



MultiPhoto/Video

Manifest, Metadata and Practices for Digital Photo-Video Collections



Basic Profile Specification

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ABSTRACT

The MultiPhoto/Video specification defines a manifest and metadata format and practices for processing and playback of collections of digital photo, video, and related audio and file content stored on an optical disc and other storage media such as memory cards and computer harddrives or exchanged via internet protocols.

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Chapter 1: Introduction

1.1 Executive Summary

MultiPhoto/Video (MPV) is an open specification that makes easier the representation, exchange, processing and playback of collections of photo-video content, including stills, stills with audio, still sequences, video clips, and audio clips. By analogy, MPV is added to the original data to enable slideshow and browsing tasks of photo-video content just as DPOF [DPOF] is added to the original data to enable printing of photo content.

Applications and devices and users that use MultiPhoto/Video benefit even when they only interact with still images in basic ways; when content like video clips and still sequences are added, such as can be captured by a majority of the digital cameras introduced recently, the benefits expand.

MultiPhoto/Video uses a simple text-based format that is easily understood and also easy to produce and consume programmatically in firmware or computer software. MultiPhoto/Video does *not* tackle a large number of problems at once – instead, it focuses on a few key problems that it solves with simple but robust approaches. Where possible and practical, it supports use of established specifications and standards.

The development and promotion of MultiPhoto/Video is sponsored by the Optical Storage Technology Association (OSTA). The specification development and promotion process is open to all members; all organizations and individuals are welcomed as members. The association includes over 50 member companies from all over the world that produce products that collectively represent a majority marketshare in mainstream recordable optical storage categories.

MultiPhoto/Video is not only a specification. It also includes a compliance test suite and processes, compliance testing materials, a logo program for compliant products, and a website. These materials and procedures are made available and administered by OSTA at a modest cost. OSTA charges no royalty for use of the specification or logo. In addition, sample open-source code implementations of key steps in processing MPV content may be contributed by interested parties.

The specification is being developed in phases and results in "profiles". Each profile in MultiPhoto/Video defines only those formats and practices that are necessary for the key tasks targeted by the profile. A number of candidate profiles for development have been identified, including:

- **Basic Profile:** key tasks: defining content collections, renditions, identifiers, and access to other metadata
- **Presentation Profile:** two key tasks: viewing a slideshow and interactively browsing content collections
- **Internet Profile:** key task: interacting with and sending collections of photo-video content over the web and email
- **Capture Profile:** key task: writing new content to storage media and updating the collection info
- **Disc Archive Profile:** key task: interoperability of photo archives on recordable optical discs
- **Editing Profile:** key task: modifying existing collections of photo-video content.
- **Printing Profile:** key task: printing collections of photo-video content

- **Container Profile:** key task: storing photo-video content collections in containers

Underlying all profiles is the “Core”, which defines the overall framework of all MPV profiles. The Basic and Presentation Profiles, for example, build on the Core and, when implemented in consumer electronics devices like DVD players or in application software, can provide compelling playback of photo-video slideshows and interactive browsing of photo-video content. It can also facilitate interchange of photo-video content between applications.

MultiPhoto/Video technology has three central components: Collections, Metadata, and Identification. Each of these make reference in various ways to data files containing the photo-video content. This information may be augmented by information from various profiles. For example, the Presentation profile provides information that may be used by player applications and devices to provide an attractive playback user experience.

1.2 Overview

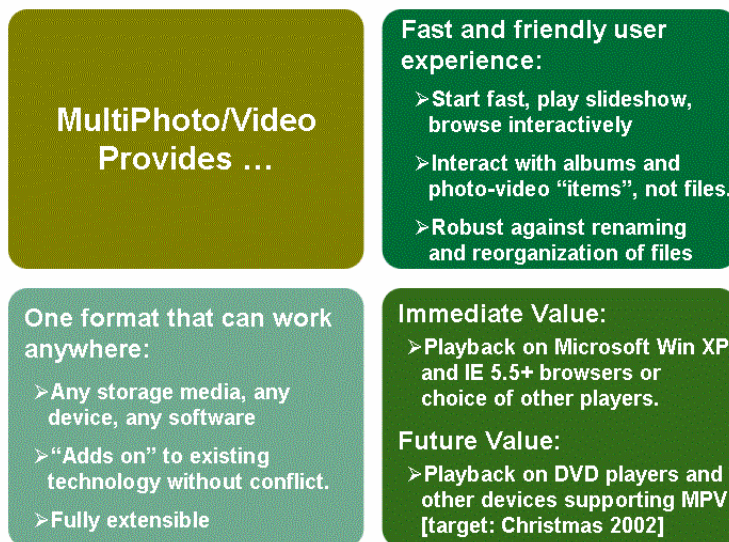
MultiPhoto/Video (MPV) is an open specification to enhance interoperability, ease-of-use, and abilities to play and manipulate collections of photo/video content, including still images, still with audio, still sequences, video clips, audio-only clips, and related files. MPV is made available without royalty from the Optical Storage Technology Association (OSTA). OSTA is an industry association promoting the use and interoperability of recordable CD and DVD discs in computer and consumer electronics devices.

MPV enables PC software and consumer electronics devices like DVD players to playback and manipulate collections of digital photo/video content including still images, still with audio, still sequences, video clips, audio-only clips, and related files. The emphasis is on personal content originating from many sources including digital cameras, film, scanners and video digitizer and stored on a range of media including memory cards, recordable or stamped CDs and DVDs, and even computer harddisks or internet services.

Development of the specification will be in multiple stages. A Basic profile provides for the basic definition of collections of photo-video content. A Presentation Profile extends the specification for an enhanced presentation experience of interactive browsing and slideshow playback provided by DVD players and other devices and media player software. Additional profiles will be developed subsequently.

The MPV specification will further promote adoption of current and new categories of digital imaging products by enhancing ease-of-use and interoperability of photo/video content collections and applications. The format enables an end-user experience that starts fast, is highly interactive, provides for playing and editing collections of photo/video content, never requires the device or application to reveal the underlying storage file system, and can be implemented in firmware of consumer electronics devices like DVD players as well as by PC software. MPV can be produced automatically or interactively by digital cameras, scanners, imaging software, internet services and other devices.

MPV provides specific manifest and metadata formats and implementation practices that support existing industry specifications such as the World Wide Web Consortium's SMIL [SMIL20] and I3A's DIG35 [DIG35-2001]. MPV is compatible with and supports the DCF [DCF-1999] and Exif [Exif2002] specifications that are widely used in digital cameras.

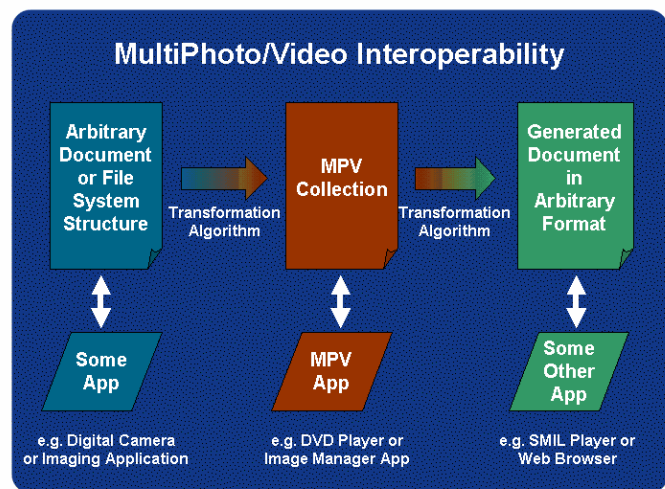


Support for MPV can be "added on" to existing applications and conventions because it is non-invasive and can co-exist with existing file system structures and formats. The format is designed for longevity and extensibility through the use of industry-standard XML. The manifest format will support write-only media, high-performance update, and use in low-memory, low-performance devices.

Key technical advances provided by the MPV specification specifically enable or enhance interoperability and end-user experience. Collections of photo-video content can be specified with optional presentation information. Practices for how to represent, compute, insert, and compare identifiers of digital assets enable collections to be more robust when assets are renamed or moved. Metadata for compound assets like still image sequences and primary and dependent assets (e.g. thumbnails, low-res renditions) allow manipulation of higher level constructs than the individual primary assets.

The MPV format does not contain the content itself -
 - MPV is an aggregation of information about the content, including references to the content. It provides essentially a Table of Contents and metadata repository; a typical implementation is a stand-alone file such as "ALBUM.PVM" and zero or more dependent files.

MPV is well suited as an intermediate format for exchange of photo-video content collections across applications, devices, and services. Some applications may also choose to use it as the primary format for storing their own data. MPV is structured such that it may be used with reasonable efficiency as a lightweight textual database to maintain metadata and related information for hundreds to the low thousands of photo-video content files.



1.3 Terms of Use

This section of the specification is descriptive and not intended to be complete nor definitive. Please refer to the definitive statement of licensing terms at the beginning of the MultiPhoto/Video specification document for a precise and legal description.

The MultiPhoto/Video specification is developed using an open process. The resulting specification is available from OSTA. No royalty is charged by OSTA for use of the specification. The overall desire is to develop a specification that is not subject to separate licensing requirements or royalty. During the development process, the expectation is that all participants contribute their efforts and intellectual property without any expectation or requirement for compensation. However, OSTA does not warrant that the specification is not or will not be subject to such claims by other parties.

MultiPhoto/Video is not only a specification. It also includes a compliance test suite and processes, compliance testing materials, a logo program for compliant products, and a website. These materials and procedures are made available and administered by OSTA at a modest cost. OSTA charges no royalty for use of the specification or logo. In addition, some sample open-source code implementations of key steps in processing MPV content may be contributed by interested parties.

Chapter 2: Key Concepts of the MPV and Related Specifications

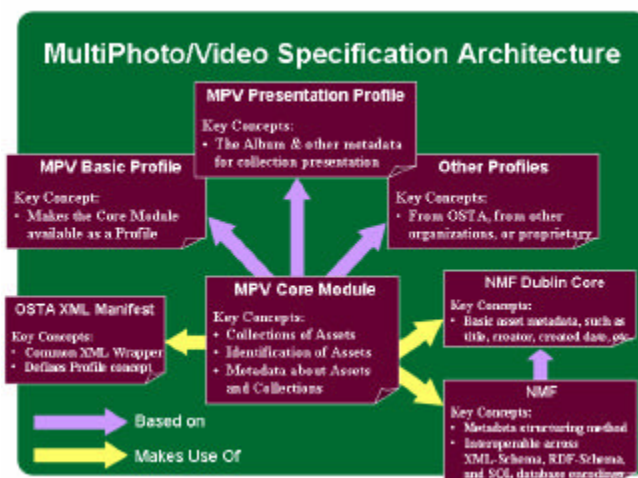
2.1 MPV Specification Architecture

MPV is not just one specification, it is a family of related specifications. This architecture results from several principle objectives:

- MPV should be highly extensible, allowing anyone to create proprietary or open extensions to MPV without modifying the MPV specification itself.
- Adding extensions should not damage interoperability of the basic collection information.
- Specifications that are fundamentally separable concepts should be separated. This allows each specification to be used and evolve independently of each other.
- MPV should not define alternate representations where mainstream representations exist.

These principles result in the following characteristics of the MPV and related specifications.

- The **MPV Core** is the essence of the MPV specification. However, it cannot be used by itself; it must always be incorporated into a Profile, which is the basic unit of extension in MPV.
- The **MPV Basic and Presentation Profiles** are extensions that utilize the MPV Core. **Other Profiles** are extensions organized in exactly the same way.
- MPV makes use of the **OSTA XML Manifest**, which defines the Profile concept.
- MPV makes use of the **NMF Specification** for structured representation of arbitrary metadata. NMF is a wholly separate concept.
- MPV recommends use of the NMF-encoding of **Dublin Core**, a separate and widely adopted specification for representing basic metadata about assets of all kinds.



2.2 Profiles, Schema and Practices

The MultiPhoto/Video specifications contain the following kinds of content.

Schema define the structure of MPV content, providing a precise grammar and vocabulary of expression. MPV uses XML-Schema [XSCHEMA], a well-known schema definition language, to define this grammar and vocabulary in combination with prose descriptions to clarify usage and behaviour. A wide variety of commercial and open source tools support the use of XML Schema, including for schema design and schema and content validation.

In MPV, all schema are available in machine-readable form in addition to inclusion on a fragmentary basis within the specification document. The machine-readable schema in the informative definition; in the case of discrepancy, the specification document supercedes the machine-readable schema.

Practices define required and recommended behaviours in prose or pseudo code. Practices are a critical component to interoperability because they establish expectations and processes for how MPV content is handled.

Profiles are a set of Schema and Practices and additional content and are the principle unit of formal specification, of specification implementation and of specification compliance. Products can implement or not implement profiles. Each profile in MultiPhoto/Video defines only those schema and practices that are necessary for the key tasks targeted by the profile.

Referenced Specifications are other specifications used by the MPV specifications. These specifications may be from OSTA or other organizations.

2.3 MPV Core and the MPV Basic and Presentation Profiles

Profiles represent the basic unit of extension within MPV. Profiles define schema and practices that are available for addressing a given task. Typically, profiles define one or more top-level elements in a manifest plus various additional metadata.

The MPV Core specification [MPV-Core] and the MPV Basic [MPVBasic] and Presentation Profiles [MPV-Basic, MPV-Pres] were all developed at one time, and the Core documentation makes reference to the Basic and Presentation Profiles. However, nothing about the Basic and Presentation Profile specifications and implementation is treated specially in the Core. In other words, the Basic and Presentation Profiles play by the same rules that new, as yet undefined additional profiles must play by.

2.3.1 MPV Core

An overview of the MPV Core is described in detail in a following chapter. It provides the three core concepts of Collections, Metadata, and Identification. No profile is considered an MPV-related Profile unless it makes use of the MPV Core, either directly or indirectly.

MPV Core establishes the use of the OSTA XML Manifest for as the XML document file format for MPV content.

2.3.2 MPV Basic Profile

This specification defines The MPV Basic Profile which simply makes available the MPV Core as an MPV Profile. This is necessary since Profiles are the only unit of incorporation into an OSTA XML Manifest. The MPV Basic Profile provides two top-level elements in a manifest: AssetList and MarkedAssets.

Primary tasks that users of the MPV Basic Profile can accomplish include definition of collections of assets by reference and grouping of those assets into distinguished sets using MarkLists. These basic tasks are the essence of what MPV provides.

ASSETLIST

The AssetList is the basic unit of collection representation in MPV. Assets themselves may only be defined in an AssetList. Only one AssetList is allowed in a manifest.

MARKEDASSETS

The MarkedAssets element may contain MarkLists that make reference to assets. Standard marklist types like “primary” and “selected” provide for interchange of lists of distinguished assets. Multiple MarkLists may be present in the MarkedAssets element.

2.3.3 MPV Presentation Profile

Primary tasks for the MPV Presentation Profile are to provide albums that allow the user apply presentation information to a collection of assets. The primary usages are to play a slideshow, interactively browse the primary assets, or selectively print the album’s contents.

The MPV Presentation Profile provides very basic presentation information that emphasizes use by a devices and applications with a broad range of presentation capabilities and significant amounts of application-level control over presentation behaviour. Additional profiles may define much richer or more tightly scoped presentation behaviours.

ALBUM, ALBUMREF

An album is a presentation-oriented view of the asset list and the most common representation of an MPV collection exposed to users . It is an ordered set of references to assets in asset lists. Albums can link to other albums. Multiple albums can be grouped together in one file or isolated in separate files. AlbumRefs can be to albums in the same or different manifests and local or remote. Albums may have renditions, related documents and mark lists of their own.

FOREGROUND, BACKGROUND

Users interact with Album-level Foreground and Background assets; they and the Album's Related Documents are conceptually the primary assets in a collection. Typically, users interact most with foreground assets while background assets are secondary and fewer. Foreground and background assets may also contain additional content, including renditions and related documents. Additional content may enhance the performance, scope, presentation, and other characteristics of an album but do not fundamentally change it from a user's perspective.

PRESENTATION CONTROL

The overall approach for representing presentation information is compatible with SMIL, a powerful XML format for representing presentations from the World Wide Web Consortium (W3C). MPV Presentation Profile provides a very constrained set of properties compatible with SMIL that provides just a basic level of presentation control. A MPV document can be mechanically translated into any of the common SMIL profiles. This makes MPV a good intermediate representation and also suggests a MPV playback strategy on platforms that also have SMIL players. Because the Presentation Profile is not extensive however, many other implementations can be contemplated. For example, compelling playback of MPV documents in modern web browsers is readily accomplished.

Because MPV also allows arbitrary XML metadata to be embedded or referenced, it is possible to embed additional presentation information directly in SMIL or other presentation languages. These may be used by players aware of these formats and practices.

2.4 XML Usage

XML LEVERAGE

MPV content is well-formed XML. This allows the MPV document to be processed using standard XML processing tools and environments. For example, when opened in the Microsoft Internet Explorer 5.5 and above web browser, a MPV document with associated style sheet can present an attractive user interface for playback of MPV photo-video collections. Similarly, straight forward XSLT translation can convert an MPV document into a SMIL-based presentation for playback with an appropriate player. MPV can also be easily utilized within other XML specifications.

NAMESPACES

XML namespaces are a means to allow XML elements of the same name that exist in different schema to co-exist within the same document.

MPV requires the use of namespaces. By convention, all elements and attributes in MPV are used with their prefixes in all XML encodings. MPV does not support namespace-unaware processing. Most modern XML tools support namespace-aware processing.

Chapter 3: MPV Basic Profile 1.0

The MPV Basic Profile 1.0 is designed to accomplish the following key tasks: defining collections of photo-video assets and related types of content including other media types and renditions, identifiers of those assets, and access to metadata. The Basic Profile instantiates the MPV Core specification as a Profile.

The only thing that the Basic Profile adds to the MPV Core is the top-level `MarkedAssets` element. This element serves as a top-level container for any `MarkLists` that are defined by the application.

The MPV Basic Profile 1.0 consists of the following schemas and practices, which are specified in detail separately in this document.

- MPV Core Schema 1.0
- MPV Core Practices 1.0
- MPV Basic Schema 1.0
- MPV Basic Profile Practices 1.0

The MPV Basic Profile is expected to be supported by most MPV-aware applications and devices and provides the basis for interoperability of collections across all range of storage media, devices, applications, and services.

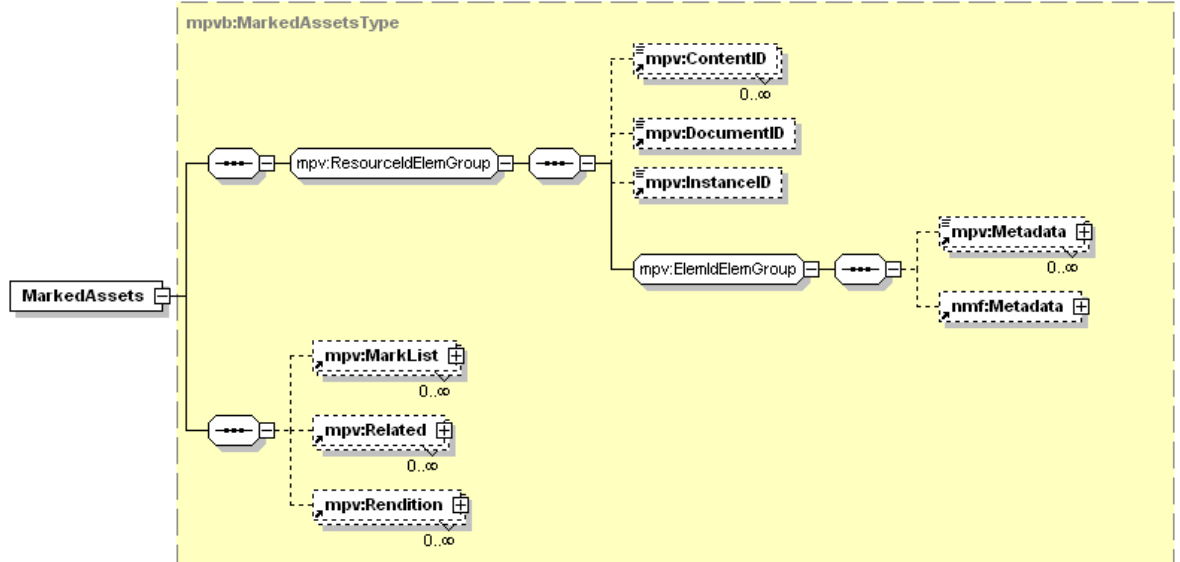
Schema group	Namespace Identifier	Schema Location	Conventional Namespace Prefix
Basic Profile	http://ns.osta.org/mpv/basic/1.0/	<code>lax/profiles/basic/profile.xsd</code>	<code>mpvb:</code>

3.1 `<mpvb:MarkedAssets>`

The `MarkedAssets` element may contain `MarkLists` that make reference to assets. Standard marklist types like “primary” and “selected” provide for interchange of lists of distinguished assets. Multiple `MarkLists` may be present in the `MarkedAssets` element.

element **mpvb:MarkedAssets**

diagram



namespace <http://ns.osta.org/mpv/basic/1.0/>

type [mpvb:MarkedAssetsType](#)

children [ContentID](#) [DocumentID](#) [InstanceID](#) [Metadata](#) [Metadata](#) [Related](#) [Rendition](#) [MarkList](#)

attributes	Name	Type	Use	Default	Fixed
	mpv:id	xs:ID			

source `<xs:element name="MarkedAssets" type="mpvb:MarkedAssetsType" substitutionGroup="mpv:ManifestChildBase"/>`

source `<xs:complexType name="MarkedAssetsType">
 <xs:complexContent>
 <xs:extension base="mpv:ManifestChildType">
 <xs:sequence>
 <xs:element ref="mpv:MarkList" minOccurs="0" maxOccurs="unbounded"/>
 <xs:element ref="mpv:Related" minOccurs="0" maxOccurs="unbounded"/>
 <xs:element ref="mpv:Rendition" minOccurs="0" maxOccurs="unbounded"/>
 </xs:sequence>
 </xs:extension>
 </xs:complexContent>
 </xs:complexType>`

Chapter 4: Examples

```

<?xml version="1.0" encoding="UTF-8"?>
<file:Manifest
  xmlns:file="http://ns.osta.org/manifest/1.0/"
  xmlns:mpv="http://ns.osta.org/mpv/1.0/"
  xmlns:mpvb="http://ns.osta.org/mpv/basic/1.0/"
  xmlns:nmf="http://ns.osta.org/nmf/1.0/" >
  <nmf:Metadata>
    <ManifestProperties xmlns="http://ns.osta.org/manifest/1.0/">
      <Profile>http://ns.osta.org/mpv/basic/1.0/</Profile>
    </ManifestProperties>
  </nmf:Metadata>

  <mpvb:MarkedAssets>
    <mpv:MarkList mpv:markType="selected">
      <nmf:Metadata>
        <Properties xmlns="http://purl.org/dc/elements/1.1/">
          <title>Assets selected by the user</title>
        </Properties>
      </nmf:Metadata>
      <mpv:StillRef mpv:idRef="ID000200"/>
    </mpv:MarkList>
  </mpvb:MarkedAssets>

  <mpv:AssetList>
    <mpv:Still mpv:id="ID000100">
      <mpv:LastURL>DSC09342.JPG</mpv:LastURL>
    </mpv:Still>
    <mpv:Still mpv:id="ID000200">
      <mpv:LastURL>DSC09343.JPG</mpv:LastURL>
    </mpv:Still>
    <mpv:Still mpv:id="ID000300">
      <mpv:LastURL>DSC09344.JPG</mpv:LastURL>
    </mpv:Still>
  </mpv:AssetList>
</file:Manifest>

```

Appendix I: References

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"Cascading Style Sheets, level 2", Bert Bos, Håkon Wium Lie, Chris Lilley, Ian Jacobs. W3C Recommendation 12 May 1998.
Available at <http://www.w3.org/TR/REC-CSS2>

[DATETIME]

"Date and Time Formats", M. Wolf, C. Wicksteed. W3C Note 27 August 1998.
Available at: <http://www.w3.org/TR/NOTE-datetime>

[DC]

"Dublin Core Metadata Initiative", a Simple Content Description Model for Electronic Resources.
Available at <http://purl.org/DC/>

[DC-NMF]

"Dublin Core Normalized Metadata Format Profile Specification 1.0"; OSTA, 2002.
Available at <http://www.osta.org/mpv/>

[DCF-1999]

"Design rule for Camera File system, Version 1.0", JEIDA standard, English Version 1999.1.7, Japanese Electronic Industry Development Association (JEIDA).

[DIG35-2001]

"DIG35 Specification – Metadata for Digital Images, Version 1.1", June 18, 2001, International Imaging Industry Association (I3A) [recently formed by combining the Digital Imaging Group and PIMA].
<http://www.i3a.org>

[ISO8601]

"Data elements and interchange formats - Information interchange - Representation of dates and times", International Organization for Standardization, 1998.

[ISO10646]

"Information Technology -- Universal Multiple-Octet Coded Character Set (UCS) -- Part 1: Architecture and Basic Multilingual Plane", ISO/IEC 10646-1:1993. This reference refers to a set of codepoints that may evolve as new characters are assigned to them. This reference therefore includes future amendments as long as they do not change character assignments up to and including the first five amendments to ISO/IEC 10646-1:1993. Also, this reference assumes that the character sets defined by ISO 10646 and Unicode remain character-by-character equivalent. This reference also includes future publications of other parts of 10646 (i.e., other than Part 1) that define characters in planes 1-16. "

[JFIF]

"JPEG File Interchange Format, Version 1.02"; Eric Hamilton, September 1992.
Available at <http://www.w3.org/Graphics/JPEG/jfif.txt>

[MANIFEST]

"XML Manifest Specification 1.0"; OSTA, 19 June 2002.,
Available at <http://www.osta.org/mpv/>

[MD5]

"The MD5 Message-Digest Algorithm", RFC 1321, April 1992.
Available at <http://www.ietf.org/rfc/rfc1321.txt>. Further information and source code available at
<http://userpages.umbc.edu/~mabzug1/cs/md5/md5.html>

[MIME-2]

"RFC 2046: Multipurpose Internet Mail Extensions (MIME) Part Two: Media Types"; N. Freed, N. Borenstein,
November 1996.
Available at <ftp://ftp.isi.edu/in-notes/rfc2046.txt>

[MPV-Basic]

"MultiPhoto/Video Basic Profile Specification 1.0"; OSTA, 2002.
Available at <http://www.osta.org/mpv/>

[MPV-Core]

"MultiPhoto/Video Core Specification 1.0"; OSTA, 2002.
Available at <http://www.osta.org/mpv/>

[MPV-Pres]

"MultiPhoto/Video Presentation Profile Specification 1.0"; OSTA, 2002.
Available at <http://www.osta.org/mpv/>

[NMF]

"Normalized Metadata Format Specification 1.0"; OSTA, 2002.
Available at <http://www.osta.org/mpv/>

[MIMETYPES-REG]

IANA official registry of MIME media types
Available at <http://www.isi.edu/in-notes/iana/assignments/media-types/media-types>

[PNG-MIME]

"Registration of new Media Type image/png"; Glenn Randers-Pehrson, Thomas Boutell, 27 July 1996.
Available at <ftp://ftp.isi.edu/in-notes/iana/assignments/media-types/image/png>

[PNG-REC]

"PNG (Portable Network Graphics) Specification Version 1.0"; Thomas Boutell (Ed.).
Available at <http://www.w3.org/TR/REC-png>

[QT]

"QuickTime Movie File Format Specification", May 1996.
Available at <http://developer.apple.com/techpubs/quicktime/qtdevdocs/REF/refFileFormat96.htm>

[QT-MIME]

"Registration of new MIME content-type/subtype"; Paul Lindner, 1993.
Available at <http://www.isi.edu/in-notes/iana/assignments/media-types/video/quicktime>

[RDFsyntax]

"Resource Description Framework (RDF) Model and Syntax Specification", Ora Lassila and Ralph R. Swick. W3C Recommendation 22 February 1999,
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[RDFschema]

"Resource Description Framework (RDF) Schema Specification", Dan Brickley and R.V. Guha. W3C Proposed Recommendation 03 March 1999,
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