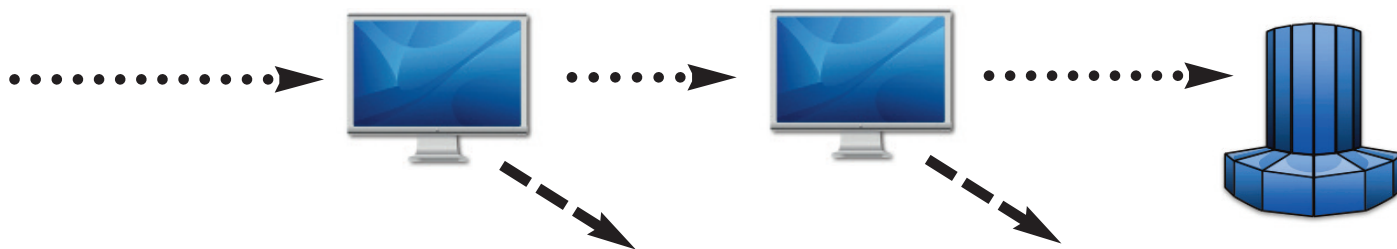
The application is a web based tool for use in generating a PLUS Universal License Summary file in XMP, suitable for embedding in digital image files. The License Generator is available in the "UsePLUS" menu of the PLUS website for free. The tool will also decode any PLUS Universal License Statement, whether embedded in an image file or stored on the user's system. Powered by ImageSpan, this fully functional BETA version is suitable for trial use. This BETA version allows users to embed or read a Universal License Statement one file at a time. Future versions will support batch processing, saved license templates, saved user contact info.

A certain amount of work precedes the use of this tool in determining the type of license and the extent of its coverage. Plus Coalition provides a guided workflow to assist in determining the licensing details.

The Plus Coalition Solution

Previews images individually and in batches

Embeds URL for PLUD Coalition site and user's license information



All tagging performed with XMP

Additional XMP Resources

PRISM -Publishing Requirements for Industry Standard Metadata

PRISM is an IDEAlliance Specification of IDEAlliance that defines an XML metadata vocabulary for managing, post-processing, multi-purposing and aggregating publishing content for magazine and journal publishing. The PRISM Working Group initiated its work in 1999, released PRISM 1.0 in 2001 and addressed publishing across media platforms by releasing PRISM 2.0 in 2008.

The Publishing Requirements for Industry Standard Metadata (PRISM) specification defines an XML metadata vocabulary for managing, aggregating, post-processing, multi-purposing and aggregating magazine, news, catalog, book, and mainstream journal content. PRISM recommends the use of certain existing standards, such as XML, RDF, the Dublin Core, and various ISO specifications for locations, languages, and date/time formats. In addition PRISM provides a framework for the interchange and preservation of content and metadata, a collection of elements to describe that content, and a set of controlled vocabularies listing the values for those elements.

Metadata is an exceedingly broad category of information covering everything from an article's country of origin to the fonts used in its layout. PRISM's scope is driven by the needs of publishers to receive, track, and deliver multi-part content. The focus is on additional uses for the content, so metadata concerning the content's appearance is outside PRISM's scope. PRISM focused on metadata for:

- General-purpose description of resources as a whole
- Specification of a resource's relationships to other resources
- Definition of intellectual property rights and permissions
- Expressing in-line metadata (that is, markup within the resource itself).

Today PRISM consists of three specifications. The PRISM Specification, itself, provides definition for the overall PRISM framework. A second specification,

the PRISM Aggregator Message (PAM) Schema/DTD, is a standard format for publishers to use for delivery of content to websites, aggregators, and syndicators. PAM is available as an XML DTD and an XML schema (XSD). Both PAM formats provides a simple, flexible model for transmitting content and PRISM metadata. The third, and newest, specification provides an XML schema (XSD) for capture of content usage rights metadata. This Guide to PRISM Usage Rights utilizes the elements found in PRISM's Usage Rights Namespace to allow users to comprehensively capture and relay rights metadata for text and media content.

http://www.idealliance.org/industry_resources/intelligent_content_informed_workflow/prism

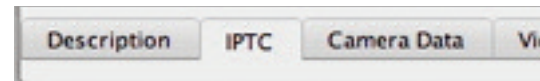
Industry Standards Groups built on implementing XMP technology

AdsML – the AdsML Consortium is dedicated to developing sets of business practices and specifications for the exchange of advertising content.

Creative Commons – provides access to creators of content an approach to simplifying a “some rights reserved” method of copyrighting work.

Digital Image Submission Criteria – is a working group of IDEAlliance. They developed the DISC Metadata for Digital Image Submission. The DISC Schema defines standards metadata fields for embedding into files.

Dublin Core Metadata Initiative – an independent, international, influenceible organization dedicated to created metadata standards for non-specific industries. International Press Telecommunications Council (IPTC) – Beginning in 2004, a joint effort between IPTC, Adobe and IDEAlliance resulted in the development and publication of the IPTC Core schema which is now represented in Adobe Creative suite applications and available to developers.



There are currently 13 standard meta

Picture Licensing Universal System (PLUS) Coalition

PLUS Coalition is an international non-profit organization dedicated to the development of and propagation of industry standards for image rights metadata. PLUS uses XMP to embed the “Universal License Statement” in image files.

Exchangeable Image File Format (EXIF)

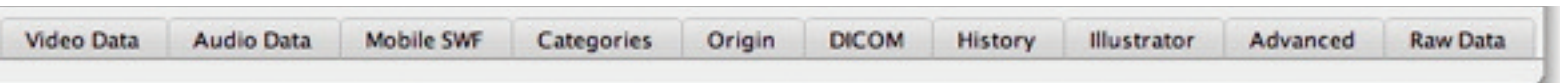
As we can see from the struggle for real estate in the File Info... window, there are many stakeholders vying for a claim on their piece of the metadata universe. Photoshop sets the standard for supporting many different types of file format and the most types of metadata capture.

Prior to the emergence of XMP, digital cameras created their own embedded metadata file with information about the camera settings and other camera conditions. Adobe continually updates their applications to support new cameras and new EXIF formats.

Currently the Exchangeable Image File Format (EXIF) is supported in JPEG and TIFF files. Until only recently the information in the EXIF file has been read only. The camera manufacturers do not use XMP as their standard for embedding metadata in files.



File info... panel with EXIF read only EXIF metadata



metadata panels included with the stock version of Photoshop

International Press Telecommunications Council (IPTC)

The accepted XMP approach to embedding metadata in files is not completely new. For many years newspapers took advantage of this approach to embed copyright and location information and other publication specific data. Since there was no standard platform for embedding this data such as XMP, they had

to embed it in the header of the image file.

From 1991 onward until the reworking of the IPTC core and the inclusion of it as a standard File Info... panel in Creative Suite 3, the IPTC metadata fields followed the Information Interchange Model (IIM).

Adobe recognized that there would be legacy files to account for and built in to the Photoshop application with the newly enabled XMP panel, the ability to detect IIM formatted data and convert it to XMP formatted data. Automatically with without user intervention.

This approach to supporting legacy metadata speaks well for the long term health of metadata and the ability to convert when necessary to the next new and improved technology.

File info... panel with a portion of the IPTC core. For many users this panel contains all the metadata fields they will ever need.

XMP Developer Resources

Adobe provides a wealth of technology and tools for corporations and developers to use to build applications that can scan, read, inject and validate XMP stored in files. The main link for these tools is: <http://www.adobe.com/devnet/xmp/>.

The following are summaries of the some of the newest and most popular tools favored by developers of XMP.

Flex is a cross-platform development framework for creating rich internet applications using traditional development environments. Flex is supplied in several different forms. Adobe Flex Builder™ software is an Eclipse™ based IDE for developing RIAs (rich internet applications) that combine the richness of desktop applications with the cross-platform reach of the Adobe Engagement Platform. Flex Builder enables developers to quickly build rich client-side logic that integrates with XML, web services, or Adobe LiveCycle® Data Services ES and other LiveCycle solutions. With sophisticated design and layout tools, user interface designers can also create richer, more usable application interfaces with a customized look and feel. Flex can be used to create custom File Info... panels for Creative Suite applications.

<http://www.adobe.com/products/flex/>

Bridge CS3 is extensible using JavaScript and ExtendScript Toolkit 2. There are also ways to automate the embedding of metadata in Bridge using stock or custom XMP panels. Bridge is the file browser for the user's file system unless Version Cue is used to connect to a third-party data repository.

<http://www.adobe.com/devnet/bridge>

XMP Technology Support

The Ghent PDF Workgroup

The Ghent Working Group is an international organization of industry associations and experts whose goal is to establish and share process specifications for best practices in graphic arts workflows.

To achieve this objective they regularly meet to decide on the development and release of specifications for applications settings, test suites to gauge productivity and job tickets that can be used for embedding XMP specifications in PDF files. The group is best known for its important work in defining the best practices for PDF/X-Plus Creation and Preflight specifications.

XMP Technology Support from Adobe

Adobe's Extensible Metadata Platform (XMP) is a labeling technology that allows you to embed data about a file, known as metadata, into the file itself. With XMP, desktop applications and back-end publishing systems gain a common method for capturing, sharing, and leveraging this valuable metadata — opening the door for more efficient job processing, workflow automation, and rights management, among many other possibilities. With XMP, Adobe has taken the "heavy lifting" out of metadata integration, offering content creators an easy way to embed meaningful information about their projects and providing industry partners with standards-based building blocks to develop optimized workflow solutions.

Adobe JDF Support page <http://www.adobe.com/products/jdf/>

Adobe XMP Support page

<http://www.adobe.com/products/xmp/overview.html>

Adobe Custom File Info panels

http://partners.adobe.com/public/developer/xmp/sdk/topic_cust_file_info_panels.html

Adobe Flex Development tools <http://www.adobe.com/products/flex/?promoid=DIOCU>

Adobe Labs for pre-release and beta software (including new XMP library for Actionscript) <http://labs.adobe.com/>

XMP-Open

Mission

The mission of XMP Open is to empower the end-to-end digital media supply chain partners to understand, adopt, and implement Adobe XMP® as an open-platform for intelligent media and informed workflow.

Role

The role of XMP-Open is to work in partnership with Adobe to establish a community of media industry and vendor stakeholders that will foster large scale XMP adoption by developing best practices and industry education, establishing registries and certification programs and developing open-source value-add implementation tools. The role of XMP-Open is to ensure the stability of the specification as it moves forward in the standards process and industry adoption to:

- Share case studies and best practices
- Collect and assess feedback and recommend user requirements
- Update the community on the technical specification

Participation in XMP-Open requires a participation fee which will be used to finance the activity. Several levels are available:

Strategic Partner

Adobe is the Strategic Partner for XMP-Open. The Strategic Partner is free to designate any number of participants in the business and technical projects undertaken by XMP-Open. In addition, the Strategic Partner may designate any number to attend and participate in the XMP-Open Leadership Council.

Sponsors

Sponsors may designate up to six (6) individuals to participate in the business and technical projects undertaken by XMP-Open. In addition, a Sponsor may designate a representative to attend and participate in the XMP-Open Leadership Council. Note that while up to 6 individuals may participate in XMP-Open working groups, there will be a limit of one vote per Sponsor Member company on any work product.

Participating Organization

Any company can become an XMP-Open Participating Organization. Each Participating Organization Member may designate up to four (4) individuals to participate in the business and technical projects undertaken by XMP-Open. Note that while up to 4 individuals may participate in XMP-Open working groups, there will be a limit of one vote per Participating Member Company on any work product. Each XMP-Open Participating Member will be granted use of a special XMP-Open Member logo. The fee for 4 individuals from an IDEAlliance member company to participate is \$1,000.00. The fee for 4 individuals from a non-member company to participate is \$3,000.00.

Network Members

XMP-Open Network Members are a special class of XMP-Open membership. Typically such memberships are used by academics, press, and individual consultants. However network membership is open to anyone. XMP-Open Network Members may participate in any XMP-Open activity, but this special membership does not confer the ability to cast a vote to approve final work products. The annual XMP-Open Network membership fee is \$345.00.

Additional Metadata Information Sources

Metadata, XMP and Related Resources

Explanation of Job Definition Format (JDF)

<http://www.cip4.org/index.html>

International Press Telecommunications Council (IPTC)

XMP File Info... SDK Overview

<http://www.adobe.com/devnet/xmp/pdfs/XMP-FileInfo-SDK-Overview.pdf>

Resource Definition Format (RDF) <http://www.w3.org/RDF/>

Publishing Requirements for Industry Standard Metadata (PRISM)

http://www.idealliance.org/industry_resources/intelligent_content_informed_workflow/prism

Ghent Working Group (GWG) <http://www.gwg.org>

Picture Licensing Universal System (PLUS Coalition)

<http://www.useplus.com/home.asp>

OWL Web Ontology Language (OWL) <http://www.w3.org/TR/owl-xmlsyntax/>

Ontology Design Patterns

<http://www.gong.manchester.ac.uk/odp/html/index.html>

Conferences with a focus on metadata and XMP: **Henry Stewart DAM Conferences** <http://www.damusers.com/>

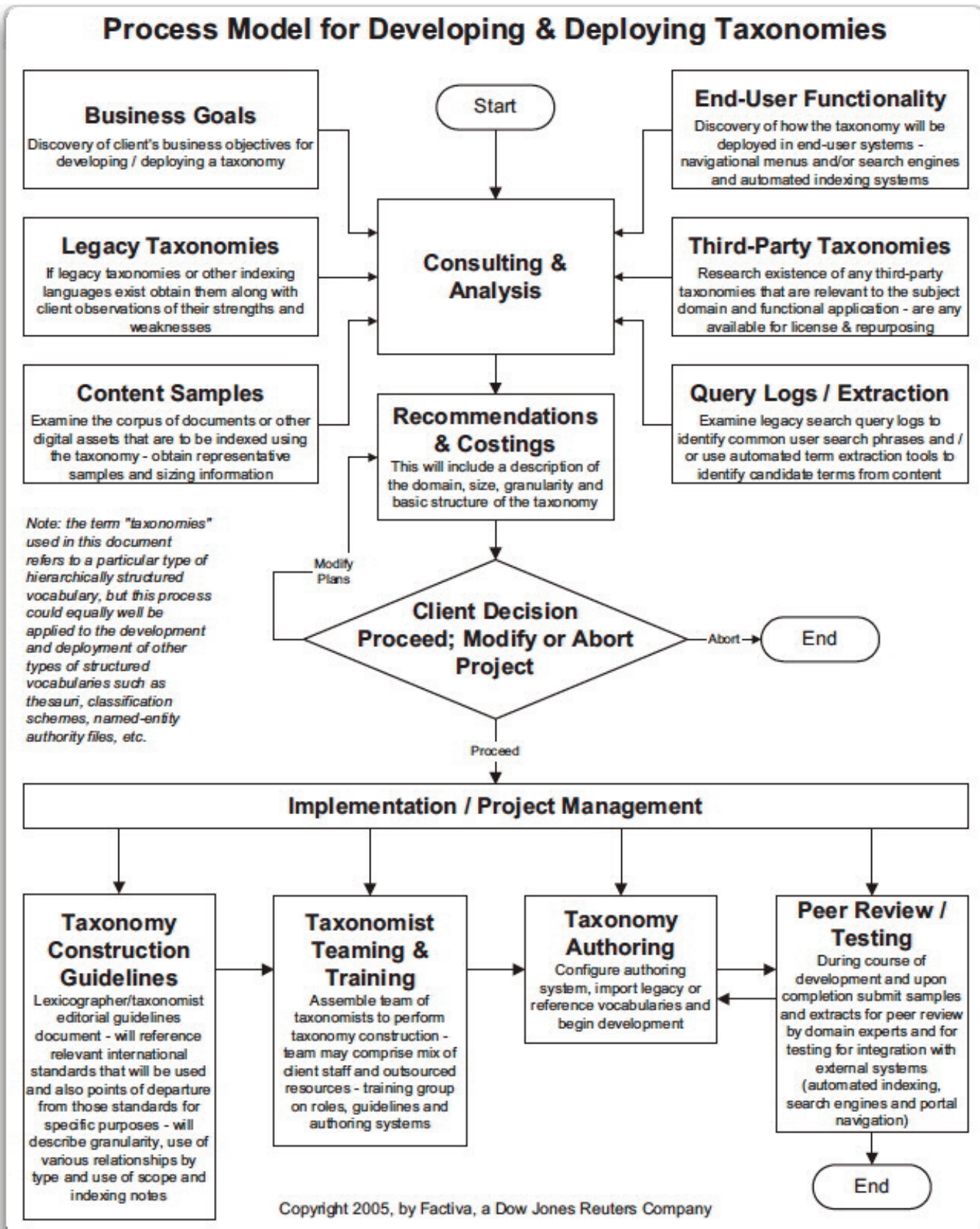
Taxonomy Building Process

A taxonomy defines the structure of a controlled vocabulary and supports the building of schema. As the illustration on the right shows, there are a number of steps that lead from concept to deployment depending on the current state of affairs and quality of the desired outcome. For most digital asset management systems, the completeness of the taxonomy planning stages will lead to success or lack of it.

Some industries such as the stock photo and vacation planning agencies, have recognized the value of taxonomy planning and have gone to great lengths to develop accurate and granular controlled vocabularies. The result are reduced customer support expenditures and increased sales. The customer nearly always finds what they are looking for and the overall experience is a good one. For these companies the controlled vocabulary has transcended metadata and become part of the companies intellectual property.

Once a strong taxonomy is in place it can be built upon with additional functions that go beyond basic contextual metadata. Adding image recognition and emotion to the new flavors of metadata provide the searcher with more choices that reflect real life criteria.

A full blown taxonomy supports a schema by providing it with the controlled vocabulary to aid in metadata capture and searching. XMP relies on key pairs of Properties:valuetypes. Capturing the value John Updike in the field labeled Author: may have originated on a taxonomical branch of Twentieth Century Authors:American:Fiction:Authors names. While the taxonomy serves as the structure for storing the controlled vocabulary of authors in the twentieth century, only the last leaf on the branch will be used in the schema. In a faceted taxonomy, a galaxy of additional data such as synonyms and topic names may link to a term to support the realities of data entry during metadata capture and searching.



Process model showing the tasks required for migrating or developing a taxonomy.