The hyperxmp package*

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Abstract

hyperxmp makes it easy for an author to include XMP metadata in a PDF document produced by LaTeX. hyperxmp integrates seamlessly with hyperref and requires virtually no modifications to a document that already specifies document metadata through hyperref's mechanisms.

1 Introduction

Adobe Systems, Inc. has been promoting XMP [3]—eXtensible Metadata Platform—as a standard way to include metadata within a document. The idea behind XMP is that it is an XML-based description of various document attributes and is embedded as uncompressed, unencoded text within the document it describes. By storing the metadata this way it is independent of the document's file format. That is, regardless of whether a document is in PDF, JPEG, HTML, or any other format, it is trivial for a program (or human) to locate, extract, and—using any standard XML parser—process the embedded XMP metadata.

As of this writing there are few tools that actually do process XMP. However, it is easy to imagine future support existing in file browsers for displaying not only a document's filename but also its title, list of authors, description, and other metadata.

This is too abstract! Give me an example. Consider a LaTeX document with three authors: Jack Napier, Edward Nigma, and Harvey Dent. The generated PDF file will contain, among other information, the following stanza of XMP code embedded within it:

```
<dc:creator>
  <rdf:Seq>
    <rdf:li>Jack Napier</rdf:li>
    <rdf:li>Edward Nigma</rdf:li>
    <rdf:li>Harvey Dent</rdf:li>
```

*This document corresponds to hyperxmp v1.3, dated 2011/04/30.

```
    </rdf:Seq>
  </dc:creator>
```

In the preceding code, the dc namespace refers to the Dublin Core schema, a collection of metadata properties. The dc:creator property surrounds the list of authors. The rdf namespace is the Resource Description Framework, which defines rdf:Seq as an ordered list of values. Each author is represented by an individual list item (rdf:li), making it easy for an XML parser to separate the authors' names.

Remember that XMP code is stored as *metadata*. It does not appear when viewing or printing the PDF file. Rather, it is intended to make it easy for applications to identify and categorize the document.

What metadata does hyperxmp process? hyperxmp knows how to embed all of the following types of metadata within a document:

- authors (dc:creator)
- copyright (dc:rights)
- date (dc:date)
- document identifier (xapMM:DocumentID)
- document instance identifier (xapMM:InstanceID)
- format (dc:format)
- keywords (pdf:Keyword and dc:subject)
- license URL (xapRights:WebStatement)
- metadata writer (photoshop:CaptionWriter)
- PDF-generating tool (pdf:Producer)
- primary author's position/title (photoshop:AuthorsPosition)
- summary (dc:description)
- title (dc:title)

More types of metadata may be added in a future release.

How does hyperxmp compare to the xmpincl package? The short answer is that xmpincl is more flexible but hyperxmp is easier to use. With xmpincl, the author manually constructs a file of arbitrary XMP data and the package merely embeds it within the generated PDF file. With hyperxmp, the author specifies values for various predefined metadata types and the package formats those values as XMP and embeds the result within the generated PDF file.

xmpincl can embed XMP only when running under pdfLaTeX and only when in PDF-generating mode. hyperxmp additionally works with a few other PDF-producing LaTeX backends.

hyperxmp and xmpincl can complement each other. An author may want to use hyperxmp to produce a basic set of XMP code, then extract the XMP code from the PDF file with a text editor, augment the XMP code with any metadata not supported by hyperxmp, and use xmpincl to include the modified XMP code in the PDF file.

2 Usage

hyperxmp provides no commands of its own. Rather, it processes some of the package options honored by hyperref. To use hyperxmp, merely put a `\usepackage{hyperxmp}` somewhere in your document's preamble. hyperxmp will construct its XMP data using the following hyperref options:

- `pdfauthor`
- `pdfkeywords`
- `pdflang`
- `pdfproducer`
- `pdfsubject`
- `pdftitle`

hyperxmp instructs hyperref also to accept the following options, which have meaning only to hyperxmp:

- `pdfauthortitle`
- `pdfcaptionwriter`
- `pdfcopyright`
- `pdflicenseurl`
- `pdfmetalang`

`pdfauthortitle` indicates the primary author's position or title. `pdfcaptionwriter` specifies the name of the person who added the metadata to the document. `\pdfcopyright` defines the copyright text. `pdflicenseurl` identifies a URL that points to the document's license agreement. `pdfmetalang` indicates the natural language in which the metadata is written, typically as an IETF language tag [5], for example, "`en`" for English, "`en-US`" for specifically United States English, "`de`" for German, and so forth. If `pdfmetalang` is not specified, hyperxmp assumes the metadata language is the same as the document language (hyperref's `pdflang` option). If neither `pdfmetalang` nor `pdflang` is specified, hyperxmp uses "`x-default`" as the metadata language.

It's usually more convenient to provide values for those options using hyperref's `\hypersetup` command than on the `\usepackage` command line. See the hyperref manual for more information. The following is a sample LaTeX document that provides values for most of the metadata options that hyperxmp recognizes:

```
\documentclass{article}
\usepackage{hyperxmp}
\usepackage{hyperref}
\title{%
  On a heuristic viewpoint concerning the production and
  transformation of light}
\author{Albert Einstein}
\hypersetup{%
  pdftitle={%
    On a heuristic viewpoint concerning the production and
    transformation of light},
  pdfauthor={Albert Einstein},
  pdfcopyright={Copyright (C) 1905, Albert Einstein},
  pdfsubject={photoelectric effect},
  pdfkeywords={energy quanta, Hertz effect, quantum physics},
  pdflang={en}
}
\begin{document}
\maketitle
A profound formal difference exists between the theoretical
concepts that physicists have formed about gases and other
ponderable bodies, and Maxwell's theory of electromagnetic
processes in so-called empty space\dots
\end{document}
```

Compile the document to PDF using any of the following approaches:

- pdfLaTeX
- LuaLaTeX
- LaTeX + Dvipdfm
- LaTeX + Dvips + Ghostscript

- LaTeX + Dvips + Adobe Acrobat Distiller
- XeLaTeX

Besides the approaches listed above, other approaches may work as well but have not been tested. Note that in many TeX distributions `ps2pdf` is a convenience script that calls Ghostscript with the appropriate options for converting PostScript to PDF and `dvipdf` is a convenience script that calls `dvips` and `ps2pdf`; both `ps2pdf` and `dvipdf` should be compatible with hyperxmp.

The resulting PDF file will contain an XMP packet that looks something like this:

```
<?xpacket begin="???" id="W5M0MpCehiHzreSzNTczkc9d"?>
<x:xmpmeta xmlns:x="adobe:ns:meta/" x:xmptk="3.1-702">
   <rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#">
      <rdf:Description rdf:about=""
           xmlns:pdf="http://ns.adobe.com/pdf/1.3/">
           <pdf:Keywords>energy quanta, Hertz effect,
           quantum physics</pdf:Keywords>
           <pdf:Producer>pdfeTeX-1.10b</pdf:Producer>
      </rdf:Description>
      <rdf:Description rdf:about=""
            xmlns:dc="http://purl.org/dc/elements/1.1/">
         <dc:format>application/pdf</dc:format>
         <dc:title>
            <rdf:Alt>
               <rdf:li xml:lang="en">On a heuristic viewpoint
               concerning the production and transformation of
               light</rdf:li>
            </rdf:Alt>
         </dc:title>
         <dc:description>
            <rdf:Alt>
               <rdf:li xml:lang="en">photoelectric effect</rdf:li>
            </rdf:Alt>
         </dc:description>
         <dc:rights>
            <rdf:Alt>
               <rdf:li xml:lang="en">Copyright (C) 1905,
               Albert Einstein</rdf:li>
            </rdf:Alt>
         </dc:rights>
         <dc:creator>
            <rdf:Seq>
               <rdf:li>Albert Einstein</rdf:li>
            </rdf:Seq>
         </dc:creator>
         <dc:subject>
            <rdf:Bag>
```

```
                <rdf:li>energy quanta</rdf:li>
                <rdf:li>Hertz effect</rdf:li>
                <rdf:li>quantum physics</rdf:li>
             </rdf:Bag>
          </dc:subject>
          <dc:date>
             <rdf:Seq>
                <rdf:li>2006-04-19</rdf:li>
             </rdf:Seq>
          </dc:date>
       </rdf:Description>
       <rdf:Description rdf:about=""
             xmlns:xapMM="http://ns.adobe.com/xap/1.0/mm/">
          <xapMM:DocumentID>uuid:c4188820-aef2-0a82-626ce4182b62</xapMM:DocumentID>
          <xapMM:InstanceID>uuid:9b62b67f-d754-626c-4c959595fd75</xapMM:InstanceID>
       </rdf:Description>
    </rdf:RDF>
 </x:xmpmeta>
 <?xpacket end="w"?>
```

Note 1: Acrobat Author bug A bug in Adobe Acrobat—at least in versions 10.0.1 and earlier—causes that PDF reader to confuse the XMP and non-XMP author lists when displaying the document's metadata. Specifically, the first author is displayed as the concatenated list of authors from the non-XMP data (Author) while the remaining authors are displayed from the XMP data (dc:creator). For example, suppose that a document's authors are Jack Napier, Edward Nigma, and Harvey Dent. When displaying the document properties, Adobe Acrobat replaces "Jack Napier" with a single author named "Jack Napier, Edward Nigma, Harvey Dent" and leaves "Edward Nigma" and "Harvey Dent" as the second and third authors, respectively.

A workaround, independent of TEX, is to modify the PDF file to remove all but the first author from the non-XMP author list while retaining all of the authors in the XMP author list. Doing so will cause Adobe Acrobat to properly display all of the authors but at the cost of other PDF readers likely displaying only the first author. The following Perl command (which should be entered as a single line) automates this modification:

```
perl -i -ne 's,(/Author\s*\([^\,\)]+)(.*?)\),"$1)" . " " x length($2),ge;
  print' myfile.pdf
```

(Systems with different quoting conventions from Linux/Unix may need to adapt the preceding commands as appropriate.)

Note 2: XeLaTeX object compression XeLaTeX (or, more precisely, the `xdvipdfmx` back end), compresses *all* PDF objects, including the ones containing XMP metadata. While Adobe Acrobat can still detect and utilize the XMP

metadata, non-PDF-aware applications are unlikely to see the metadata. Either use a different program (e.g., LuaLaTeX) or use XeLaTeX to produce a DVI or XDV file and run `xdvipdfmx` manually on that file using the `-z0` option to turn off all compression (which will of course make the PDF file substantially larger).

Note 3: Literal commas hyperxmp splits the `pdfauthor` and `pdfkeywords` lists at commas. Therefore, when specifying `pdfauthor` and `pdfkeywords`, you should separate items with commas. Also, omit "`and`" and other text that does not belong to any list item. The following example should serve as clarification:

Wrong: `pdfauthor={Jack Napier, Edward Nigma, and Harvey Dent}`

Wrong: `pdfauthor={Jack Napier; Edward Nigma; Harvey Dent}`

Right: `pdfauthor={Jack Napier, Edward Nigma, Harvey Dent}`

If you desperately need to include a comma within an author or keyword list you can define your own comma macro as follows:

```
\bgroup
\catcode`,=11
\gdef\mycomma{,}
\egroup
```

Thereafter, you can use `\mycomma` as a literal comma:

```
pdfauthor={Napier\mycomma\ Jack,
           Nigma\mycomma\ Edward,
           Dent\mycomma\ Harvey}
```

3 Implementation

This section presents the commented LaTeX source code for hyperxmp. Read this section only if you want to learn how hyperxmp is implemented.

3.1 Initial preparation

`\hyxmp@dq@code` The ngerman package redefines " " as an active character, which causes problems for hyperxmp when it tries to use that character. We therefore save the double-quote character's current category code in `\hyxmp@dq@code` and mark the character as category code 12 ("other"). The original category code is restored at the end of the package code (Section 3.7).

```
\edef\hyxmp@dq@code{\the\catcode`\"}
\catcode`\"=12
```

3.2 Integration with hyperref

An important design decision underlying hyperxmp is that the package should integrate seamlessly with hyperref. To that end, hyperxmp takes its XMP metadata from the hyperref `pdftitle`, `pdfauthor`, `pdfsubject`, and `pdfkeywords` options plus two new options, `pdfcopyright` and `pdflicenseurl`, introduced by hyperxmp. For consistency with hyperref's document-metadata naming conventions (which are in turn based on LaTeX's document-metadata naming conventions), we do not prefix metadata-related macro names with our package-specific `\hyxmp@` prefix. That is, we use names like `\@pdfcopyright` instead of `\hyxmp@pdfcopyright`.

We load three helper packages: keyval for package-option processing and pdfescape and stringenc for re-encoding Unicode strings.

```
\RequirePackage{keyval}
\RequirePackage{pdfescape}
\RequirePackage{stringenc}
```

`\@pdfcopyright` Prepare to store the document's copyright statement.

```
\def\@pdfcopyright{}
\define@key{Hyp}{pdfcopyright}{\pdfstringdef\@pdfcopyright{#1}}
```

`\@pdflicenseurl` Prepare to store the URL containing the document's license agreement.

```
\def\@pdflicenseurl{}
\define@key{Hyp}{pdflicenseurl}{\pdfstringdef\@pdflicenseurl{#1}}
```

`\@pdfauthortitle` Prepare to store the author's position/title (e.g., Staff Writer).

```
\def\@pdfauthortitle{}
\define@key{Hyp}{pdfauthortitle}{\pdfstringdef\@pdfauthortitle{#1}}
```

`\@pdfcaptionwriter` Prepare to store the name of the person who inserted the hyperxmp metadata.

```
\def\@pdfcaptionwriter{}
\define@key{Hyp}{pdfcaptionwriter}{\pdfstringdef\@pdfcaptionwriter{#1}}
```

`\@pdfmetalang` Prepare to store the natural language of the document's metadata, typically as an ISO 639-1 two-letter abbreviation.

```
\def\@pdfmetalang{}
\define@key{Hyp}{pdfmetalang}{\pdfstringdef\@pdfmetalang{#1}}
```

`\hyxmp@find@metadata` `\hyxmp@concated@metadata` Issue a warning message if the author failed to include any metadata at all. Note that we don't consider `\@pdflang` or `\@pdfmetalang` as metadata, as they're meaningful only when used in conjunction with other information.

```
\newcommand*{\hyxmp@find@metadata}{%
  \edef\hyxmp@concated@metadata{%
    \@pdfauthor
    \@pdfauthortitle
    \@pdfcaptionwriter
    \@pdfcopyright
```

```
    \@pdfkeywords
    \@pdflicenseurl
    \@pdfsubject
    \@pdftitle
  }%
  \ifx\hyxmp@concated@metadata\@empty
    \PackageWarningNoLine{hyperxmp}{%
\jobname.tex did not specify any metadata to\MessageBreak
include in the XMP packet.\space\space Please see the hyperxmp\MessageBreak
documentation for instructions on how to provide\MessageBreak
metadata values to hyperxmp}%
  \fi
}
```

Rather than load hyperref ourself we let the author do it then verify he actually did. This approach gives the author the flexibility to load hyperxmp and hyperref in either order and to call `\hypersetup` anywhere in the document's preamble, not just before hyperxmp is loaded.

```
\AtBeginDocument{%
  \@ifpackageloaded{hyperref}%
    {%
```

If the user explicitly specified the language to use for the document's metadata, we use that. If not, we use the document language, specified to hyperref with the `pdflang` option. If the author did not specify a language, we use `x-default` as the metadata language.

```
      \ifx\@pdfmetalang\@empty
        \ifx\@pdflang\@empty
          \def\@pdfmetalang{x-default}%
        \else
          \edef\@pdfmetalang{\@pdflang}%
        \fi
      \fi
      \ifHy@unicode
        \hyxmp@reencode\@pdfmetalang
      \fi
```

We wait until the end of the document to construct the XMP packet and write it to the PDF document catalog. This gives the author ample opportunity to provide metadata to hyperref and thereby hyperxmp.

```
      \AtEndDocument{%
        \hyxmp@find@metadata
        \hyxmp@embed@packet
      }%
    }%
    {\PackageWarningNoLine{hyperxmp}{%
\jobname.tex failed to include a\MessageBreak
\string\usepackage\string{hyperref\string}
in the preamble.\MessageBreak
Consequently, all hyperxmp functionality will be\MessageBreak
```

```
disabled}%
    }%
}
```

3.3 Manipulating author-supplied data

The author provides metadata information to hyperxmp via package options to hyperref or via hyperref's \hypersetup command. The functions in this section convert author-supplied lists (e.g., pdfkeywords={foo, bar, baz}) into LaTeX lists (e.g., \@elt {foo} \@elt {bar} \@elt {baz}) that can be more easily manipulated (Section 3.3.1); define macros for the XML entites <, >, and & (Section 3.3.2); trim spaces off the ends of strings (Section 3.3.3); and, in Section 3.3.4, convert text to XML (e.g., from <scott+hyxmp@pakin.org> to <scott+hyxmp@pakin.org>).

3.3.1 List manipulation

We define a macro for converting a list of comma-separated elements (e.g., the list of PDF keywords) to a list of LaTeX \@elt-separated elements.

\hyxmp@commas@to@list

Given a macro name (#1) and a comma-separated list (#2), define the macro name as the elements of the list, each preceded by \@elt. (Executing the macro therefore applies \@elt to each element in turn.)

```
\newcommand*{\hyxmp@commas@to@list}[2]{%
  \gdef#1{}%
  \expandafter\hyxmp@commas@to@list@i\expandafter#1#2,,%
}
```

\hyxmp@commas@to@list@i
\next

Recursively construct macro #1 from comma-separated list #2. Stop if #2 is empty.

```
\def\hyxmp@commas@to@list@i#1#2,{%
  \gdef\hyxmp@sublist{#2}%
  \ifx\hyxmp@sublist\@empty
    \let\next=\relax
  \else
    \hyxmp@trimspaces\hyxmp@sublist
    \@cons{#1}{{\hyxmp@sublist}}%
    \def\next{\hyxmp@commas@to@list@i{#1}}%
  \fi
  \next
}
```

3.3.2 Character-code and XML entity definitions

The hyperref package invokes \pdfstringdef on its metadata parameters, setting every character to TeX category code 11 ("other"). To match against these, we have to define a few category code 11 characters of our own. Furthermore, because XMP is an XML format, we have to replace the characters "&", "<", and ">" with equivalent XML entities.

\hyxmp@xml@amp
\hyxmp@other@amp
\hyxmp@amp

Define category code 11 ("other") versions of the character "&" and map \hyxmp@other@amp to its XML entity, &.

```
\bgroup
\catcode`\&=11
\gdef\hyxmp@xml@amp{&amp;}
\global\let\hyxmp@other@amp=&
\gdef\hyxmp@amp{&}
```

\hyxmp@xml@lt
\hyxmp@other@lt

Define a category code 11 ("other") version of the character "<" and map \hyxmp@other@lt to its XML entity, <.

```
\catcode`\<=11
\gdef\hyxmp@xml@lt{&lt;}
\global\let\hyxmp@other@lt=<
```

\hyxmp@xml@gt
\hyxmp@other@gt

Define a category code 11 ("other") version of the character ">" and map \hyxmp@other@gt to its XML entity, >.

```
\catcode`\>=11
\gdef\hyxmp@xml@gt{&gt;}
\global\let\hyxmp@other@gt=>
```

\hyxmp@other@space
\next

Define a category code 11 ("other") version of the space character.

```
\def\next#1{#1}
\next{\global\let\hyxmp@other@space= } %
```

\hyxmp@other@bs

Define a category code 11 ("other") version of the character "\".

```
\catcode`\|=0
\catcode`\\=11
|global|let|hyxmp@other@bs=\
|egroup
```

3.3.3 Trimming leading and trailing spaces

To make it easier for XMP processors to manipulate our output we define a \hyxmp@trimspaces macro to strip leading and trailing spaces from various data fields.

\hyxmp@trimspaces

Redefine a macro as its previous value but without leading or trailing spaces. This code—as well as that for its helper macros, \hyxmp@trimb and \hyxmp@trimc—was taken almost verbatim from a solution to an *Around the Bend* puzzle [4]. Inline comments are also taken from the solution text.

```
\catcode`\Q=3
```

\hyxmp@trimspaces\x redefines \x to have the same replacement text sans leading and trailing space tokens.

```
\newcommand{\hyxmp@trimspaces}[1]{%
```

Use grouping to emulate a multi-token afterassignment queue.

```
  \begingroup
```

Put "\toks 0 {" into the afterassignment queue.

```
\aftergroup\toks\aftergroup0\aftergroup{%
```

Apply \hyxmp@trimb to the replacement text of #1, adding a leading \noexpand to prevent brace stripping and to serve another purpose later.

```
\expandafter\hyxmp@trimb\expandafter\noexpand#1Q Q}%
```

Transfer the trimmed text back into #1.

```
\edef#1{\the\toks0}%
}
```

\hyxmp@trimb

\hyxmp@trimb removes a trailing space if present, then calls \hyxmp@trimc to clean up any leftover bizarre Qs, and trim a leading space. In order for \hyxmp@trimc to work properly we need to put back a Q first.

```
\def\hyxmp@trimb#1 Q{\hyxmp@trimc#1Q}
```

\hyxmp@trimc

Execute \vfuzz assignment to remove leading space; the \noexpand will now prevent unwanted expansion of a macro or other expandable token at the beginning of the trimmed text. The \endgroup will feed in the \aftergroup tokens after the \vfuzz assignment is completed.

```
\def\hyxmp@trimc#1Q#2{\afterassignment\endgroup \vfuzz\the\vfuzz#1}
\catcode`\Q=11
```

3.3.4 Converting text to XML

The "<", ">", and "&" characters are significant to XML. We therefore need to escape them in any author-supplied text.

\hyxmp@reencode
\hyxmp@reencoded

Given a control word that expands to a Unicode (utf16be) string, re-encode it in a more basic (pdfdoc) 8-bit encoding so we don't wind up escaping each octet of what should be a single 16-bit character. The bulk of the work is left to \EdefUnescapeString from the pdfescape package and \StringEncodingConvert and to \StringEncodingSuccessFailure from the stringenc package.

```
\newcommand*{\hyxmp@reencode}[1]{%
  \EdefUnescapeString\hyxmp@reencoded{#1}%
  \StringEncodingConvert\hyxmp@reencoded\hyxmp@reencoded{utf16be}{pdfdoc}%
  \StringEncodingSuccessFailure{%
    \global\let\hyxmp@reencoded=\hyxmp@reencoded
  }{%
    \gdef\hyxmp@reencoded{#1}%
  }%
  \edef#1{\hyxmp@reencoded}%
}
```

\hyxmp@xmlify
\hyxmp@xmlified
\hyxmp@text

Given a piece of text defined using \pdfstringdef (i.e., with many special characters redefined to have category code 11), set \hyxmp@xmlified to the same text but with all occurrences of "<" replaced with <, all occurrences of ">" replaced with >, and all occurrences of "&" replaced with &.

If \pdfmark is defined then there's a chance the user will run dvips on the resulting DVI file and dvips may convert some of the spaces to newlines, which is problematic for the proper display of an XMP packet. We therefore conditionally invoke \hyxmp@obscure@spaces to replace all spaces with .

```
\newcommand*{\hyxmp@xmlify}[1]{%
  \gdef\hyxmp@xmlified{}%
  \edef\hyxmp@text{#1}%
  \ifHy@unicode
    \hyxmp@reencode\hyxmp@text
  \fi
  \expandafter\hyxmp@xmlify@i\hyxmp@text\@empty
  \@ifundefined{pdfmark}{}{%
    \expandafter\hyxmp@obscure@spaces\expandafter{\hyxmp@xmlified}%
  }%
}
```

\hyxmp@xmlify@i
\hyxmp@one@token

Bind the next token in the input stream to \hyxmp@one@token and invoke \hyxmp@xmlify@ii. \hyxmp@xmlify@i (and therefore \hyxmp@xmlify@ii) is invoked on each character in the text supplied to \hyxmp@xmlify.

```
\def\hyxmp@xmlify@i{\futurelet\hyxmp@one@token\hyxmp@xmlify@ii}
```

\hyxmp@xmlify@ii
\next

Given a token in \hyxmp@one@token, define \next to consume the token, append the corresponding text to \hyxmp@xmlified, and recursively invoke \hyxmp@xmlify@i to consume subsequent tokens.

```
\def\hyxmp@xmlify@ii{%
  \if\hyxmp@one@token\hyxmp@other@lt
```

Replace "<" with <.

```
    \def\next##1{%
      \xdef\hyxmp@xmlified{\hyxmp@xmlified\hyxmp@xml@lt}%
      \hyxmp@xmlify@i
    }%
  \else
    \if\hyxmp@one@token\hyxmp@other@gt
```

Replace ">" with >.

```
      \def\next##1{%
        \xdef\hyxmp@xmlified{\hyxmp@xmlified\hyxmp@xml@gt}%
        \hyxmp@xmlify@i
      }%
    \else
      \if\hyxmp@one@token\hyxmp@other@amp
```

Replace "&" with &.

```
        \def\next##1{%
          \xdef\hyxmp@xmlified{\hyxmp@xmlified\hyxmp@xml@amp}%
          \hyxmp@xmlify@i
        }%
      \else
        \ifx\hyxmp@one@token\hyxmp@other@space
```

Store spaces. We need a special case for this to avoid inadvertently discarding spaces.

```
          \def\next##1{%
            \g@addto@macro\hyxmp@xmlified{ }%
            \hyxmp@xmlify@i##1%
          }%
        \else
          \if\hyxmp@one@token\hyxmp@other@bs
```

Replace \⟨*ooo*⟩ with &#⟨*ddd*⟩;. For example, \100, the octal code for "@", is represented in XML as @.

```
            \def\next##1{\futurelet\hyxmp@one@token\hyxmp@xmlify@iii}
          \else
            \ifx\hyxmp@one@token\@empty
```

End the recursion upon encountering \@empty.

```
              \def\next##1{}%
            \else
```

In most cases we merely append the next character in the input to \hyxmp@xmlified without any special processing.

```
              \def\next##1{%
                \g@addto@macro\hyxmp@xmlified{##1}%
                \hyxmp@xmlify@i
              }%
            \fi
          \fi
        \fi
      \fi
    \fi
  \fi
```

Recursively process the next character in the input stream.

```
  \next
}
```

\hyxmp@xmlify@iii
\next

hyperref's \pdfstringdef macro converts certain special characters to a backslash followed by a three-digit octal number. However, it also replaces "(" and ")" with "\(" and "\)". The \hyxmp@xmlify@iii macro is called after encountering (and removing) a backslash. If the next character in the input stream (\hyxmp@one@token) is a parenthesis, \hyxmp@xmlify@iii leaves it alone. Otherwise, \hyxmp@xmlify@iii assumes it's an octal number and replaces it with its XML equivalent.

```
\def\hyxmp@xmlify@iii{%
  \def\next##1##2##3{%
    \@tempcnta='##1##2##3
    \xdef\hyxmp@xmlified{\hyxmp@xmlified
      \hyxmp@amp\hyxmp@hash\the\@tempcnta;%
    }%
    \hyxmp@xmlify@i
```

```
  }%
  \if\hyxmp@one@token(
    \let\next=\hyxmp@xmlify@i
  \else
    \if\hyxmp@one@token)
      \let\next=\hyxmp@xmlify@i
    \fi
  \fi
  \next
}
```

`\hyxmp@obscure@spaces` The `dvips` backend rather obnoxiously word-wraps text. Doing so can cause XMP metadata to be displayed incorrectly. For example, Adobe Acrobat displays the document's dc:rights (copyright notice) within a single-line field. By introducing an extra line break in the middle of the copyright notice, `dvips` implicitly causes it to be truncated when displayed.

To thwart `dvips`'s word-wrapping, we define `\hyxmp@obscure@spaces` to replace each space in a given piece of text with an XML `&#32;` (space) entity.

```
\newcommand*{\hyxmp@obscure@spaces}[1]{%
  \gdef\hyxmp@xmlified{}%
  \expandafter\hyxmp@obscure@spaces@i#1 {} %
}
```

`\hyxmp@obscure@spaces@i` Do all of the work for `\hyxmp@obscure@spaces`.

`\hyxmp@one@token` `\next`

```
\def\hyxmp@obscure@spaces@i #1 #2 {%
  \def\hyxmp@one@token{#2}%
  \ifx\hyxmp@one@token\@empty
    \xdef\hyxmp@xmlified{\hyxmp@xmlified#1}%
    \let\next=\relax
  \else
    \xdef\hyxmp@xmlified{\hyxmp@xmlified#1\hyxmp@amp\hyxmp@hash32;}%
    \def\next{\expandafter\hyxmp@obscure@spaces@i\expandafter#2 }%
  \fi
  \next
}
```

3.4 UUID generation

We use a linear congruential generator to produce pseudorandom UUIDs. True, this method has its flaws but it's simple to implement in TEX and is good enough for producing the XMP xapMM:DocumentID and xapMM:InstanceID fields.

`\hyxmp@modulo@a` Replace the contents of `\@tempcnta` with the contents modulo `#1`. Note that `\@tempcntb` is overwritten in the process.

```
\def\hyxmp@modulo@a#1{%
  \@tempcntb=\@tempcnta
  \divide\@tempcntb by #1
  \multiply\@tempcntb by #1
```

```
  \advance\@tempcnta by -\@tempcntb
}
```

`\hyxmp@big@prime` `\hyxmp@big@prime@ii` Define a couple of large prime numbers that can still be stored in a TEX counter.

```
\def\hyxmp@big@prime{536870923}
\def\hyxmp@big@prime@ii{536870027}
```

`\hyxmp@seed@rng` `\hyxmp@one@token` Seed hyperxmp's random-number generator from a given piece of text.

```
\def\hyxmp@seed@rng#1{%
  \@tempcnta=\hyxmp@big@prime
  \futurelet\hyxmp@one@token\hyxmp@seed@rng@i#1\@empty
}
```

`\hyxmp@seed@rng@i` `\hyxmp@one@token` `\next` Do all of the work for `\hyxmp@seed@rng`. For each character code c of the input text, assign `\@tempcnta` $\leftarrow 3 \cdot$ `\@tempcnta` $+ c \pmod{\texttt{\hyxmp@big@prime}}$.

```
\def\hyxmp@seed@rng@i{%
  \ifx\hyxmp@one@token\@empty
    \let\next=\relax
  \else
    \def\next##1{%
      \multiply\@tempcnta by 3
      \advance\@tempcnta by `##1
      \hyxmp@modulo@a{\hyxmp@big@prime}%
      \futurelet\hyxmp@one@token\hyxmp@seed@rng@i
    }%
  \fi
  \next
}
```

`\hyxmp@set@rand@num` `\hyxmp@rand@num` Advance `\hyxmp@rand@num` to the next pseudorandom number in the sequence. Specifically, we assign `\hyxmp@rand@num` $\leftarrow 3 \cdot$ `\hyxmp@rand@num` $+$ `\hyxmp@big@prime@ii` $\pmod{\texttt{\hyxmp@big@prime}}$. Note that both `\@tempcnta` and `\@tempcntb` are overwritten in the process.

```
\def\hyxmp@set@rand@num{%
  \@tempcnta=\hyxmp@rand@num
  \multiply\@tempcnta by 3
  \advance\@tempcnta by \hyxmp@big@prime@ii
  \hyxmp@modulo@a{\hyxmp@big@prime}%
  \xdef\hyxmp@rand@num{\the\@tempcnta}%
}
```

`\hyxmp@append@hex` Append a randomly selected hexadecimal digit to macro `#1`. Note that both `\@tempcnta` and `\@tempcntb` are overwritten in the process.

```
\def\hyxmp@append@hex#1{%
  \hyxmp@set@rand@num
  \@tempcnta=\hyxmp@rand@num
  \hyxmp@modulo@a{16}%
  \ifnum\@tempcnta<10
    \xdef#1{#1\the\@tempcnta}%
  \else
```

There *must* be a better way to handle the numbers 10–15 than with `\ifcase`.

```
    \advance\@tempcnta by -10
    \ifcase\@tempcnta
      \xdef#1{#1a}%
      \or\xdef#1{#1b}%
      \or\xdef#1{#1c}%
      \or\xdef#1{#1d}%
      \or\xdef#1{#1e}%
      \or\xdef#1{#1f}%
    \fi
  \fi
}
```

`\hyxmp@append@hex@iv` Invoke `\hyxmp@append@hex` four times.

```
\def\hyxmp@append@hex@iv#1{%
  \hyxmp@append@hex#1%
  \hyxmp@append@hex#1%
  \hyxmp@append@hex#1%
  \hyxmp@append@hex#1%
}
```

`\hyxmp@create@uuid` Define macro `#1` as a UUID of the form "`uuid:`*xxxxxxx*`-`*xxxx*`-`*xxxx*`-`*xxxxxxxxxxx*" in which each "*x*" is a lowercase hexadecimal digit. We assume that the random-number generator is already seeded. Note that `\hyxmp@create@uuid` overwrites both `\@tempcnta` and `\@tempcntb`.

```
\def\hyxmp@create@uuid#1{%
  \def#1{uuid:}%
  \hyxmp@append@hex@iv#1%
  \hyxmp@append@hex@iv#1%
  \g@addto@macro#1{-}%
  \hyxmp@append@hex@iv#1%
  \g@addto@macro#1{-}%
  \hyxmp@append@hex@iv#1%
  \g@addto@macro#1{-}%
  \hyxmp@append@hex@iv#1%
  \hyxmp@append@hex@iv#1%
  \hyxmp@append@hex@iv#1%
}
```

`\hyxmp@def@DocumentID` `\hyxmp@DocumentID` Seed the random-number generator with a function of the current filename, PDF document title, and PDF author, then invoke `\hyxmp@create@uuid` to define `\hyxmp@DocumentID` as a random UUID.

```
\newcommand*{\hyxmp@def@DocumentID}{%
  \edef\hyxmp@seed@string{\jobname:\@pdftitle:\@pdfauthor}%
  \expandafter\hyxmp@seed@rng\expandafter{\hyxmp@seed@string}%
  \edef\hyxmp@rand@num{\the\@tempcnta}%
  \hyxmp@create@uuid\hyxmp@DocumentID
}
```

\hyxmp@def@InstanceID
\hyxmp@InstanceID

Seed the random-number generator with a function of the current filename, PDF document title, PDF author, and the current day, month, year, and minutes since midnight, then invoke \hyxmp@create@uuid to define \hyxmp@InstanceID as a random UUID.

```
\newcommand*{\hyxmp@def@InstanceID}{%
  \edef\hyxmp@seed@string{%
    \jobname:\@pdftitle:\@pdfauthor:%
    \the\year/\the\month/\the\day:%
    \the\time
  }%
  \expandafter\hyxmp@seed@rng\expandafter{\hyxmp@seed@string}%
  \edef\hyxmp@rand@num{\the\@tempcnta}%
  \hyxmp@create@uuid\hyxmp@InstanceID
}
```

3.5 Constructing the XMP packet

An XMP packet "shall consist of the following, in order: a header PI, the serialized XMP data model (the XMP packet) with optional white-space padding, and a trailer PI" [3]. ("PI" is an abbreviation for "processing instructions"). The serialized XMP includes blocks of XML for various XMP schemata: Adobe PDF (Section 3.5.2), Dublin Core (Section 3.5.3), XMP Rights Management (Section 3.5.4), and XMP Media Management (Section 3.5.5). The \hyxmp@construct@packet macro constructs the XMP packet into \hyxmp@xml. It first writes the appropriate XML header, then calls the various schema-writing macros, then injects \hyxmp@padding as padding, and finally writes the appropriate XML trailer.

3.5.1 XMP utility functions

\hyxmp@add@to@xml

Given a piece of text, replace all underscores with category-code 11 ("other") spaces and append the result to the \hyxmp@xml macro.

```
\newcommand*{\hyxmp@add@to@xml}[1]{%
  \bgroup
    \@tempcnta=0
    \loop
      \lccode\@tempcnta=\@tempcnta
      \advance\@tempcnta by 1
      \ifnum\@tempcnta<256
    \repeat
    \lccode`\_=`\ \relax
    \lowercase{\xdef\hyxmp@xml{\hyxmp@xml#1}}%
  \egroup
}
```

\hyxmp@hash

Define a category-code 11 ("other") version of the "#" character.

```
\bgroup
\catcode`\#=11
\gdef\hyxmp@hash{#}
```

```
\egroup
```

`\hyxmp@padding` `\hyxmp@xml` The XMP specification recommends leaving approximately 2000 bytes of whitespace at the end of each XMP packet to facilitate editing the packet in place [3]. `\hyxmp@padding` is defined to contain 32 lines of 50 spaces and a newline apiece for a total of 1632 characters of whitespace.

```
\bgroup
  \xdef\hyxmp@xml{}%
  \hyxmp@add@to@xml{%
_____________________________________________________^^J%
  }
  \xdef\hyxmp@padding{\hyxmp@xml}%
\egroup
\xdef\hyxmp@padding{\hyxmp@padding\hyxmp@padding}
\xdef\hyxmp@padding{\hyxmp@padding\hyxmp@padding}
\xdef\hyxmp@padding{\hyxmp@padding\hyxmp@padding}
\xdef\hyxmp@padding{\hyxmp@padding\hyxmp@padding}
\xdef\hyxmp@padding{\hyxmp@padding\hyxmp@padding}
```

`\hyxmp@today` Define today's date in *YYYY-MM-DD* format.

```
\xdef\hyxmp@today{\the\year}%
\ifnum\month<10
  \xdef\hyxmp@today{\hyxmp@today-0\the\month}%
\else
  \xdef\hyxmp@today{\hyxmp@today-\the\month}%
\fi
\ifnum\day<10
  \xdef\hyxmp@today{\hyxmp@today-0\the\day}%
\else
  \xdef\hyxmp@today{\hyxmp@today-\the\day}%
\fi
```

3.5.2 The Adobe PDF schema

`\hyxmp@pdf@schema` Add properties defined by the Adobe PDF schema to the `\hyxmp@xml` macro.

```
\newcommand*{\hyxmp@pdf@schema}{%
```

`\hyxmp@have@any` Include an Adobe PDF schema block if at least one of `\@pdfkeywords` and `\@pdfproducer` is defined.

```
  \let\hyxmp@have@any=!%
  \ifx\@pdfkeywords\@empty
    \ifx\@pdfproducer\@empty
      \let\hyxmp@have@any=\@empty
    \fi
  \fi
  \ifx\hyxmp@have@any\@empty
  \else
```

Add a block of XML to \hyxmp@xml that lists the document's keywords (the pdf:Keywords property) and the tools used to produce the PDF file (the pdf:Producer property).

```
    \hyxmp@add@to@xml{%
______<rdf:Description rdf:about=""^^J%
__________xmlns:pdf="http://ns.adobe.com/pdf/1.3/">^^J%
    }%
    \ifx\@pdfkeywords\@empty
    \else
      \hyxmp@xmlify{\@pdfkeywords}%
      \hyxmp@add@to@xml{%
__________<pdf:Keywords>\hyxmp@xmlified</pdf:Keywords>^^J%
      }%
    \fi
    \ifx\@pdfproducer\@empty
    \else
      \hyxmp@xmlify{\@pdfproducer}%
      \hyxmp@add@to@xml{%
__________<pdf:Producer>\hyxmp@xmlified</pdf:Producer>^^J%
      }%
    \fi
    \hyxmp@add@to@xml{%
______</rdf:Description>^^J%
    }%
  \fi
}
```

3.5.3 The Dublin Core schema

\hyxmp@rdf@dc Given a Dublin Core property (#1) and a macro containing some \pdfstringdef-defined text (#2), append the appropriate block of XML to the \hyxmp@xml macro but only if #2 is non-empty.

```
\newcommand*{\hyxmp@rdf@dc}[2]{%
  \ifx#2\@empty
  \else
    \hyxmp@xmlify{#2}%
    \hyxmp@add@to@xml{%
_________<dc:#1>^^J%
_____________<rdf:Alt>^^J%
_________________<rdf:li xml:lang="\@pdfmetalang">\hyxmp@xmlified</rdf:li>^^J%
_____________</rdf:Alt>^^J%
_________</dc:#1>^^J%
    }%
  \fi%
}%
```

\hyxmp@list@to@xml Given a Dublin Core property (#1), an RDF array (#2), and a macro containing a comma-separated list (#3), append the appropriate block of XML to the \hyxmp@xml macro but only if #3 is non-empty.

```
\newcommand*{\hyxmp@list@to@xml}[3]{%
  \ifx#3\@empty
  \else
    \hyxmp@add@to@xml{%
__________<dc:#1>^^J%
____________<rdf:#2>^^J%
    }%
    \bgroup
```

`\hyxmp@text` `\@elt` We store the comma-separated list in `\hyxmp@text` so we can re-encode it from Unicode if necessary. We then redefine `\@elt` to XML-ify each element of the list and append it to `\hyxmp@xmlified`.

```
      \edef\hyxmp@text{#3}%
      \ifHy@unicode
        \hyxmp@reencode\hyxmp@text
      \fi
      \hyxmp@commas@to@list\hyxmp@list{\hyxmp@text}%
      \def\@elt##1{%
        \hyxmp@xmlify{##1}%
        \hyxmp@add@to@xml{%
________________<rdf:li>\hyxmp@xmlified</rdf:li>^^J%
        }%
      }%
      \hyxmp@list
    \egroup
    \hyxmp@add@to@xml{%
____________</rdf:#2>^^J%
__________</dc:#1>^^J%
    }%
  \fi
}
```

`\hyxmp@dc@schema` Add properties defined by the Dublin Core schema to the `\hyxmp@xml` macro. Specifically, we add entries for the dc:title property if the author specified a `pdftitle`, the dc:description property if the author specified a `pdfsubject`, the dc:rights property if the author specified a `pdfcopyright`, the dc:creator property if the author specified a `pdfauthor`, and the dc:subject property if the author specified `pdfkeywords`. We also specify the dc:date property using the date the document was run through LaTeX.

```
\newcommand*{\hyxmp@dc@schema}{%
  \hyxmp@add@to@xml{%
______<rdf:Description rdf:about=""^^J%
____________xmlns:dc="http://purl.org/dc/elements/1.1/">^^J%
__________<dc:format>application/pdf</dc:format>^^J%
  }%
  \hyxmp@rdf@dc{title}{\@pdftitle}%
  \hyxmp@rdf@dc{description}{\@pdfsubject}%
  \hyxmp@rdf@dc{rights}{\@pdfcopyright}%
  \hyxmp@list@to@xml{creator}{Seq}{\@pdfauthor}%
```

```
  \hyxmp@list@to@xml{subject}{Bag}{\@pdfkeywords}%
  \hyxmp@list@to@xml{date}{Seq}{\hyxmp@today}%
  \hyxmp@add@to@xml{%
______</rdf:Description>^^J%
  }%
}
```

3.5.4 The XMP Rights Management schema

`\hyxmp@xapRights@schema` Add properties defined by the XMP Rights Management schema to the `\hyxmp@xml` macro. Currently, these are only the xapRights:Marked property and the xapRights:WebStatement property and only if the author defined a `pdflicenseurl`.

```
\newcommand*{\hyxmp@xapRights@schema}{%
  \ifx\@pdflicenseurl\@empty
  \else
    \hyxmp@xmlify{\@pdflicenseurl}%
    \hyxmp@add@to@xml{%
______<rdf:Description rdf:about=""^^J%
__________xmlns:xapRights="http://ns.adobe.com/xap/1.0/rights/">^^J%
_________<xapRights:Marked>True</xapRights:Marked>^^J%
_________<xapRights:WebStatement>\hyxmp@xmlified</xapRights:WebStatement>^^J%
______</rdf:Description>^^J%
    }%
  \fi
}
```

3.5.5 The XMP Media Management schema

`\hyxmp@mm@schema` Add properties defined by the XMP Media Management schema to the `\hyxmp@xml` macro. According to the XMP specification, the xapMM:DocumentID property is supposed to uniquely identify a document, and the xapMM:InstanceID property is supposed to change with each save operation [3]. As seen in Section 3.4, we do what we can to honor this intention from within a TEX-based workflow.

```
\gdef\hyxmp@mm@schema{%
  \hyxmp@def@DocumentID
  \hyxmp@def@InstanceID
  \hyxmp@add@to@xml{%
______<rdf:Description rdf:about=""^^J%
____________xmlns:xapMM="http://ns.adobe.com/xap/1.0/mm/">^^J%
_________<xapMM:DocumentID>\hyxmp@DocumentID</xapMM:DocumentID>^^J%
_________<xapMM:InstanceID>\hyxmp@InstanceID</xapMM:InstanceID>^^J%
______</rdf:Description>^^J%
  }%
}
```

3.5.6 The Photoshop schema

\hyxmp@photoshop@schema
\hyxmp@photoshop@data

Add properties defined by the Photoshop schema to the \hyxmp@xml macro. We support only the photoshop:AuthorsPosition and photoshop:CaptionWriter properties, as that's all that Adobe Acrobat currently displays.

```
\gdef\hyxmp@photoshop@schema{%
  \edef\hyxmp@photoshop@data{\@pdfauthortitle\@pdfcaptionwriter}%
  \ifx\hyxmp@photoshop@data\@empty
  \else
    \hyxmp@add@to@xml{%
______<rdf:Description rdf:about=""^^J%
____________xmlns:photoshop="http://ns.adobe.com/photoshop/1.0/">^^J%
    }%
  \fi

  \ifx\@pdfauthortitle\@empty
  \else
    \hyxmp@xmlify{\@pdfauthortitle}%
    \hyxmp@add@to@xml{%
_________<photoshop:AuthorsPosition>\hyxmp@xmlified</photoshop:AuthorsPosition>^^J%
    }%
  \fi

  \ifx\@pdfcaptionwriter\@empty
  \else
    \hyxmp@xmlify{\@pdfcaptionwriter}%
    \hyxmp@add@to@xml{%
_________<photoshop:CaptionWriter>\hyxmp@xmlified</photoshop:CaptionWriter>^^J%
    }%
  \fi

  \ifx\hyxmp@photoshop@data\@empty
  \else
    \hyxmp@add@to@xml{%
______</rdf:Description>^^J%
    }%
  \fi
}
```

3.5.7 Constructing the XMP packet

\hyxmp@construct@packet
\hyxmp@xml

Successively add XML data to \hyxmp@xml until we have something we can insert into the document's PDF catalog. The XMP specification states that the argument to the begin attribute is supposed to be "the Unicode character U+FEFF used as a byte-order marker" [3], so that's what we use, although inserted as the 8-bit character sequence $\langle EF\rangle\langle BB\rangle\langle BF\rangle$. We explicitly mark those characters as character code 12 ("letter") because the inputenc package re-encodes them as character code 13 ("active"), which causes LaTeX to abort with an "Undefined control sequence" error upon invoking \hyxmp@construct@packet.

```
\bgroup
```

```
\catcode`\^^ef=12
\catcode`\^^bb=12
\catcode`\^^bf=12
\gdef\hyxmp@construct@packet{%
  \gdef\hyxmp@xml{}%
  \hyxmp@add@to@xml{%
<?xpacket begin="^^ef^^bb^^bf" id="W5M0MpCehiHzreSzNTczkc9d"?>^^J%
<x:xmpmeta xmlns:x="adobe:ns:meta/" x:xmptk="3.1-702">^^J%
___<rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns\hyxmp@hash">^^J%
  }%
  \hyxmp@pdf@schema
  \hyxmp@xapRights@schema
  \hyxmp@dc@schema
  \hyxmp@photoshop@schema
  \hyxmp@mm@schema
  \hyxmp@add@to@xml{%
___</rdf:RDF>^^J%
</x:xmpmeta>^^J%
\hyxmp@padding
<?xpacket end="w"?>^^J%
  }%
}
\egroup
```

3.6 Embedding the XMP packet

The PDF specification says that "a metadata stream may be attached to a document through the Metadata entry in the document catalogue" [2] so that's what we do here.

`\hyxmp@embed@packet` `\hyxmp@driver` Determine which hyperref driver is in use and invoke the appropriate embedding function.

```
\newcommand*{\hyxmp@embed@packet}{%
  \hyxmp@construct@packet
  \def\hyxmp@driver{hpdftex}%
  \ifx\hyxmp@driver\Hy@driver
    \hyxmp@embed@packet@pdftex
  \else
    \def\hyxmp@driver{hdvipdfm}%
    \ifx\hyxmp@driver\Hy@driver
      \hyxmp@embed@packet@dvipdfm
    \else
      \def\hyxmp@driver{hxetex}%
      \ifx\hyxmp@driver\Hy@driver
        \hyxmp@embed@packet@xetex
      \else
        \@ifundefined{pdfmark}{%
          \PackageWarningNoLine{hyperxmp}{%
            Unrecognized hyperref driver `\Hy@driver'.\MessageBreak
```

```
            \jobname.tex's XMP metadata will *not* be\MessageBreak
            embedded in the resulting file}%
        }{%
          \hyxmp@embed@packet@pdfmark
        }%
      \fi
    \fi
  \fi
}
```

3.6.1 Embedding using pdfTeX

`\hyxmp@embed@packet@pdftex` Embed the XMP packet using pdfTeX primitives.

```
\newcommand*{\hyxmp@embed@packet@pdftex}{%
  \bgroup
    \pdfcompresslevel=0
    \immediate\pdfobj stream attr {%
      /Type /Metadata
      /Subtype /XML
    }{\hyxmp@xml}%
    \pdfcatalog {/Metadata \the\pdflastobj\space 0 R}%
  \egroup
}
```

3.6.2 Embedding using any pdfmark-based backend

`\hyxmp@embed@packet@pdfmark` Embed the XMP packet using hyperref's `\pdfmark` command. I believe `\pdfmark` is used by the `dvipdf`, `dvipsone`, `dvips`, `dviwindo`, `nativepdf`, `pdfmark`, `ps2pdf` `textures`, and `vtexpdfmark` options to hyperref but I've tested only a few of those.

```
\newcommand*{\hyxmp@embed@packet@pdfmark}{%
  \pdfmark{%
    pdfmark=/OBJ,
    Raw={/_objdef \string{hyxmp@Metadata\string} /type /stream}%
  }%
  \pdfmark{%
    pdfmark=/PUT,
    Raw={\string{hyxmp@Metadata\string}%
      <<
        /Type /Metadata
        /Subtype /XML
      >>
    }%
  }%
  \pdfmark{%
    pdfmark=/PUT,
    Raw={\string{hyxmp@Metadata\string} (\hyxmp@xml)}%
  }%
  \pdfmark{%
    pdfmark=/CLOSE,
```

```
    Raw={\string{hyxmp@Metadata\string}}%
  }%
```

Adobe's pdfmark reference indicates that a metadata stream should be added to the document catalog by specifying the Metadata pdfmark [1]. However, earlier versions of Adobe Acrobat Distiller (pre-6.0) and Ghostscript ignored Metadata but honored PUT so that's what versions of hyperxmp prior to 1.3 used. As all current PostScript-to-PDF generators seem to honor the Metadata pdfmark, hyperxmp now uses that mechanism to point the document catalog to our metadata stream.

```
  \pdfmark{%
    pdfmark=/Metadata,
    Raw={\string{Catalog\string}%
      <<
        /Metadata \string{hyxmp@Metadata\string}%
      >>
    }%
  }%
}
```

3.6.3 Embedding using dvipdfm

\hyxmp@embed@packet@dvipdfm Embed the XMP packet using dvipdfm-specific \special commands. Note that dvipdfm rather irritatingly requires us to count the number of characters in the \hyxmp@xml stream ourselves.

```
\newcommand*{\hyxmp@embed@packet@dvipdfm}{%
  \hyxmp@string@len{\hyxmp@xml}%
  \special{pdf: object @hyxmp@Metadata
    <<
      /Type /Metadata
      /Subtype /XML
      /Length \the\@tempcnta
    >>
    stream^^J\hyxmp@xml endstream%
  }%
  \special{pdf: docview
    <<
      /Metadata @hyxmp@Metadata
    >>
  }%
}
```

\hyxmp@string@len Set \@tempcnta to the number of characters in a given string (#1). The approach is first to tally the number of space characters then to tally the number of non-space characters. While this is rather sloppy I haven't found a better way to achieve the same effect, especially given that all of the characters in #1 have already been assigned their category codes.

```
\newcommand*{\hyxmp@string@len}[1]{%
  \@tempcnta=0
```

```
  \expandafter\hyxmp@count@spaces#1 {} %
  \expandafter\hyxmp@count@non@spaces#1{}%
}
```

`\hyxmp@count@spaces` Count the number of spaces in a given string. We rely on the built-in pattern matching of TEX's `\def` primitive to pry one word at a time off the head of the input string.

```
\def\hyxmp@count@spaces#1 {%
  \def\hyxmp@one@token{#1}%
  \ifx\hyxmp@one@token\@empty
    \advance\@tempcnta by -1
  \else
    \advance\@tempcnta by 1
    \expandafter\hyxmp@count@spaces
  \fi
}
```

`\hyxmp@count@non@spaces` Count the number of non-spaces in a given string. Ideally, we'd count both spaces and non-spaces but `\TeX` won't bind `#1` to a space character (category code 10). Hence, in each iteration, `#1` is bound to the next non-space character only.

```
\newcommand*{\hyxmp@count@non@spaces}[1]{%
  \def\hyxmp@one@token{#1}%
  \ifx\hyxmp@one@token\@empty
  \else
    \advance\@tempcnta by 1
    \expandafter\hyxmp@count@non@spaces
  \fi
}
```

3.6.4 Embedding using XeTeX

`\hyxmp@embed@packet@xetex` Embed the XMP packet using `xdvipdfmx`-specific `\special` commands. I don't know how to tell `xdvipdfmx` always to leave the Metadata stream uncompressed, so the XMP metadata is likely to be missed by non-PDF-aware XMP viewers.

```
\newcommand*{\hyxmp@embed@packet@xetex}{%
  \special{pdf:stream @hyxmp@Metadata (\hyxmp@xml)
    <<
      /Type /Metadata
      /Subtype /XML
    >>
  }%
  \special{pdf:put @catalog
    <<
      /Metadata @hyxmp@Metadata
    >>
  }%
}
```

3.7 Final clean-up

Having saved the category code of " " at the start of the package code (Section 3.1), we now restore that character's original category code.

```
608 \catcode`\"=\hyxmp@dq@code
```

References

[1] Adobe Systems, Inc., San Jose, California. *Adobe Acrobat X SDK Help, pdfmark Reference*. Available from `http://www.adobe.com/devnet/acrobat/documentation.html`.

[2] Adobe Systems, Inc., San Jose, California. *Document Management—Portable Document Format—Part 1: PDF 1.7*, July 2008. ISO 32000-1 standard document. Available from `http://wwwimages.adobe.com/www.adobe.com/content/dam/Adobe/en/devnet/pdf/pdfs/PDF32000_2008.pdf`.

[3] Adobe Systems, Inc., San Jose, California. *XMP Specification Part 1: Data model, Serialization, and Core Properties*, July 2010. Available from `http://wwwimages.adobe.com/www.adobe.com/content/dam/Adobe/en/devnet/xmp/pdfs/XMPSpecificationPart1.pdf`.

[4] Michael Downes. Around the bend #15, answers, 4th (last) installment. `comp.text.tex` newsgroup posting, January 3, 1994. Archived by Google at `http://groups.google.com/group/comp.text.tex/msg/7da7643b9e8f3b48`.

[5] Internet Assigned Numbers Authority. Language subtag registry, January 11, 2011. Available from `http://www.iana.org/assignments/language-subtag-registry`.

Change History

\hyxmp@reencode: Introduced this macro to re-encode Unicode strings as 8-bit strings before manipulating them into XMP schema. This change addresses a bug reported by Martin Münch 12

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Numbers written in italic refer to the page where the corresponding entry is described; numbers underlined refer to the code line of the definition; numbers in roman refer to the code lines where the entry is used.