

PhotoML: Photo Description Markup Language

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Revision 0.07
Revision 0.06
Revision 0.05
Revision 0.04
Revision 0.03

Revision History
22 November 2007
8 June 2007
20 August 2005
18 November 2004
31 January 2004

Purpose

This distribution is primarily intended to provide a format (defined by the PhotoML DTD) and tools for describing details of photo creation, processing, and content in a collection of photographs. It is designed to be appropriate for a wide variety of photographic formats, including roll film (such as 35mm and 120/220), sheet film (such as 4x5 and 8x10) and digital images. The type of information represented, while allowing description of details of content, creation etc. for digital images, does not support some of the more low-level housekeeping details that might be necessary in an application such as an online database of digital images. In particular, PhotoML is not yet another web photo gallery generator.

Alternative Formats

While alternatives exist, none of them seem to completely fit the role for which PhotoML was designed. [Photo RDF](#) has significantly lower complexity than PhotoML, allowing representation of a much smaller set of information, and does not provide any of the photo grouping mechanisms which seem desirable when describing a large collection of photos. [DIG35](#) has higher complexity than PhotoML in some respects, providing support for greater detail for individual images. Since DIG35 is designed as metadata to be attached in the header of a digital image, it also lacks the image grouping facilities of PhotoML, and while DIG35 is intended to become an industry standard, the schema is not completely freely distributed (available on request only, but free for government and educational use).

Further Development

PhotoML has received a substantial amount of work, but a number of rough edges still require attention. Comments, suggestions, and contributions (including any involving significant changes) are welcome, and should be directed to <photoml@wohlberg.net>. There are no immediate plans for a transition from the DTD to an [XML Schema](#) as the primary format definition (in contrast to DTDs, there does not yet seem to be much free software supporting editing and validation of schemas), but example schemas auto-generated from the DTD are included in the distribution.

The Distribution

The distribution consists of [XML](#) document type definitions, [XSLT](#) stylesheets for generating HTML formatted versions of the photo description XML, and various software tools. Note that the name *PhotoML* is used to describe the XML format defined by the PhotoML DTD as well as the entire distribution; the intended meaning should be clear from the context in which the name is used.

License

Use of this distribution is subject to the terms of the GNU [General Public License](#) (version 2), a copy of which is included in the distribution. If anyone wishing to use this distribution finds the GPL too restrictive, I will consider requests to make it available under an alternative open source license.

Platforms

The primary content of the `dtd`, `xsd`, `xsl`, and `xml` directories should be platform independent, but the configuration and installation files require a UNIX environment. The scripts in the `tools` directory have been tested under Linux on an i386 architecture, but should work on any UNIX platform with recent versions of [libxml2](#) and [libxslt](#) installed. MS Windows versions of the utility scripts are not currently available, but should be easily ported from shell script to a scripting language available on that platform. Windows users may, however, wish to try installing under the [cygwin](#) environment.

Prerequisites

The primary prerequisites, other than basic UNIX shell utilities, are [perl](#), and the [libxml2](#) and [libxslt](#) packages. Some of the tools have additional requirements:

| | |
|------------------------|---|
| md5sum | Standard on many Linux systems. |
| dcraw | Available as source , RPM and deb packages. |
| imageinfo | Source, SRPM and Ubuntu source deb packages available . |
| xgrep | Source, SRPM and Ubuntu source deb packages available . |
| Date::Manip | Perl module available from CPAN. |
| Image::ExifTool | Perl module available from CPAN. |

Installation

The source distribution is available from the [PhotoML download page](#). After unpacking the tar archive, the simplest installation procedure consists of the following commands (executed from the distribution root directory):

```
./configure
make
make test
make install
```

The final **make install** usually needs to be performed with root privileges (see the INSTALL file for further details). Using the default configuration, software tools are installed in `/usr/local/bin`, and the DTD, XSL, and associated files are installed in `/usr/local/share/photoml`.

Users of [Red Hat/Fedora](#) or [Ubuntu](#) Linux may install the RPM or deb packages available from the [PhotoML download page](#). When installing from RPM or deb packages, software tools are installed in `/usr/bin`, and the DTD, XSL, and associated files are installed in `/usr/share/photoml`.

Distribution Content

The distribution content is divided up into a number of subdirectories, as described below.

DTD

The `dtd` directory contains the PhotoML DTD and associated files (character set defining external entities) and a catalogue file which is used by **libxml2** tools for locating DTDs. The PhotoML DTD defines the primary XML format for describing collections of photographs, and, while still under development, should be reasonably stable. When the DTD is changed, the **pmlupgrade** utility provides automatic (or semi-automatic, in complex cases) conversion to the new format.

XSL

The `xsl` directory contains XSLT stylesheets for constructing HTML views of PhotoML XML files (in the `xsl/html` directory), for expansion of defaults elements (in the `xsl/defaults` directory), for upgrading PhotoML XML files from older DTD versions (in the `xsl/upgrade` directory), and for supporting the functionality of some of the tools (in the `xsl/misc` directory).

XML

The `xml` directory contains XML examples of PhotoML photo description and image description files. The top level **make** command builds HTML views of these files using the XSLT stylesheets in the `xsl` directory.

Tools

The `tools` directory contains tools for expanding defaults in PhotoML files, validating PhotoML files, constructing HTML representations etc.:

| | |
|-------------------|--|
| pmlcreate | Generate PhotoML roll description outline |
| pmldigital | Generate PhotoML descriptions of digital images from digital cameras and film scanners |
| pmlexpand | Expand and remove defaults in a PhotoML XML file |
| pmlgrep | Provides a grep-like utility for PhotoML files |
| pmlindex | Constructs an HTML index of PhotoML files |

| | |
|-------------------|---|
| pmltrans | Transform a PhotoML XML file using the standard PhotoML XSL style sheet |
| pmlupgrade | Upgrade PhotoML XML files to latest DTD version |
| pmlvalid | Validate PhotoML XML files |

Further details are provided in the *man* pages (and associated HTML files) in that directory. Installation of [libxml2](#) and [libxslt](#) is required, as the scripts in this directory make use of the **xmllint** and **xsltproc** utilities.

Documentation

Suprisingly enough, the `docs` directory contains documentation; the main document source in *DocBook* format, and viewable documents in HTML, PDF, and text formats.

XSD

The `xsd` directory contains XML Schema definitions that have been auto-generated from the PhotoML DTD by the [dtd2xsd](#) and [trang](#) tools. While these schemas may be useful to those wishing to use schema based XML tools, they have not been verified to be correct, and should not be considered as the primary document type definitions.

Using PhotoML

At least some familiarity with [XML](#) is probably necessary to make use of PhotoML. It is particularly important for users who are not familiar with DTD syntax to use an XML editor (see [Appendix A, XML Editing Tools](#)) that provides DTD guided context-dependent element insertion to ensure that valid documents are created.

The recommended formal public identifier for the current version of the PhotoML DTD is

```
"-//BW//DTD PhotoML 0.12//EN"
```

A PhotoML XML file will therefore usually begin with the following two lines

```
<?xml version="1.0">  
<!DOCTYPE photo PUBLIC "-//BW//DTD PhotoML 0.12//EN" "photo.dtd">
```

It is important to use the full public identifier including the DTD version number so that the version upgrade script is able to correctly identify the relevant DTD version when transitioning to a new DTD.

The PhotoML DTD

PhotoML is a very flexible format, providing facilities for recording far more detail than is likely to be of interest to the average photographer. A reasonable introduction to the format can be obtained by inspecting the example files in the `xml` directory, and viewing the corresponding HTML views generated by the XSLT stylesheets. For those who are familiar with DTD syntax, see [Appendix B, PhotoML DTD](#) or read through the heavily commented DTD in the `dtd` directory. A few issues are sufficiently complex to warrant additional discussion.

Collections

The *id* attribute of *roll*, *sheet*, and *digital* elements is intended to assign the primary identity for the group. If the group contains a *collection* element, the *cgid* attribute represents a secondary identity for the group relative to the collection, the identity of which is determined by the *id* attribute of the *collection* element. The *fstid* and *lsid* attributes specify the first and last frame identities which are contained in the collection, so that it may contain only part of the group. A group may also contain multiple *collection* elements.

The *frame id* and *fn* attributes

The *id* attribute is intended to assign the primary identity for the frame. It is recommended that the values be two digit numbers, increasing in chronological frame order (e.g. 01 for the first frame exposed, 02 for the second frame exposed etc.). If the actual frame number marked on the film differs from the *id*, it may be recorded using the *fn* attribute, which is also useful in other situations, e.g. when the camera exposes film beginning at the end, so that the *id* numbers increase in chronological order, while the *fn* values decrease.

The *xml:lang* attribute

The *xml:lang* attribute, available for relevant elements, is a standard mechanism for specifying the language of the element content. In addition to the [definition](#) in the XML standard, relevant information is available in the documents describing [rfc3066](#) and [iso639-2](#).

The *date* element

The *date* element has the format *YYYY[-MM[-DD]]*, (that is, *YYYY-MM-DD*, *YYYY-MM*, or *YYYY*).

The *time* element

The *time* element (using the 24 hour clock) has the format *hh[:mm[:ss[.ss*]]]* (that is, *hh*, *hh:mm*, *hh:mm:ss*, or *hh:mm:ss.s* with an arbitrary number of fractional seconds after the decimal point).

The optional *zone* attribute represents the UTC time zone in the format *(+|-)hh[:mm]* (that is *+hh:mm*, *-hh:mm*, *+hh*, or *-hh*).

For further details see a [comprehensive discussion](#) of ISO time notation, upon which these restrictions are based.

The *digimage* element

The *digimage* element is intended to provide a mechanism for describing digital images, primarily images from digital cameras, from film scanners, and edited digital images. Note that this format complements the primary PhotoML digital element for images from digital images. For example, each image captured using a digital camera is both a photograph (relevant aspects of which, such as creation date, location, scene description etc. are described using digital elements and their frame children) and a digital image (relevant aspects of which, such as image geometry, bit depth, image format etc. are described using *digimage* elements).

The *defaults* element

Elements contained within a *defaults* element provide default values for the subsequent entities in which the relevant elements have not been specified (for example, sub-elements of a *frame* specified within a *defaults* element are considered implied markup within any subsequent *frame* for which those sub-elements are not explicitly specified. An expanded version of a PhotoML file, with all *defaults* elements explicitly merged into the relevant elements, may be obtained by using the **pmlexpand** utility.

An understanding of the rules governing *defaults* elements is necessary for using them appropriately. The ruling defaults at any point in a PhotoML document are obtained by combining (as discussed below) all preceding *defaults* elements at higher levels in the element tree, and preceding *defaults* elements which are also children of the current parent node (the scope of a *defaults* element is defined by its parent element). For example, within the following document

```
<photo>
  <defaults> ... A ... </defaults>
  <roll>
    <defaults> ... B ... </defaults>
    <frame>
      ... 1 ...
    </frame>
  </roll>
  <roll>
    <frame>
      ... 2 ...
    </frame>
  </roll>
</photo>
```

defaults A and B apply to frame 1, but only defaults A apply to frame 2.

The current defaults at any point in the document are obtained by combining all preceding relevant (those within the current scope) defaults. As each *defaults* element is encountered in document order, a new current defaults set is constructed by combining the newly encountered *defaults* element with the current set in the manner specified by the *combine* attribute of the newly encountered *defaults* element. (A new copy of the current set is created when an inner scope is encountered so that any modifications to the current set within that scope do not effect the outer scope.) The possible values of the *combine* attribute are (the default attribute value is *merge*):

- | | |
|---------|--|
| replace | The current defaults are deleted and replaced by the content of a defaults element with a value of <i>replace</i> for its <i>combine</i> attribute. |
| merge | The <i>defaults</i> element with a value of <i>merge</i> for its <i>combine</i> attribute is merged over the current defaults in the sense that any elements not in the current defaults are inserted, and any terminal node elements in both are replaced by those in the defaults element. |

The processing instruction `<?merge:reject element-name element-name ... @attribute-name @attribute-name ... ?>` may be used to signal the removal of an element

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during a subtree merge, as illustrated in the following example

```
<photo>
  <roll>
    <defaults>
      <frame>
        <scene>
          <occasion>
            <date>2000-01-01</date>
            <time zone='+02:00'>12:30</time>
          </occasion>
          <location>
            <country>country-name</country>
            <city>city-name</city>
          </location>
        </scene>
      </frame>
    </defaults>

    <frame id='01'>
      <scene>
        <occasion>
          <time>
            <?merge:reject @zone?>
          </time>
        </occasion>
        <location>
          <?merge:reject city?>
        </location>
      </scene>
    </frame>

  </roll>
</photo>
```

where defaults expansion results in the frame with id='01' having the defaults content merged in, with the exception of the attribute *zone* and the element *city*.

Finally, note that the *defaults* mechanism is not yet completely stable, and may still be subject to modification. If changes are made, every effort will be made to support automatic conversion to a new mechanism via the **pmlupgrade** utility.

Recommended Frame Numbering System

The PhotoML DTD assumes that film rolls, frames, etc. are assigned unique identifiers. This section describes a recommended numbering system for photographic images, to be used within PhotoML documents. The general format consists of a full or partial date (that is, a year, a year and month, or a year, month, and day), a number within a grouping for that partial date (for example, a number for a roll of film started on the date part of the identifier), and a frame number with respect to the grouping (for example, a frame number within the roll). In the following forms year denotes a four digit number, month denotes a two digit number (range 01 to 12), day denotes a two digit number (range 01 to 31), and roll number, digital media number, and frame number denote two or three digit numbers with leading zeros where necessary.

Roll Film

The recommended forms are

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```
<year>r<roll number>f<frame number>
```

or

```
<year>--<month>r<roll number>f<frame number>
```

For example, 2001r31f08 denotes frame 8 on roll 31 of the year 2001, while 2001-05r03f12 denotes frame 12 on roll 3 of May 2001.

Digital Camera Images

The recommended forms are

```
<year>d<digital media number>f<frame number>
```

or

```
<year>--<month>d<digital media number>f<frame number>
```

or

```
<year>--<month>--<day>d<frame number>
```

For example, 2000d020f12 denotes frame 12 on compact flash card 20 (assuming a policy of assigning a new number each time an empty card is loaded) of the year 2000, while 2000-01d03f09 denotes frame 9 on compact flash card 3 of January 2000, and 2000-02-21d45 denotes frame 45 taken on 21 February 2000.

Sheet Film

The recommended forms are

```
<year>--<month>s<frame number>
```

or

```
<year>--<month>--<day>s<frame number>
```

For example, 2002-10s05 denotes frame 5 taken during October 2002, while 2002-03-09s02 denotes frame 2 taken on 9 October 2002.

Image Identifiers

An image identifier specifies a specific version of an image derived via editing of an original frame. The recommended form of an image identifier is

```
<frame identifier>n<version number>
```

where version number is a two digit number representing the specific version. For example, if two differently cropped images are derived from a scan of frame 2001r31f08,

they may be assigned image numbers 2001r31f08n01 and 2001r31f08n02.

Acknowledgments

Thanks to Stephen Darlington and Oskar Ojala for valuable comments and suggestions. Oskar Ojala has also made a number of contributions to the distribution, including the `detailed.xsl` XSLT stylesheet.

A. XML Editing Tools

A number of [XML editing tools](#) are available, including open source, shareware, and commercial products for a variety of platforms.

Emacs/XEmacs

The [emacs](#) and [xemacs](#) editors are highly recommended, both of which provide XML editing support via the following extension packages:

| | |
|--------------------------|--|
| psgml | A major mode for editing SGML and XML |
| tdtd | A major mode for editing DTDs |
| xslide | A major mode for editing XSL stylesheets |
| css-mode | A major mode for editing CSS stylesheets |

The `psgml` package relies on the [nsgml](#) parser for validation. The environment variable `SGML_SEARCH_PATH` needs to be set so that the PhotoML DTD can be found; for editing after building the PhotoML distribution, but prior to installation, the following command issued from the distribution root directory will work for `csh/tcsh`:

```
setenv SGML_SEARCH_PATH `(cd dtd; pwd)`
```

or for `sh/bash`:

```
SGML_SEARCH_PATH=`(cd dtd; pwd)`; export SGML_SEARCH_PATH
```

After installation, this environment variable should be set to the directory in which the DTD, entities etc. are installed - `/usr/local/share/photoml/dtd` by default.

B. PhotoML DTD

PhotoML: Photo Description Markup Language
Version: 0.12 Date: 21 November 2007

The recommended formal public identifier for this DTD is:

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"-//BW//DTD PhotoML 0.12//EN"

Please consult the comments in this file, and the notes in the PhotoML distribution documentation.

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Acknowledgement: Thanks to Stephen Darlington and Oskar Ojala for valuable comments and suggestions.

Parameter Entities

xlink-simple-attributes

Link specification attributes

Definition

xmlns:xlink CDATA #FIXED
'http://www.w3.org/1999/xlink' xlink:type (simple)
#FIXED 'simple' xlink:href CDATA #IMPLIED

xml-lang-attribute

The language specification attribute

Definition

xml:lang NMTOKEN #IMPLIED

Text

Unrestricted text string

Definition

#PCDATA

Integer

An integer

Definition #PCDATA

PositiveInteger

A positive integer (including zero)

Definition #PCDATA

Real

A real number

Definition #PCDATA

Rational

A rational number, expressed either as a decimal fraction or in numerator/denominator form

Definition #PCDATA

Fraction

A fraction, expressed either as a real number, or as the quotient of two integer or real numbers

Definition #PCDATA

HexString

A string of hexadecimal digits

Definition #PCDATA

Date

A date

Definition #PCDATA

Time

A time

Definition #PCDATA

DateTime

A date and time

Definition #PCDATA

TimeInterval

A time interval

Definition #PCDATA

EmailAddress

An email address

Definition #PCDATA

PhoneNumber

A phone number

Definition #PCDATA

CompassDirection

A compass direction

Definition #PCDATA

ElevationAngle

An elevation angle

Definition #PCDATA

Latitude

A latitude value

Definition #PCDATA

Longitude

A longitude value

Definition #PCDATA

Elements

photo

The root element contains optional default settings, photograph description elements roll (for roll film), sheet (for sheet film), and digital (for photographs taken using a digital camera), and digimage elements describing specific digital images, either direct from a camera or scanner, or derived via editing, composition etc.

| | | | |
|---------------|--|---------|----------|
| Content model | (defaults?, (roll sheet digital digimage digimage-set)+) | | |
| Attributes | xml:lang | NMTOKEN | #IMPLIED |
| Used inside | | | |

defaults

Elements contained within a defaults element provide default values for the corresponding elements in which the relevant information has not been specified. A full description of the semantics of this element is rather lengthy, and may be found in the accompanying documentation.

| | | | |
|---------------|---|-----------------|---------|
| Content model | (film?, processing?, frame?, properties?, history?) | | |
| Attributes | combine | (merge replace) | 'merge' |
| Used inside | photo roll digital frame-set digimage-set | | |

roll

The details of a roll of film (e.g. 35mm, APS, 120). Optional film and processing descriptions are followed by a sequence of optional loading details, optional defaults (to be applied to the following frames), frame descriptions, and optional unloading details. A defaults element must always precede at least one frame element, and load and unload elements, if present, must respectively precede and follow some group of frame elements. The id attribute specifies an identity/name assigned to the roll.

| | | | |
|---------------|--|---------|-----------|
| Content model | (collection*, description?, film?, processing?, (load?, (defaults?, (frame frame-set))+, unload?)+, note?) | | |
| Attributes | id | NMTOKEN | #REQUIRED |
| Used inside | photo | | |

sheet

The details of a single sheet of film (e.g. 4x5, 8x10). Optional film, processing and loading descriptions precede the single frame description, which is followed by an optional unloading description. The id attribute specifies an identity/name assigned to the sheet.

| | | | |
|---------------|---|---------|-----------|
| Content model | (collection*, film?, processing?, load?, frame, unload?, note?) | | |
| Attributes | id | NMTOKEN | #REQUIRED |
| Used inside | photo | | |

digital

The details of a sequence of digital photographs. Each group of frame descriptions may be preceded by a defaults element. The id attribute specifies an identity/name assigned to the digital sequence.

| | | | |
|---------------|---|---------|-----------|
| Content model | (collection*, description?, (defaults?, (frame frame-set))+, note?) | | |
| Attributes | id | NMTOKEN | #REQUIRED |
| Used inside | photo | | |

collection

A collection of photograph descriptions that should be grouped together. Particularly useful for sheet film, since each sheet element describes a single photo, but also useful, for example, for a number of roll film descriptions for the same day, event, trip etc. The id attribute allows an identity/name to be assigned to the collection, the cgid attribute provides a collection based id for the group (roll, digital, or sheet), and the optional fstfid and lstfid specify initial and final frame ids for a subset of the frames in the group.

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| | | | |
|---------------|------------------------|---------|-----------|
| Content model | (description?, note?) | | |
| Attributes | id | NMTOKEN | #REQUIRED |
| | cgid | NMTOKEN | #REQUIRED |
| | fstfid | NMTOKEN | #IMPLIED |
| | lstfid | NMTOKEN | #IMPLIED |
| Used inside | roll sheet digital | | |

description

A brief description of the parent element. Provides a description of the scene or location for a specific frame when a child of the scene or location elements, or of an entire collection, roll, or digital photography session, providing information relevant to all of the frames within the grouping, when a child of the collection, roll, or digital elements.

| | | | |
|---------------|--|---------|----------|
| Content model | %Text; | | |
| Attributes | xml:lang | NMTOKEN | #IMPLIED |
| Used inside | roll digital collection scene location operation | | |

note

A note for miscellaneous details of the parent element.

| | | | |
|---------------|---|---------|----------|
| Content model | %Text; | | |
| Attributes | xml:lang | NMTOKEN | #IMPLIED |
| Used inside | roll sheet digital collection film processing lab developing developer load unload frame photographer ipr scene occasion location object equipment body body-attachment lens lens-attachment illumination support device exposure focus digimage properties history editing scanner camera software hardware settings operation | | |

film

A description of the film used.

| | | | |
|---------------|--|--|--|
| Content model | (make?, name?, speed?, process?, type?, format?, expiry?, note?) | | |
| Used inside | defaults roll sheet | | |

make

The manufacturer of the product, e.g. Fuji (when the parent element is film).

Content model [%Text;](#)
Used inside [film](#) | [developer](#) | [body](#) | [lens](#) | [device](#) | [hardware](#)

name

The name of a person, business, or product, e.g. Velvia (when the parent element is film).

Content model [%Text;](#)
Used inside [film](#) | [lab](#) | [developer](#) | [photographer](#) | [owner](#) | [person](#) | [object](#) | [software](#)

speed

The ISO film speed, e.g. 50.

Content model [%PositiveInteger;](#)
Used inside [film](#)

process

The appropriate film developing process. Recommended values are C41 (standard negative film), E6 (standard slide film), K14 (Kodachrome) and B&W (black and white). A custom designation should be used for processes not listed here. As a child of the film element, this indicates the designated process of the film. In the case of cross-processing, a different process may be specified as a child of the developing element.

Content model [%Text;](#)
Used inside [film](#) | [developing](#)

type

The type of a film (recommended values for film type are colour positive, colour negative, b&w positive, and b&w negative), camera body (e.g. SLR, TLR, rangefinder), or lens (e.g. zoom, prime).

Content model [%Text;](#)
Used inside [film](#) | [body](#) | [lens](#)

format

The film format. Recommended values are APS, 35mm (or 135), 120 or 220 for medium format, and the film size for large format.

Content model [%Text;](#)
Used inside [film](#)

expiry

The film expiry (expiration in the US) date. The format is YYYY-MM since film expiry dates usually only specify a year and month.

Content model [%Date;](#)
Used inside [film](#)

processing

A description of the film processing.

Content model [\(lab?, tag?, date?, time?, developing?, note?\)](#)
Used inside [defaults](#) | [roll](#) | [sheet](#)

tag

The number of the double/triple check tag affixed to the film by the lab.

Content model [%Text;](#)
Used inside [processing](#)

date

A date, represented in the format YYYY[-MM[-DD]].

Content model [%Date;](#)
Used inside [processing](#) | [load](#) | [unload](#) | [occasion](#) | [origin](#) | [editing](#)

time

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A time, represented in the format hh[:mm[:ss[.ss*]]]. The optional zone attribute represents the time zone in the format (+|-)hh[:mm].

| | | | |
|---------------|--|-------|----------|
| Content model | %Time; | | |
| Attributes | zone | CDATA | #IMPLIED |
| Used inside | processing load unload occasion origin editing | | |

lab

The lab which developed the film. The optional xlink:href attribute represents the laboratory web page.

| | | | |
|---------------|---|----------|--|
| Content model | (name, address?, phone?, fax?, email?, note?) | | |
| Attributes | xmlns:xlink | CDATA | #FIXED 'http://www.w3.org/1999/xlink' |
| | xlink:type | (simple) | #FIXED 'simple' |
| | xlink:href | CDATA | #IMPLIED |
| Used inside | processing | | |

address

The address of a person or business.

| | | | |
|---------------|--|--|--|
| Content model | %Text; | | |
| Used inside | lab photographer owner person object | | |

phone

The phone number of a person or business.

| | | | |
|---------------|-------------------------------------|--|--|
| Content model | %PhoneNumber; | | |
| Used inside | lab photographer owner person | | |

fax

The fax number of a person or business.

| | | | |
|---------------|-------------------------------------|--|--|
| Content model | %PhoneNumber; | | |
| Used inside | lab photographer owner person | | |

email

The email address of a person or business.

| | |
|---------------|---|
| Content model | %EmailAddress; |
| Used inside | lab photographer owner person |

developing

A description of the development stage of processing.

| | |
|---------------|---|
| Content model | (process?, shift?, developer?, method?, agitation?, temperature?, duration?, note?) |
| Used inside | processing |

shift

The number of stops push or pull applied during processing.

| | | | |
|---------------|----------------------------|-----------------------------|---------------------------|
| Content model | %Real; | | |
| Attributes | type | (push pull) | #REQUIRED |
| Used inside | developing | | |

method

The development method, e.g. daylight tank, tray etc.

| | |
|---------------|----------------------------|
| Content model | %Text; |
| Used inside | developing |

agitation

Description of the agitation during development.

| | |
|---------------|----------------------------|
| Content model | %Text; |
| Used inside | developing |

temperature

The temperature of the developer solution (in degrees Celcius by default).

| | | | |
|---------------|------------|-------|------|
| Content model | %Real; | | |
| Attributes | units | CDATA | '°C' |
| Used inside | developing | | |

duration

The amount of time the film spent in the developer, represented in the form %m:%s (minutes:seconds).

| | |
|---------------|----------------|
| Content model | %TimeInterval; |
| Used inside | developing |

developer

The developer solution used.

| | |
|---------------|----------------------------------|
| Content model | (make?, name?, dilution?, note?) |
| Used inside | developing |

dilution

The dilution of the developer solution.

| | |
|---------------|-----------|
| Content model | %Text; |
| Used inside | developer |

load

Film loading details.

| | |
|---------------|-----------------------|
| Content model | (date?, time?, note?) |
| Used inside | roll sheet |

unload

Film unloading details.

| | |
|---------------|---|
| Content model | (date? , time? , note?) |
| Used inside | roll sheet |

frame-set

A container allowing the scope of defaults elements to be restricted to the contained set of frame elements.

| | |
|---------------|--|
| Content model | (defaults? , ((frame frame-set)+, defaults?)?) |
| Used inside | roll digital frame-set |

frame

The frame element describes a single frame in a roll of film or sequence of digital photos, and also describes the single frame on a piece of sheet film. The id attribute should be an identifying number assigned in chronological sequence (e.g. 01, 02 etc.). If the actual frame number marked on the film differs from the id, it may be recorded using the fn attribute. The fn attribute is also useful in other situations, e.g. when the camera exposes film beginning at the end, so the the id numbers increase in chronological order while the fn values decrease. A frame that is not a child of a digital element should not have a digimage child element.

| | | | |
|---------------|--|---------|----------|
| Content model | (photographer? , ipr? , scene? , equipment? , exposure? , focus? , size? , evaluation? , condition? , digimage? , idximage? , note?) | | |
| Attributes | id | NMTOKEN | #IMPLIED |
| | fn | CDATA | #IMPLIED |
| Used inside | defaults roll sheet digital frame-set | | |

size

The physical size of the frame. The value may be specified as actual physical dimensions in the format <width>x<height> (e.g. a value of "24x36" with units "mm" for standard 135 (35mm) film frames, or a value of "56x41.5" with units "mm" for 645 frames on 120 film), in which case the units attribute must be specified, or as standard frame size designations (e.g. "645", "6x6", "6x7", etc. on 120 film, or "4x5", "8x10" etc. large format film), in which case the units attribute must be omitted as an indication that the value does not represent an actual physical measurement.

| | | | |
|---------------|-------------------------|-------|----------|
| Content model | %Text ; | | |
| Attributes | units | CDATA | #IMPLIED |
| Used inside | frame | | |

condition

A description of any damage, such as scratches, to a frame or group of frames.

| | | | |
|---------------|----------|---------|----------|
| Content model | %Text; | | |
| Attributes | xml:lang | NMTOKEN | #IMPLIED |
| Used inside | frame | | |

idximage

The idximage allows the specification of the location of an index image suitable for viewing in an image index, and should therefore be small enough for convenient display in a web browser (for example), but larger than a thumbnail. This facility is useful for constructing indices of frame descriptions, or, within digimage elements, when the actual digital image being described is too large for convenient display in this context.

| | | | |
|---------------|------------------|----------|--|
| Content model | EMPTY | | |
| Attributes | xmlns:xlink | CDATA | #FIXED 'http://www.w3.org/1999/xlink' |
| | xlink:type | (simple) | #FIXED 'simple' |
| | xlink:href | CDATA | #IMPLIED |
| Used inside | frame digimage | | |

photographer

The name and other details of the photographer. The optional xlink:href attribute represents the photographer's web page.

| | | | |
|---------------|---|----------|--|
| Content model | (name, address?, phone?, fax?, email?, note?) | | |
| Attributes | xmlns:xlink | CDATA | #FIXED 'http://www.w3.org/1999/xlink' |
| | xlink:type | (simple) | #FIXED 'simple' |
| | xlink:href | CDATA | #IMPLIED |
| Used inside | frame | | |

ipr

Intellectual Property Rights details

| | |
|---------------|-----------------------------|
| Content model | (copyright?, owner?, note?) |
|---------------|-----------------------------|

Used inside [frame](#)

copyright

A copyright statement

| | | | |
|---------------|------------------------|---------|----------|
| Content model | %Text; | | |
| Attributes | xml:lang | NMTOKEN | #IMPLIED |
| Used inside | ipr | | |

owner

Details of the copyright owner. The optional xlink:href attribute represents the owner's web page.

| | | | |
|---------------|--|----------|--|
| Content model | (name, address?, phone?, fax?, email?) | | |
| Attributes | xmlns:xlink | CDATA | #FIXED 'http://www.w3.org/1999/xlink' |
| | xlink:type | (simple) | #FIXED 'simple' |
| | xlink:href | CDATA | #IMPLIED |
| Used inside | ipr | | |

scene

A description of the scene depicted in the frame

| | |
|---------------|--|
| Content model | (occasion?, location?, description?, caption?, genre?, keywords?, content?, note?) |
| Used inside | frame |

caption

A short descriptive caption for the photograph.

| | | | |
|---------------|------------------------|---------|----------|
| Content model | %Text; | | |
| Attributes | xml:lang | NMTOKEN | #IMPLIED |
| Used inside | scene | | |

genre

The genre of the scene, e.g. portrait, landscape, sport, travel, macro etc.

Content model %Text;
Used inside scene

keywords

Keywords relevant to the description of the scene.

Content model %Text;
Attributes xml:lang NMTOKEN #IMPLIED
Used inside scene

occasion

A description of when the photograph was taken.

Content model (date?, time?, event?, note?)
Used inside scene

event

A description of the event at which the photo was taken.

Content model %Text;
Attributes xml:lang NMTOKEN #IMPLIED
Used inside occasion

location

A description of the location at which the photo was taken.

Content model (country?, region?, subregion?, district?, city?, subcity?, subsubcity?, area?,
road?, place?, description?, coordinates?, direction?, note?)
Used inside scene

country

The country of the location.

| | | | |
|---------------|----------|---------|----------|
| Content model | %Text; | | |
| Attributes | xml:lang | NMTOKEN | #IMPLIED |
| Used inside | location | | |

region

A region within the location. The type attribute may be used to specify the type of region (e.g. province, state, etc.). For example, in the US, typical usage would be to use the region element to represent a state, and the subregion or district element to represent a county, while in Italy a region element would represent an official region, and a subregion element would represent a province.

| | | | |
|---------------|----------|---------|----------|
| Content model | %Text; | | |
| Attributes | type | CDATA | #IMPLIED |
| | xml:lang | NMTOKEN | #IMPLIED |
| Used inside | location | | |

subregion

A subdivision of the region. The type attribute may be used to specify the type of subdivision.

| | | | |
|---------------|----------|---------|----------|
| Content model | %Text; | | |
| Attributes | type | CDATA | #IMPLIED |
| | xml:lang | NMTOKEN | #IMPLIED |
| Used inside | location | | |

district

A subdivision of the subregion, when necessary. May also be a direct subdivision of the region when the subregion is omitted. The type attribute may be used to specify the type of subdivision.

| | | | |
|---------------|----------|---------|----------|
| Content model | %Text; | | |
| Attributes | type | CDATA | #IMPLIED |
| | xml:lang | NMTOKEN | #IMPLIED |
| Used inside | location | | |

city

The city of the location.

| | | | |
|---------------|----------|---------|----------|
| Content model | %Text; | | |
| Attributes | xml:lang | NMTOKEN | #IMPLIED |
| Used inside | location | | |

subcity

A subdivision of the city, such as a suburb, borough, or ward. The type attribute may be used to specify the type of subdivision (e.g. an arrondissement of Paris or a ku (ward) of Tokyo).

| | | | |
|---------------|----------|---------|----------|
| Content model | %Text; | | |
| Attributes | type | CDATA | #IMPLIED |
| | xml:lang | NMTOKEN | #IMPLIED |
| Used inside | location | | |

subsubcity

A subdivision of the subcity, when necessary (for example, Asakusa is a subdivision of Taito-ku, which is a ward of Tokyo). The type attribute may be used to specify the type of subdivision.

| | | | |
|---------------|----------|---------|----------|
| Content model | %Text; | | |
| Attributes | type | CDATA | #IMPLIED |
| | xml:lang | NMTOKEN | #IMPLIED |
| Used inside | location | | |

area

The area is intended for a level of detail below that of city, when a city is specified (e.g. `Central Park'), or below that of district when there is no relevant city (e.g. `Kruger National Park'). The type attribute may be used to specify the type of subdivision.

| | | | |
|---------------|----------|---------|----------|
| Content model | %Text; | | |
| Attributes | type | CDATA | #IMPLIED |
| | xml:lang | NMTOKEN | #IMPLIED |
| Used inside | location | | |

road

A road or city street.

| | | | |
|---------------|----------|---------|----------|
| Content model | %Text; | | |
| Attributes | xml:lang | NMTOKEN | #IMPLIED |
| Used inside | location | | |

place

The place is intended for a level of detail below that of area (e.g. 'Conservatory Garden' when the area is 'Central Park', or 'Skukuza Camp' when the area is 'Kruger National Park').

| | | | |
|---------------|----------|---------|----------|
| Content model | %Text; | | |
| Attributes | xml:lang | NMTOKEN | #IMPLIED |
| Used inside | location | | |

coordinates

The coordinates (latitude, longitude, altitude) of the location (obtained from a GPS device, for example).

| | |
|---------------|------------------------------------|
| Content model | (latitude?, longitude?, altitude?) |
| Used inside | location |

latitude

The location latitude.

| | |
|---------------|-------------|
| Content model | %Latitude; |
| Used inside | coordinates |

longitude

The location longitude.

| | |
|---------------|-------------|
| Content model | %Longitude; |
| Used inside | coordinates |

altitude

The location altitude (in metres by default). The optional reference attribute specifies whether the specified altitude is Above Mean Sea Level or Above Ground Level.

| | | | |
|---------------|-------------|------------|----------|
| Content model | %Real; | | |
| Attributes | units | CDATA | 'm' |
| | reference | (amsl agl) | #IMPLIED |
| Used inside | coordinates | | |

direction

The direction in which the camera was pointed (i.e. from the viewpoint to the scene). If this element is present, the coordinates are considered to be of the scene viewpoint.

| | |
|---------------|------------------------|
| Content model | (azimuth?, elevation?) |
| Used inside | location |

azimuth

The compass direction of the scene from the viewpoint (e.g. "0" for North, "90" for East, etc.) in the range 0 to 360 (degrees).

| | |
|---------------|--------------------|
| Content model | %CompassDirection; |
| Used inside | direction |

elevation

The elevation angle of the scene from the viewpoint (e.g. "0" for horizontal, "90" for directly upwards, etc.) in the range -90 to 90 (degrees).

| | |
|---------------|------------------|
| Content model | %ElevationAngle; |
| Used inside | direction |

content

A detailed description of the scene content.

| | |
|---------------|---------------------------------|
| Content model | ((person object)+ segment+) |
|---------------|---------------------------------|

Used inside [scene](#)

person

The optional xlink:href attribute represents the person's web page.

| | | | |
|---------------|---|----------|--|
| Content model | (name, address?, phone?, fax?, email?) | | |
| Attributes | xlink:xlink | CDATA | #FIXED 'http://www.w3.org/1999/xlink' |
| | xlink:type | (simple) | #FIXED 'simple' |
| | xlink:href | CDATA | #IMPLIED |
| Used inside | content segment | | |

object

The optional type and xlink:href attributes represent the object type (e.g. building, vehicle) and a URL associated with the object (e.g. for a museum).

| | | | |
|---------------|---|----------|--|
| Content model | (name?, address?, note?) | | |
| Attributes | type | CDATA | #IMPLIED |
| | xlink:xlink | CDATA | #FIXED 'http://www.w3.org/1999/xlink' |
| | xlink:type | (simple) | #FIXED 'simple' |
| | xlink:href | CDATA | #IMPLIED |
| Used inside | content segment | | |

segment

A segment of the scene. The label attribute allows identification of segments (e.g. foreground, upper-left, etc).

| | | | |
|---------------|---|-------|----------|
| Content model | (segment person object)+ | | |
| Attributes | label | CDATA | #IMPLIED |
| Used inside | content segment | | |

equipment

A description of the camera and associated equipment.

| | |
|---------------|--|
| Content model | (body? , body-attachment? , lens? , lens-attachment? , illumination? , support? , note?) |
| Used inside | frame |

body

The camera body. While often fixed for a particular roll, it is included here since it forms part of the equipment, and is also not always fixed (e.g. APS mid-roll roll change).

| | |
|---------------|--|
| Content model | (make? , model? , serial? , type? , note?) |
| Used inside | equipment |

body-attachment

An accessory attached to the body, e.g. motor-drive, multi-function back

| | |
|---------------|---|
| Content model | (device+ , note?) |
| Used inside | equipment |

lens

A lens.

| | |
|---------------|--|
| Content model | (make? , model? , serial? , type? , note?) |
| Used inside | equipment |

lens-attachment

An accessory attached to the lens, e.g. teleconverter, extension-tube, diopter, filter, lens-hood.

| | |
|---------------|---|
| Content model | (device+ , note?) |
| Used inside | equipment |

illumination

An illumination source, e.g. flash.

| | |
|---------------|---|
| Content model | (device+ , note?) |
|---------------|---|

Used inside [equipment](#)

support

A support, e.g. tripod leg set, ball-head, monopod.

Content model [\(device*, note?\)](#)

Used inside [equipment](#)

device

A description of an item of equipment. The optional type attribute represents the device type (e.g. filter, ball-head, flash).

Content model [\(make?, model?, serial?, note?\)](#)

Attributes type CDATA #IMPLIED

Used inside [body-attachment](#) | [lens-attachment](#) | [illumination](#) | [support](#)

model

The model number/code of a photographic product.

Content model [%Text;](#)

Used inside [body](#) | [lens](#) | [device](#) | [hardware](#)

serial

The serial number/code of a photographic product.

Content model [%Text;](#)

Used inside [body](#) | [lens](#) | [device](#) | [hardware](#)

exposure

A description of film exposure and camera metering settings.

Content model [\(aperture?, shutter?, exp-comp?, flash?, flash-comp?, rated-speed?, mode?, metering?, note?\)](#)

Used inside [frame](#)

aperture

The lens aperture in f/-stops.

Content model [%Real;](#)
Used inside [exposure](#)

shutter

The shutter speed in seconds.

Content model [%Fraction;](#)
Used inside [exposure](#)

exp-comp

Exposure compensation in EV units.

Content model [%Real;](#)
Used inside [exposure](#)

flash

Flash usage description.

Content model [%Text;](#)
Used inside [exposure](#)

flash-comp

Flash exposure compensation in EV units.

Content model [%Real;](#)
Used inside [exposure](#)

rated-speed

ISO speed setting of the camera (useful if different from the actual film ISO speed).

| | |
|---------------|-------------------|
| Content model | %PositiveInteger; |
| Used inside | exposure |

mode

Exposure mode (e.g. program, manual, shutter priority) for an automated camera.

| | |
|---------------|------------------|
| Content model | %Text; |
| Used inside | exposure focus |

metering

Metering mode (e.g. matrix, centre-weighted, spot).

| | |
|---------------|----------|
| Content model | %Text; |
| Used inside | exposure |

focus

Information relevant to lens focus.

| | |
|---------------|--|
| Content model | (focal-length?, focal-distance?, mode?, note?) |
| Used inside | frame |

focal-length

The lens focal length (useful when the lens doesn't have a fixed focal length), in millimeters by default.

| | | | |
|---------------|--------|-------|------|
| Content model | %Real; | | |
| Attributes | units | CDATA | 'mm' |
| Used inside | focus | | |

focal-distance

The focal distance (in metres by default).

| | | | |
|---------------|------------------------|-------|-----|
| Content model | %Real; | | |
| Attributes | units | CDATA | 'm' |
| Used inside | focus | | |

evaluation

An evaluation of the merits of the frame. If a score attribute is specified, it represents the aggregate rating for the frame, independent of the score values for child elements; if it is not specified, the aggregate score should be computed as a weighted average of the score attributes of child elements.

| | | | |
|---------------|---|-------|----------|
| Content model | (artistic?, technical?) | | |
| Attributes | score | CDATA | #IMPLIED |
| Used inside | frame | | |

artistic

An evaluation of the artistic merits of the frame. The element content is a comment on the evaluation, and a numeric rating is provided by the score attribute.

| | | | |
|---------------|----------------------------|-------|----------|
| Content model | %Text; | | |
| Attributes | score | CDATA | #IMPLIED |
| Used inside | evaluation | | |

technical

An evaluation of the technical merits (focus, depth of field, etc.) of the frame. The element content is a comment on the evaluation, and a numeric rating is provided by the score attribute.

| | | | |
|---------------|----------------------------|-------|----------|
| Content model | %Text; | | |
| Attributes | score | CDATA | #IMPLIED |
| Used inside | evaluation | | |

digimage

The details of an individual digital image. The optional xlink:href attribute represents the location of the digital image file being described. The group-id attribute is the id of the roll, sheet, or digital element in which the corresponding photographic frame is described, the

PhotoML: Photo Description Markup Language

frame-id attribute is the id of that frame element, and the image-id provides an id number for the specific digital file representing that frame (e.g. two scans of the same film frame would have the same group-id and frame-id, but different image-id).

| | | | |
|---------------|--|----------|---------------------------------------|
| Content model | (properties?, history?, idximage?, note?) | | |
| Attributes | xmlns:xlink | CDATA | #FIXED 'http://www.w3.org/1999/xlink' |
| | xlink:type | (simple) | #FIXED 'simple' |
| | xlink:href | CDATA | #IMPLIED |
| | group-id | NMTOKEN | #IMPLIED |
| | frame-id | NMTOKEN | #IMPLIED |
| | image-id | NMTOKEN | #IMPLIED |
| Used inside | photo frame digimage-set | | |

digimage-set

A container allowing the scope of defaults elements to be restricted to the contained set of digimage elements.

| | |
|---------------|---|
| Content model | (defaults?, ((digimage digimage-set)+, defaults?)+) |
| Used inside | photo digimage-set |

properties

Details of the image properties.

| | |
|---------------|--|
| Content model | (geometry ?, bit-depth ?, file-format ?, icc-profile ?, file-hash ?, image-hash ?, note?) |
| Used inside | defaults digimage |

geometry

The pixel dimensions of the image.

| | |
|---------------|--|
| Content model | (width , height) |
| Used inside | properties |

bit-depth

The bit depth of a sample, commonly 8 or 12 bits per colour band per pixel.

| | |
|---------------|-------------------|
| Content model | %PositiveInteger; |
| Used inside | properties |

file-format

The image format. This may either be described by using the `std` attribute within an empty element, or omitting the `std` attribute and describing the format within the element content. When possible, the former approach is preferred.

| | | |
|---------------|------------|-------------------------------------|
| Content model | %Text; | |
| Attributes | std | (bmp jpeg j2k png psd tiff)#IMPLIED |
| Used inside | properties | |

icc-profile

The ICC profile for the image colour space. The optional `xlink:href` refers to the relevant ICC profile specification file.

| | | | |
|---------------|-------------|----------|---------------------------------------|
| Content model | %Text; | | |
| Attributes | xmlns:xlink | CDATA | #FIXED 'http://www.w3.org/1999/xlink' |
| | xlink:type | (simple) | #FIXED 'simple' |
| | xlink:href | CDATA | #IMPLIED |
| Used inside | properties | | |

file-hash

The result of a hash function applied to the image file. Not as reliable as the hash value of the image content (i.e. the raw decoded bitmap representation of the image, which is not dependent on the specific image file format), but may be faster to compute in some circumstances, and therefore useful for an initial match test.

| | | | |
|---------------|---|---------------|-------|
| Content model | %HexString; | | |
| Attributes | type | (md5 sha-256) | 'md5' |
| Used inside | properties source | | |

image-hash

PhotoML: Photo Description Markup Language

The result of a hash function applied to the image content. Useful for ensuring a correct match between the image description and the image data file.

| | | | |
|---------------|---------------------|---------------|-------|
| Content model | %HexString; | | |
| Attributes | type | (md5 sha-256) | 'md5' |
| Used inside | properties source | | |

width

The image width in pixels

| | |
|---------------|-------------------|
| Content model | %PositiveInteger; |
| Used inside | geometry |

height

The image height in pixels

| | |
|---------------|-------------------|
| Content model | %PositiveInteger; |
| Used inside | geometry |

history

Details of the creation and editing history of the image. More than one editing element is allowed so that multiple stages of editing, using different software, may be described.

| | |
|---------------|----------------------------|
| Content model | (origin?, editing*, note?) |
| Used inside | defaults digimage |

origin

Details of the origin of the image; either a film scanner or digital camera, or source image(s) from which it is derived via editing (multiple source images are possible when, for example, a panoramic image is composed of a number of smaller images).

| | |
|---------------|---|
| Content model | ((date?, time?, (scanner camera)?) source+) |
| Used inside | history |

editing

Details of the editing operations applied to the image.

Content model (date?, time?, software?, operations?, note?)
Used inside history

scanner

The details of the scanner and scanning process.

Content model (hardware?, software?, settings?, note?)
Used inside origin

camera

The details of the digital camera.

Content model (hardware?, settings?, note?)
Used inside origin

source

A description of the source image to which editing operations were applied to derive the image described by the image element. The group-id and frame-id attributes should only be used when they differ from the respective values of the image element.

| | | | |
|---------------|---------------------------|----------|--|
| Content model | (file-hash?, image-hash?) | | |
| Attributes | xmlns:xlink | CDATA | #FIXED 'http://www.w3.org/1999/xlink' |
| | xlink:type | (simple) | #FIXED 'simple' |
| | xlink:href | CDATA | #IMPLIED |
| | image-id | NMTOKEN | #IMPLIED |
| | group-id | NMTOKEN | #IMPLIED |
| | frame-id | NMTOKEN | #IMPLIED |
| Used inside | origin | | |

software

The software used to perform the editing.

Content model (publisher?, name?, version?, note?)
Used inside editing | scanner

operations

The details of the editing operations.

Content model operation+
Used inside editing

hardware

The details of the camera or scanner hardware.

Content model (make?, model?, serial?, firmware?, note?)
Used inside scanner | camera

settings

The details of the camera, scanner, or editing software settings.

Content model (setting+, note?)
Used inside scanner | camera | operation

publisher

The name of the company which designed the software.

Content model %Text;
Used inside software

version

The version number of the software.

Content model %Text;

Used inside [software](#)

operation

The details of an individual edit. In addition to the text description, further details may be specified by providing the relevant command line when editing was performed via a command shell, or settings for operations applied via a GUI.

Content model [\(description?, \(command | settings\)?, note?\)](#)

Used inside [operations](#)

command

The command line used to apply the edit.

Content model [%Text;](#)

Used inside [operation](#)

firmware

The firmware version.

Content model [%Text;](#)

Used inside [hardware](#)

setting

The setting element describes software configuration settings during scanning. The name attribute should contain the name of the setting (e.g. multi-pass, ICE), and the element content represents the corresponding value.

Content model [%Text;](#)

| | | | |
|------------|-------|-------|-----------|
| Attributes | name | CDATA | #REQUIRED |
| | units | CDATA | #IMPLIED |

Used inside [settings](#)