

The hyperxmp package^{*}

Scott Pakin
scott+hyxmp@pakin.org

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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 [4]—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` v2.8, dated 2016/04/05.

```

</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`)
- base URL (`xmp:BaseURL`)
- contact address (`lptc4xmpCore:CreatorContactInfo/CiAdrExtadr`,
`lptc4xmpCore:CreatorContactInfo/CiAdrCity`,
`lptc4xmpCore:CreatorContactInfo/CiAdrRegion`,
`lptc4xmpCore:CreatorContactInfo/CiAdrPcode`, and
`lptc4xmpCore:CreatorContactInfo/CiAdrCtry`)
- contact email address(es) (`lptc4xmpCore:CreatorContactInfo/CiEmailWork`)
- contact telephone number(s) (`lptc4xmpCore:CreatorContactInfo/CiTelWork`)
- contact URL(s) (`lptc4xmpCore:CreatorContactInfo/CiUrlWork`)
- copyright (`dc:rights` and `xmpRights:Marked`)
- date (`dc:date`, `xmp:CreateDate`, `xmp:ModifyDate`, and `xmp:MetadataDate`)
- document identifier (`xmpMM:DocumentID`)
- document instance identifier (`xmpMM:InstanceID`)
- file format (`dc:format`)
- keywords (`pdf:Keywords` and `dc:subject`)
- language (`dc:language`)
- L^AT_EX file name (`dc:source`)
- license URL (`xmpRights:WebStatement`)
- metadata writer (`photoshop:CaptionWriter`)

- PDF version (`pdf:PDFVersion`)
- PDF-generating tool (`pdf:Producer` and `xmp:CreatorTool`)
- PDF/A compliance level and version (`pdfaid:part` and `pdfaid:conformance`)
- 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` works by postprocessing some of the package options honored by `hyperref`. To use `hyperxmp`, merely put a `\usepackage{hyperxmp}` in your document's preamble. That line can appear anywhere before the `hyperref` PDF options are specified (i.e., with either `\usepackage[...]{hyperref}` or `\hypersetup{...}`). `hyperxmp` will construct its XMP data using the following `hyperref` options:

- `baseurl`
- `pdfauthor`
- `pdfkeywords`
- `pdflang`
- `pdfproducer`
- `pdfsubject`

- `pdftitle`

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

- `pdfauthortitle`
- `pdfcaptionwriter`
- `pdfcontactaddress`
- `pdfcontactcity`
- `pdfcontactcountry`
- `pdfcontactemail`
- `pdfcontactphone`
- `pdfcontactpostcode`
- `pdfcontactregion`
- `pdfcontacturl`
- `pdfcopyright`
- `pdfdate`
- `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. The next eight items describe how to contact the person or institution responsible for the document (the “contact”). `pdfcontactaddress` is the contact’s street address and can include the institution name if the contact is an institution; `pdfcontactcity` is the contact’s city. `pdfcontactcountry` is the contact’s country; `pdfcontactemail` is the contact’s email address (or multiple, comma-separated email addresses); `pdfcontactphone` is the contact’s telephone number (or multiple, comma-separated telephone numbers); `pdfcontactpostcode` is the contact’s postal code; `pdfcontactregion` is the contact’s state or province; and `pdfcontacturl` is the contact’s URL (or multiple, comma-separated URLs).

`pdfcopyright` defines the copyright text. `pdfdate` specifies the document date. It is analogous to the `LATEX` `\date` command, and, like `\date`, defaults to the date the document was built. However, `pdfdate` must be specified in `YYYY-MM-DDThh:mm:ss.ff+TT:tt` format as per the W3C’s recommendation [11]. For example, 14 hours, 15 minutes, 9.26 seconds past midnight U.S. Mountain Daylight Time (UTC-6) on the 23rd day of September in the year 2014 should be written as `2014-09-23T14:15:09.26-06:00`. This can be truncated

to 2014-09-23T14:15:09-06:00 or 2014-09-23T14:15-06:00 or 2014-09-23 or 2014-09 or 2014 but no other subsets. `hyperxmp` does not validate `pdfdate`'s argument, but an invalid format may confuse a PDF reader.

`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 [7], 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 only “x-default” as the metadata language. Note that “x-default” metadata is always included in addition to the specified metadata language, as the user reading the document may not have specified a language preference.

It is 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 L^AT_EX 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}
\date{March 17, 1905}
\hypersetup{%
  pdftitle={%
    On a heuristic viewpoint concerning the production and
    transformation of light},
  pdfauthor={Albert Einstein},
  pdfauthortitle={Technical Assistant, Level III},
  pdfdate={1905-03-17},
  pdfcopyright={Copyright (C) 1905, Albert Einstein},
  pdfsubject={photoelectric effect},
  pdfkeywords={energy quanta, Hertz effect, quantum physics},
  pdflicenseurl={http://creativecommons.org/licenses/by-nc-nd/3.0/},
  pdfcaptionwriter={Scott Pakin},
  pdfcontactaddress={Kramgasse 49},
  pdfcontactcity={Bern},
  pdfcontactpostcode={3011},
  pdfcontactcountry={Switzerland},
  pdfcontactphone={031 312 00 91},
  pdfcontactemail={aeinstein@ipi.ch},
  pdfcontacturl={%
    http://einstein.biz/,
    https://www.facebook.com/AlbertEinstein
  },
  pdflang={en},
```

```

    baseurl={http://mirror.ctan.org/macros/latex/contrib/hyperxmp/}
}
\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:

- pdf \LaTeX
- Lua \LaTeX
- \LaTeX + Dvipdfm
- \LaTeX + Dvips + Adobe Acrobat Distiller
- Xe \LaTeX

Unfortunately, the \LaTeX + Dvips + Ghostscript path doesn't work. Ghostscript bug report #690066, closed with "WONTFIX" status on 2012-05-28, explains that Ghostscript doesn't honor the Metadata tag needed to inject a custom XMP packet. Instead, Ghostscript fabricates an XMP packet of its own based on the metadata it finds in the PDF file's Info dictionary (Author, Title, Subject, and Keywords).

Once the document is compiled, the resulting PDF file will contain an XMP packet that looks something like that shown in Appendix A. Figure 1 is a screenshot of the XMP metadata as it appears in Adobe Acrobat's "Advanced" metadata dialog box. Further clicking on the "Advanced" item within that dialog box displays all of the document's metadata sorted by schema as shown in Figure 2.

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.

`\XMPTruncateList` The `hyperxmp` package provides a workaround for this bug in the form of the `\XMPTruncateList` macro. `\XMPTruncateList` takes the name of a list (a `hyperref`

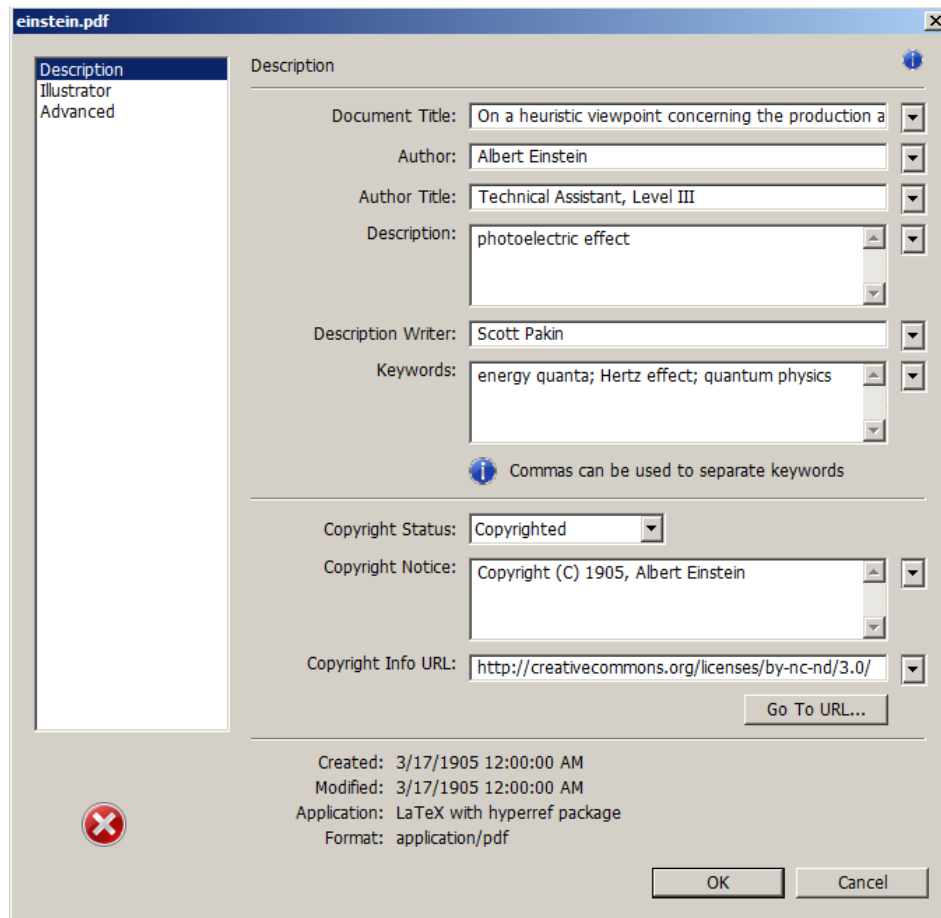


Figure 1: XMP metadata as it appears in Adobe Acrobat

option name) and replaces the list with the value of its first element. Currently, the only meaningful usage is to put

```
\XMPTruncateList{pdfauthor}
```

in your document’s preamble. This 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.

Note 2: Acrobat multiline-field bug The IPTC Photo Metadata schema states that “the [contact] address is a multiline field” [6]. `hyperxmp` converts commas in `pdfcontactaddress`’s argument to line breaks in the generated XML.

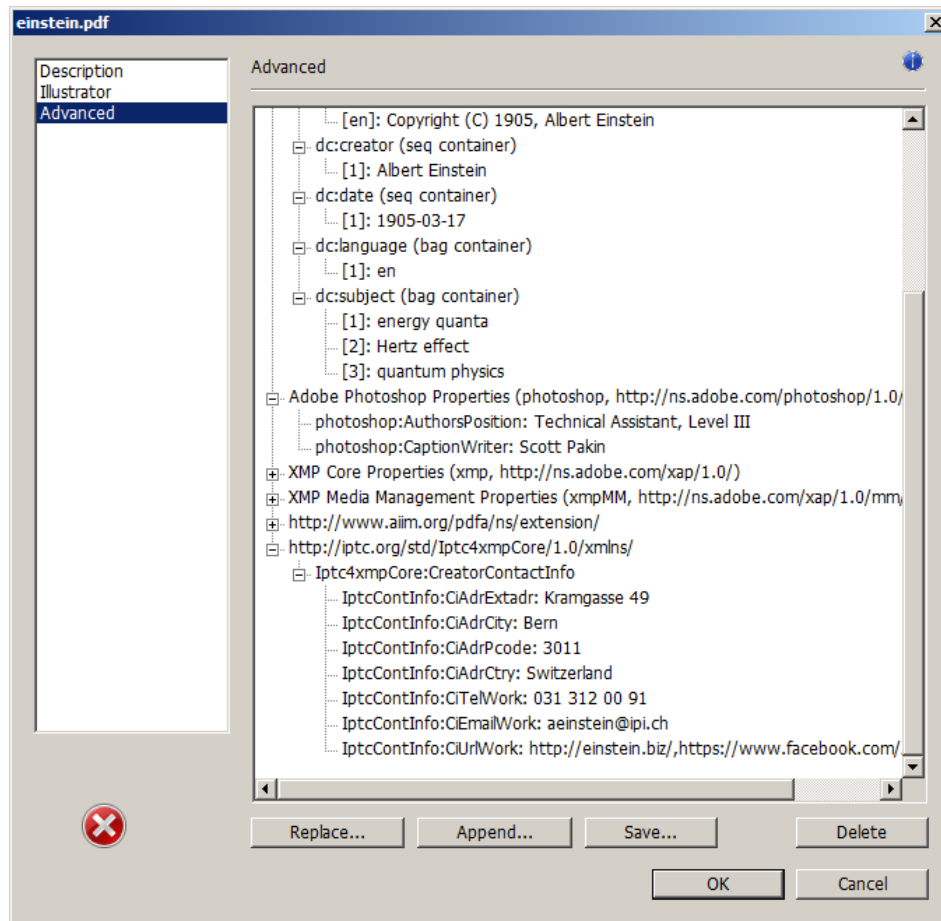


Figure 2: Additional XMP metadata as it appears in Adobe Acrobat

Unfortunately, A bug in Adobe Acrobat—at least in versions 10.0.1 and earlier—causes that PDF reader to discard line breaks in the contact address. Interestingly, Adobe Illustrator CS5 correctly displays the contact address. If you find Adobe Acrobat’s behavior bothersome, you can redefine the `\xmplinesep` macro as a string to use as an address-line separator. For example, the following replaces all commas appearing in `pdfcontactaddress`’s argument with semicolons:

```
\renewcommand*{\xmplinesep}{;}
```

Note 3: \LaTeX object compression \LaTeX (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. Three

options to consider are to (1) use a different program (e.g., Lua \LaTeX), (2) pass the `--output-driver="xdvipdfmx -z0"` option to \TeX to instruct `xdvipdfmx` to turn off all compression (which will of course make the PDF file substantially larger), or (3) postprocess the generated PDF file by loading it into the commercial version of Adobe Acrobat and re-saving it with the Save As... menu option.

Note 4: 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 examples 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}`

`\xmpcomma` `\xmpquote` If you need to include a literal comma within an author or keyword list (where commas normally separate list items) or a street address (where commas normally separate lines), use the `\xmpcomma` macro to represent it, and wrap the entire entry containing the comma within `\xmpquote{...}` as shown below:

```
pdfauthor={\xmpquote{Jack Napier\xmpcomma\ Jr.},
           \xmpquote{Edward Nigma\xmpcomma\ PhD},
           \xmpquote{Harvey Dent\xmpcomma\ Esq.}}

pdfcontactaddress={Office of the President,
                   \xmpquote{Wayne Enterprises\xmpcomma\ Inc.},
                   One Wayne Blvd}
```

As of version 2.2 of `hyperxmp`, it is acceptable to use `\xmpcomma` and `\xmpquote` within any `hyperxmp` option, not just in those in which a comma normally serves as a separator (i.e., lists and multiline fields). Outside of cases in which a comma serves as a separator, `\xmpcomma` is treated as an ordinary comma, and `\xmpquote` returns its argument unmodified. Hence, it is legitimate to use `\xmpcomma` and `\xmpquote` in cases like the following

```
pdfauthor={\xmpquote{Psychiatrist\xmpcomma\ Arkham Asylum}}
```

(Like most `hyperxmp` options, `pdfauthor` inserts its argument unmodified in an XMP tag.) When in doubt, use `\xmpcomma` and `\xmpquote`; it should always be safe to do so.

`\xmptilde` Version 2.4 of `hyperxmp` introduces a convenience macro called `\xmptilde`. `\xmptilde` expands to a literal tilde character instead of the nonbreaking space that “~” normally represents. Use it to represent URLs such as `http://www.pakin.org/~scott/` (“`http://www.pakin.org/\xmptilde scott/`”) in options such as `baseurl`, `pdfcontacturl` and `pdflicenseurl`.

Note 5: Unicode support Unicode support is provided via the `hyperref` package. If you specify `unicode=true` either as a `hyperref` option or as an argument to the `\hypersetup` command, the document can include Unicode characters in its XMP fields.

Note 6: Automatically specified metadata `pdftitle` defaults to the document’s title as specified by `\title{...}`. `pdfauthor` defaults to the document’s author(s) as specified by `\author{...}`. `pdfdate` defaults to the current date and time. `pdfmetalang` defaults to the same value as `pdflang` if non-empty, “x-default” otherwise. An implication of automatic metadata specification is that an author can simply include `\usepackage{hyperxmp}` in a document’s preamble and benefit from a modicum of XMP metadata with no additional effort.

3 Implementation

This section presents the commented L^AT_EX 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).

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

`\hyxmp@at@end` The `\hyxmp@at@end` macro includes code at the end of the document. For pdfT_EX, the standard `\AtEndDocument` works well enough. For all the other backends we use `\AtEndDvi` from the `atenddvi` package, which is more robust but requires an addition L^AT_EX run.

`\hyxmp@driver`

```
3 \def\hyxmp@driver{hpdfTeX}
4 \ifx\hyxmp@driver\Hy@driver
5   \let\hyxmp@at@end=\AtEndDocument
6 \else
7   \RequirePackage{atenddvi}
8   \let\hyxmp@at@end=\AtEndDvi
9 \fi
```

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 `hyperref`’s `baseurl`, `pdfauthor`, `pdfkeywords`, `pdflang`, `pdfproducer`, `pdfsubject`,

and `pdftitle` options. It also introduces a number of new options, which are listed on page 4. For consistency with `hyperref`’s document-metadata naming conventions (which are in turn based on L^AT_EX’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 a bunch of helper packages: `koptions` for package-option processing, `pdfescape` and `stringenc` for re-encoding Unicode strings, `intcalc` for performing integer calculations (division and modulo), and `ifxetex` for detecting X_YL^AT_EX.

```
10 \RequirePackage{koptions}
11 \RequirePackage{pdfescape}
12 \RequirePackage{stringenc}
13 \RequirePackage{intcalc}
14 \RequirePackage{ifxetex}
```

`\hyxmp@pdfstringdef` Because `hyperxmp` uses underscores to represent hard spaces, we need “_” to map
`\hyxmp@textunderscore` initially to something other than an underscore, in particular the ASCII NAK (`^U`) character. To accomplish this, we wrap `hyperref`’s `\pdfstringdef` macro with our own version that temporarily does the proper substitution. Later in the execution, after underscores have been replaced with spaces, we replace NAK characters with underscores.

```
15 \newcommand{\hyxmp@pdfstringdef}[2]{%
16   \let\hyxmp@textunderscore=\textunderscore
17   \let\textunderscore=\hyxmp@uscore
18   \pdfstringdef{#1}{#2}%
19   \let\textunderscore=\hyxmp@textunderscore
20 }
```

`\@pdfdatetime` Prepare to store the document’s date and (optionally) time.

```
21 \def\@pdfdatetime{}
22 \define@key{Hyp}{pdfdate}{\hyxmp@pdfstringdef\@pdfdatetime{#1}}
```

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

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

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

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

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

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

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

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

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

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

The following eight macros—`\pdfcontactaddress`, `\pdfcontactcity`, `\pdfcontactregion`, `\pdfcontactpostcode`, `\pdfcontactcountry`, `\pdfcontactphone`, `\pdfcontactemail`, and `\pdfcontacturl`—together specify how to contact the person or institution responsible for the document.

`\pdfcontactaddress` Prepare to store a street address for the document’s contact person/institution. The IPTC standard defines this as follows:

The contact information address part. Comprises an optional company name and all required information to locate the building or postbox to which mail should be sent. To that end, the address is a multiline field.

For consistency with the rest of `hyperxmp`, we use commas to separate terms, in this case, lines of the address. The author can use `\xmpquote` and `\xmpcomma` to include literal commas.

```
33 \def\pdfcontactaddress{}
34 \define@key{Hyp}{pdfcontactaddress}{%
35   \let\xmpcomma=\hymp@comma
36   \def\xmpquote##1{##1}%
37   \hymp@pdfstringdef\pdfcontactaddress{#1}%
38   \def\xmpcomma{,}%
39   \let\xmpquote=\relax
40 }
```

`\pdfcontactcity` Prepare to store the city of the document’s contact person/institution.

```
41 \def\pdfcontactcity{}
42 \define@key{Hyp}{pdfcontactcity}{\hymp@pdfstringdef\pdfcontactcity{#1}}
```

`\pdfcontactregion` Prepare to store the state or province of the document’s contact person/institution.

```
43 \def\pdfcontactregion{}
44 \define@key{Hyp}{pdfcontactregion}{\hymp@pdfstringdef\pdfcontactregion{#1}}
```

`\pdfcontactpostcode` Prepare to store the postal code of the document’s contact person/institution.

```
45 \def\pdfcontactpostcode{}
46 \define@key{Hyp}{pdfcontactpostcode}{\hymp@pdfstringdef\pdfcontactpostcode{#1}}
```

`\pdfcontactcountry` Prepare to store the country of the document’s contact person/institution.

```
47 \def\pdfcontactcountry{}
48 \define@key{Hyp}{pdfcontactcountry}{\hymp@pdfstringdef\pdfcontactcountry{#1}}
```

`\pdfcontactphone` Prepare to store the telephone number of the document’s contact person/institution.

```
49 \def\pdfcontactphone{}
50 \define@key{Hyp}{pdfcontactphone}{\hymp@pdfstringdef\pdfcontactphone{#1}}
```

`\@pdfcontactemail` Prepare to store the email address of the document's contact person/institution.

```

51 \def\@pdfcontactemail{}
52 \define@key{Hyp}{pdfcontactemail}{\hyxmp@pdfstringdef\@pdfcontactemail{#1}}

```

`\@pdfcontacturl` Prepare to store the URL of the document's contact person/institution.

```

53 \def\@pdfcontacturl{}
54 \define@key{Hyp}{pdfcontacturl}{\hyxmp@pdfstringdef\@pdfcontacturl{#1}}

```

We need to capture list arguments (viz. `pdfauthor` and `pdfkeywords`) before `hyperref` converts them to `PDFDocEncoding`. Otherwise, `\xmpcomma` is permanently replaced with a comma, and we lose our ability to change it to a `\hyxmp@comma`. We therefore need to augment `hyperref`'s option processing with our own. Because `hyperref` has not yet been loaded we need to ensure that our augmentation gets loaded in the future: after the `\usepackage{hyperref}` but before options are passed to that package.

For lack of a better approach, `hyperxmp` redefines `\ProcessKeyvalOptions` to alter the way `hyperref` processes `pdfauthor` and `pdfkeywords`. This is somewhat heavy-handed as it gets executed for *every* subsequently loaded package that uses `\ProcessKeyvalOptions`, but at least it does what we need. `hyperxmp` also redefines `\hypersetup` to do the same thing. This is required in case `hyperref` is loaded before `hyperxmp`.

`\hyxmp@pdfauthor` Prepare to store the name of the author and a list of keywords.

`\hyxmp@pdfkeywords`

```

55 \def\hyxmp@pdfauthor{}
56 \def\hyxmp@pdfkeywords{}

```

`\hyxmp@redefine@Hyp` If not already redefined, redefine `hyperref`'s `pdfauthor` and `pdfkeywords` options to properly handle `\xmpcomma` and `\xmpquote`.

```

57 \newcommand*{\hyxmp@redefine@Hyp}{%

```

`\hyxmp@Hyp@pdfauthor` Store the old definition of `\KV@Hyp@pdfauthor` in `\hyxmp@Hyp@pdfauthor`, but only if we see that `\KV@Hyp@pdfauthor` is defined and `\hyxmp@Hyp@pdfauthor` isn't. Otherwise, we'd be defining `\hyxmp@Hyp@pdfauthor` in terms of itself and creating an infinite loop.

```

58 \ifundefined{KV@Hyp@pdfauthor}{}{%
59   \ifundefined{hyxmp@Hyp@pdfauthor}{%
60     \expandafter\let\expandafter\hyxmp@Hyp@pdfauthor
61       \csname KV@Hyp@pdfauthor\endcsname
62   }{}%
63 }%

```

`\KV@Hyp@pdfauthor` Redefine `\KV@Hyp@pdfauthor` to process its argument twice. The first time, `\xmpcomma` is defined as a placeholder character (`\hyxmp@comma`) and `\xmpquote` as the identity function. The result is stored in `\hyxmp@pdfauthor` for use in structured lists (those surrounding each entry with `<rdf:li>`). The second time, `\hyxmp@and` and `\and` `\xmpcomma` is defined as an ordinary comma, and `\xmpquote` is defined as a macro that puts its argument within double quotes. The result is stored in `\@pdfauthor`

`\@pdfauthor`

for use in unstructured lists (those in which the entire list appears within a single pair of tags). In case `pdfauthor` is left unspecified and we copy `\author`'s argument to `pdfauthor`, we temporarily redefine `\and` as the list separator when producing a structured list and as “and” when producing an unstructured list.

```

64 \define@key{Hyp}{pdfauthor}{%
65   \let\xmpcomma=\hyxmp@comma
66   \def\xmpquote####1{####1}%
67   \let\hyxmp@and=\and
68   \def\and{,}%
69   \hyxmp@Hyp@pdfauthor{##1}%
70   \global\let\hyxmp@pdfauthor=\@pdfauthor
71   \def\and{and\space}%
72   \def\xmpcomma{,}%
73   \def\xmpquote####1{"####1"%
74   \hyxmp@Hyp@pdfauthor{##1}%
75   \def\xmpcomma{,}%
76   \let\xmpquote=\relax
77   \let\and=\hyxmp@and
78 }%
```

`\hyxmp@Hyp@pdfkeywords` The previous block of code now repeats for the keyword list, starting by storing the old definition of `\KV@Hyp@pdfkeywords` in `\hyxmp@Hyp@pdfkeywords`.

```

79 \ifundefined{KV@Hyp@pdfkeywords}{%
80   \ifundefined{hyxmp@Hyp@pdfkeywords}{%
81     \expandafter\let\expandafter\hyxmp@Hyp@pdfkeywords
82     \csname KV@Hyp@pdfkeywords\endcsname
83   }{%
84 }%
```

`\KV@Hyp@pdfkeywords` Redefine `\KV@Hyp@pdfkeywords` to process its argument twice. The first time, `\xmpcomma` is defined as a placeholder character (`\hyxmp@comma`) and `\xmpquote` as the identity function. The result is stored in `\hyxmp@pdfkeywords` for use in structured lists (those surrounding each entry with `<rdf:li>`). The second time, `\xmpcomma` is defined as an ordinary comma, and `\xmpquote` is defined as a macro that puts its argument within double quotes. The result is stored in `\@pdfkeywords` for use in unstructured lists (those in which the entire list appears within a single pair of tags).

```

85 \define@key{Hyp}{pdfkeywords}{%
86   \let\xmpcomma=\hyxmp@comma
87   \def\xmpquote####1{####1}%
88   \hyxmp@Hyp@pdfkeywords{##1}%
89   \global\let\hyxmp@pdfkeywords=\@pdfkeywords
90   \def\xmpcomma{,}%
91   \def\xmpquote####1{"####1"%
92   \hyxmp@Hyp@pdfkeywords{##1}%
93   \def\xmpcomma{,}%
94   \let\xmpquote=\relax
95 }%
96 }
```

<code>\hyxmp@ProcessKeyvalOptions</code> <code>\ProcessKeyvalOptions</code>	<p>Redefine kvoptions's <code>\ProcessOptions</code> command to invoke <code>\hyxmp@redefine@Hyp</code> before performing its normal option processing.</p> <pre> 97 \let\hyxmp@ProcessKeyvalOptions=\ProcessKeyvalOptions 98 \renewcommand*{\ProcessKeyvalOptions}{% 99 \hyxmp@redefine@Hyp 100 \hyxmp@ProcessKeyvalOptions 101 }</pre>
<code>\hyxmp@hypersetup</code> <code>\hypersetup</code>	<p>Redefine <code>hyperref</code>'s <code>\hypersetup</code> command to invoke <code>\hyxmp@redefine@Hyp</code> before performing its normal option processing.</p> <pre> 102 \let\hyxmp@hypersetup=\hypersetup 103 \def\hypersetup{% 104 \hyxmp@redefine@Hyp 105 \hyxmp@hypersetup 106 }</pre>
<code>\hyxmp@find@metadata</code> <code>\hyxmp@concat@metadata</code>	<p>Issue a warning message if the author failed to specify any metadata at all. This excludes metadata that is included automatically such as the current timestamp. Note that we don't consider <code>\@pdfmetlang</code> as metadata as that value is meaningful only when used in conjunction with other information.</p> <pre> 107 \newcommand*{\hyxmp@find@metadata}{% 108 \edef\hyxmp@concat@metadata{% 109 \@baseurl 110 \@pdfauthor 111 \@pdfauthortitle 112 \@pdfcaptionwriter 113 \@pdfcontactaddress 114 \@pdfcontactcity 115 \@pdfcontactcountry 116 \@pdfcontactemail 117 \@pdfcontactphone 118 \@pdfcontactpostcode 119 \@pdfcontactregion 120 \@pdfcontacturl 121 \@pdfcopyright 122 \@pdfdatetime 123 \@pdfkeywords 124 \@pdflang 125 \@pdflicenseurl 126 \@pdfsubject 127 \@pdftitle 128 }% 129 \ifx\hyxmp@concat@metadata\@empty 130 \PackageWarningNoLine{hyperxmp}{% 131 \jobname.tex did not specify any metadata to\MessageBreak 132 include in the XMP packet.\space\space Please see the\MessageBreak 133 hyperxmp documentation for instructions on how to\MessageBreak 134 provide metadata values to hyperxmp}% 135 \fi</pre>

136 }

Rather than load `hyperref` ourselves 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.

```
137 \AtBeginDocument{%
138   \ifpackageloaded{hyperref}{%
```

In older versions of `hyperref`, `\pdflang` is set to `\empty` if `pdflang` is not specified. In newer versions of `hyperref`, `\pdflang` is set to `\relax` if `pdflang` is not specified. The latter is a bit problematic for `hyperxmp` because it makes `\pdflang` non-expandable, which causes a literal “`\pdflang`” to be written as XMP metadata. To avoid that situation we redefine `\pdflang` as `\empty` if we see it set to `\relax`.

```
139   \ifx\pdflang\relax
140     \let\pdflang=\empty
141   \fi
```

If the author 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.

```
142   \ifx\pdflang\empty
143     \let\pdfmetalang=\hyxmp@xdefault
144   \else
145     \edef\pdfmetalang{\pdflang}%
146   \fi
147   \hyxmp@xmlify\pdfmetalang
```

If the author explicitly specified the document date, override the compilation timestamp with the specified date.

```
148   \ifx\pdfdatetime\empty
149   \else
150     \edef\hyxmp@today{\pdfdatetime}%
151   \fi
```

If the author left `pdftitle` blank but specified `\title`, use the title for `pdftitle`. Likewise, if the author left `pdfauthor` blank but specified `\author`, use the author for `pdfauthor`.

```
152   \ifx\pdftitle\empty
153     \ifx\title\empty
154     \else
155       \hypersetup{pdftitle={\title}}%
156     \fi
157   \fi
158   \ifx\pdfauthor\empty
159     \ifx\author\empty
160     \else
161       \hypersetup{pdfauthor={\author}}%
162     \fi
163   \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`.

```

164   \hyxmp@at@end{%
165       \hyxmp@find@metadata
166       \hyxmp@embed@packet
167   }%
168 }{%
169   \PackageWarningNoLine{hyperxmp}{%
170 \jobname.tex failed to include a\MessageBreak
171 \string\usepackage\string{hyperref\string}
172 in the preamble.\MessageBreak
173 Consequently, all hyperxmp functionality will be\MessageBreak
174 disabled}%
175 }%
176 }
```

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 L^AT_EX lists (e.g., `\@elt {foo} \@elt {bar} \@elt {baz}`) that can be more easily manipulated (Section 3.3.1); trim spaces off the ends of strings (Section 3.3.2); and, in Section 3.3.3, 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 L^AT_EX `\@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.)
177 \newcommand*{\hyxmp@commas@to@list}[2]{%
178   \gdef#1{%
179     \expandafter\hyxmp@commas@to@list@i\expandafter#1#2,,%
180 }

\hyxmp@commas@to@list@i Recursively construct macro #1 from comma-separated list #2. Stop if #2 is empty.
\next
181 \def\hyxmp@commas@to@list@i#1#2,{%
182   \gdef\hyxmp@sublist{#2}%
183   \ifx\hyxmp@sublist@empty
184     \let\next=\relax
185   \else
186     \hyxmp@trimspaces\hyxmp@sublist
187     \@cons{#1}{\hyxmp@sublist}%

```

```

188     \def\next{\hyxmp@commas@to@list@i{#1}}%
189     \fi
190     \next
191 }

```

\xmpcomma Because `hyperxmp` splits lists at commas, a comma cannot normally be used within a list. We there provide an `\xmpcomma` macro that can expand to either a true comma or a placeholder character depending on the situation. Here, we bind it to a comma so it can be used in *any* `hyperxmp` option, not just those that treat commas specially.

```
192 \def\xmpcomma{,}%

```

\hyxmp@comma This is what `\xmpcomma` maps to during list construction. We assume that documents will never otherwise use an ETX (`^^C`) character in their XMP metadata.

```

193 \bgroup
194   \catcode'\^^C=11
195   \gdef\hyxmp@comma{^^C}
196 \egroup

```

\hyxmp@uscore This is what `_` temporarily maps to during packet construction. Because underscores are replaced by spaces, we need a mechanism to preserve user-specified underscores (e.g., in email addresses). We assume that documents will never otherwise use an NAK (`^^U`) character in their XMP metadata.

```

197 \bgroup
198   \catcode'\^^U=11
199   \gdef\hyxmp@uscore{^^U}
200 \egroup

```

\xmpquote Adobe Acrobat likes to see double quotes around list elements that contain commas when the entire list appears within a single XMP tag (e.g., `<pdf:Keywords>`). However, it doesn't like to see double quotes around list elements that contain commas when the list is broken up into individual components (i.e., using `<rdf:li>` tags). We therefore introduce an `\xmpquote` macro that quotes or doesn't quote its argument based on context. Here, we bind `\xmpquote` to `\relax` to prevent it from prematurely quoting or not quoting.

```
201 \let\xmpquote=\relax

```

\xmptilde As a convenience for the user, we define `\xmptilde` as a category 12 (other) “~” character.

```

202 \bgroup
203   \catcode'\~=12%
204   \gdef\xmptilde{~}%
205 \egroup

```

\XMPTruncateList As a workaround for Adobe Acrobat's inability to display author lists correctly (cf. “Acrobat Author bug” on page 6) we introduce a hack that replaces a list with its first element. One can then write “`\XMPTruncateList{pdfauthor}`” and have

\@elt

Adobe Acrobat display the author list correctly. It's sad that this is necessary, though.

```

206 \newcommand{\XMPTruncateList}[1]{%
207   \edef\hyxmp@temp@str{\csname hyxmp@#1\endcsname}%
208   \hyxmp@commas@to@list{\hyxmp@temp@list}{\hyxmp@temp@str}%
209   \def\@elt##1{%
210     \expandafter\gdef\csname @#1\endcsname{##1}%
211     \let\@elt=\@gobble
212   }
213   \hyxmp@temp@list
214 }

```

3.3.2 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 [5]. Inline comments are also taken from the solution text.

```

215 \catcode'\Q=3
\hyxmp@trimspaces\x redefines \x to have the same replacement text sans leading
and trailing space tokens.
216 \newcommand{\hyxmp@trimspaces}[1]{%
  Use grouping to emulate a multi-token afterassignment queue.
217   \begingroup
    Put “\toks 0 {” into the afterassignment queue.
218   \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.
219   \expandafter\hyxmp@trimb\expandafter\noexpand#1Q Q}%
    Transfer the trimmed text back into #1.
220   \edef#1{\the\toks0}%
221 }

```

`\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.

```

222 \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.

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

3.3.3 Converting text to XML

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

`\ifhyxmp@unicodetex` `XYTeX` and `LuaTeX` natively support Unicode. We define the conditional `\ifhyxmp@unicodetex` to check for these so we can properly handle encoding conversions. The trick here is that Unicode `TeX` implementations compare decimal 64 to hexadecimal 40 (decimal 64), specified with four carets, and take the TRUE branch; non-Unicode `TeX` implementations compare decimal 64 to character “^” (decimal 94), ignore the “^^0040” and the rest of the TRUE branch, and take the FALSE branch.

```
225 \newif\ifhyxmp@unicodetex
226 \ifnum64='^^^^0040\relax
227   \hyxmp@unicodetextrue
228 \else
229   \hyxmp@unicodetexfalse
230 \fi
```

`\hyxmp@reencode` This is now a placeholder macro needed only for `\@pdfmetalang` in the `\begin{document}`.

```
231 \newcommand*{\hyxmp@reencode}[1]{}
```

`\SE->pdfdoc003` Preserve ETX (`^^C`), which is normally an invalid character in `PDFDocEncoding`. We use it in `hyperxmp` (and specifically in `\hyxmp@xmlify` below) as a list-element separator.

```
232 \expandafter\def\csname SE->pdfdoc003\endcsname{0003}
```

`\SE->pdfdoc0015` Preserve NAK (`^^U`), which is normally an invalid character in `PDFDocEncoding`. We use it in `hyperxmp` (and specifically in `\hyxmp@xmlify` below) as a placeholder for an underscore character.

```
233 \expandafter\def\csname SE->pdfdoc0015\endcsname{0015}
```

`\hyxmp@xmlify` 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 `\hyxmp@xmlified` but with all occurrences of “<” replaced with `<`; all occurrences of “>” replaced with `>`; and all occurrences of “&” replaced with `&`;

```
234 \newcommand*{\hyxmp@xmlify}[1]{%
235   \gdef\hyxmp@xmlified{}
```

Escaped PDF string → `PDFDocEncoding/Unicode`

```
236   \EdefUnescapeString\hyxmp@text{#1}%
237   \ifhyxmp@unicodetex
```

PDFDocEncoding/Unicode → UTF-32BE

```

238 \hyxmp@is@unicode\hyxmp@text{%
239 \StringEncodingConvert
240 \hyxmp@text\hyxmp@text{utf16be}{utf32be}%
241 }{%
242 \ifxetex
243 \hyxmp@xetex@crap
244 \else
245 \StringEncodingConvert
246 \hyxmp@text\hyxmp@text{pdfdoc}{utf32be}%
247 \fi
248 }%

```

UTF-32BE → UTF-32BE as hex string

```

249 \EdefEscapeHex\hyxmp@text{\hyxmp@text}%

```

UTF-32BE → XML in ASCII

```

250 \edef\hyxmp@text{%
251 \expandafter
252 }\expandafter\hyxmp@toxml@unicodetex\hyxmp@text
253 \relax\relax\relax\relax\relax\relax\relax\relax
254 \else

```

PDFDocEncoding/Unicode → UTF-8

```

255 \hyxmp@is@unicode\hyxmp@text{%
256 \StringEncodingConvert
257 \hyxmp@text\hyxmp@text{utf16be}{utf8}%
258 }{%
259 \StringEncodingConvert
260 \hyxmp@text\hyxmp@text{pdfdoc}{utf8}%
261 }%

```

UTF-8 → UTF-8 as hex string

```

262 \EdefEscapeHex\hyxmp@text{\hyxmp@text}%

```

UTF-8 as hex string → XML in UTF-8 as hex string

```

263 \edef\hyxmp@text{%
264 \expandafter\hyxmp@toxml\hyxmp@text\@empty\@empty
265 }%

```

XML in UTF-8 as hex string → XML in UTF-8

```

266 \EdefUnescapeHex\hyxmp@text{\hyxmp@text}%
267 \fi
268 \global\let\hyxmp@xmlified\hyxmp@text
269 }

```

\hyxmp@is@unicode Given a string and two expressions, evaluate the first expression if the string is
\hyxmp@@is@unicode UTF-16BE-encoded and the second expression if not.

```

270 \begingroup
271 \lccode'\<=254 %
272 \lccode'\>=255 %
273 \catcode254=12 %

```

```

274 \catcode255=12 %
275 \lowercase{\endgroup
276 \def\hyxmp@is@unicode#1{%
277   \expandafter\hyxmp@@is@unicode#1<>\@nil
278 }%
279 \def\hyxmp@@is@unicode#1<>#2\@nil{%
280   \ifx\#1\%
281     \expandafter\@firstoftwo
282   \else
283     \expandafter\@secondoftwo
284   \fi
285 }%
286 }

```

`\hyxmp@toxml` Replace the characters “<”, “&”, and “>” with XML entities when using a non-native-Unicode T_EX (T_EX or pdfT_EX).

```

287 \def\hyxmp@toxml#1#2{%
288   \ifx#1\@empty
289   \else
290     \ifnum"#1#2='\& %
291       26616D703B% &
292     \else\ifnum"#1#2='\< %
293       266C743B% <
294     \else\ifnum"#1#2='\> %
295       2667743B% >
296   \else

```

`dvips` wraps text when generating most PostScript code but preserves line breaks within strings. Unfortunately, `dvips` fails to observe the special case in the PostScript specification that “[b]alanced pairs of parentheses in the string require no special treatment” [2]. Consequently, XMP data containing parentheses (e.g., “Copyright (C) 1605 Miguel de Cervantes”) confuse `dvips` into thinking that the string has ended after the closing parenthesis and that line breaks can subsequently be injected safely into the document at arbitrary points for formatting purposes. This leads to erroneous display by PDF viewers, which honor line breaks within XMP tags. The solution is to insert a backslash before all parentheses when in `pdfmark`-generating mode to convince `dvips` that the entire XMP packet must be treated as a single, not-to-be-modified string.

```

297   \@ifundefined{pdfmark}{%
298     #1#2%
299   }{%
300     \ifnum"#1#2='\( %
301       5C28% \(
302     \else\ifnum"#1#2='\) %
303       5C29% \)
304     \else
305       #1#2%
306     \fi\fi
307   }%

```

```

308     \fi\fi\fi
309     \expandafter\hyxmp@toxml
310   \fi
311 }

```

`\hyxmp@toxml@unicodetex` Replace the characters “<”, “&”, and “>” with XML entities when using a native-Unicode `TeX` (`XYTeX` or `LuaTeX`).

```

312 \def\hyxmp@toxml@unicodetex#1#2#3#4#5#6#7#8{%
313   \ifx#1\relax
314   \else
315     \ifnum"#1#2#3#4#5#6#7#8>127 %
316       \uccode'\*="#1#2#3#4#5#6#7#8\relax
317       \uppercase{%
318         \edef\hyxmp@text{\hyxmp@text *}%
319       }%
320     \else\ifnum"#7#8='< %
321       \edef\hyxmp@text{\hyxmp@text &lt;}%
322     \else\ifnum"#7#8='& %
323       \edef\hyxmp@text{\hyxmp@text &amp;}%
324     \else\ifnum"#7#8='> %
325       \edef\hyxmp@text{\hyxmp@text &gt;}%
326     \else\ifnum"#7#8='\ %
327       \edef\hyxmp@text{\hyxmp@text\space}%
328     \else
329       \uccode'\*="#7#8\relax
330       \uppercase{%
331         \edef\hyxmp@text{\hyxmp@text *}%
332       }%
333     \fi\fi\fi\fi\fi
334     \expandafter\hyxmp@toxml@unicodetex
335   \fi
336 }

```

`\hyxmp@skipzeros` Skip over leading zeroes in the input argument.

```

337 \def\hyxmp@skipzeros#1{%
338   \ifx#10%
339     \expandafter\hyxmp@skipzeros
340   \fi
341 }

```

`\x` In the case of `XYTeX`, the strings defined by `\pdfstringdef` can contain big characters. In this case, the string is treated as Unicode.

```

\hyxmp@xetex@crap \hyxmp@try 342 \begingroup
\hyxmp@crap@result 343 \def\x#1{\endgroup
\hyxmp@text 344 \def\hyxmp@xetex@crap{%
345   \edef\hyxmp@try{%
346     \expandafter\hyxmp@SpaceOther\hyxmp@text#1\@nil
347   }%
348   \let\hyxmp@crap@result=N%

```

```

349 \expandafter\hyxmp@crap@test\hyxmp@try\relax
350 \ifx\hyxmp@crap@result Y%
351 \let\hyxmp@text\@empty
352 \expandafter\hyxmp@crap@convert\hyxmp@try\relax
353 \else
354 \StringEncodingConvert\hyxmp@text\hyxmp@text{pdfdoc}{utf32be}%
355 \fi
356 }%
357 }
358 \x{ }

```

`\hyxmp@SpaceOther` Re-encode all spaces in a string with category code 12 (“other”).

```

359 \begingroup
360 \catcode'\~=12 %
361 \lccode'\~=\' %
362 \lowercase{\endgroup
363 \def\hyxmp@SpaceOther#1 #2\@nil{%
364 #1%
365 \ifx\relax#2\relax
366 \expandafter\@gobble
367 \else
368 ~%
369 \expandafter\@firstofone
370 \fi
371 {\hyxmp@SpaceOther#2\@nil}%
372 }%
373 }

```

`\hyxmp@crap@test` Determine if we need to treat a string as Unicode.

```

374 \def\hyxmp@crap@test#1{%
375 \ifx#1\relax
376 \else
377 \ifnum'#1>127 %
378 \let\hyxmp@crap@result=Y%
379 \expandafter\expandafter\expandafter\hyxmp@skiptorelax
380 \else
381 \expandafter\expandafter\expandafter\hyxmp@crap@test
382 \fi
383 \fi
384 }

```

`\hyxmp@skiptorelax` Discard all tokens up to and including the first `\relax`.

```

385 \def\hyxmp@skiptorelax#1\relax{}

```

`\hyxmp@crap@convert` Convert a hexadecimal string to a number.

```

\hyxmp@num 386 \def\hyxmp@crap@convert#1{%
\hyxmp@text 387 \ifx#1\relax
388 \else
389 \edef\hyxmp@num{\number'#1}%

```



```

390 \ifnum\hyxmp@num>"FFFFFF %
391 \lccode'\!=\intcalcdDiv{\hyxmp@num}{\number"1000000}\relax
392 \lowercase{\edef\hyxmp@text{\hyxmp@text!}}}%
393 \edef\hyxmp@num{\intcalcmMod{\hyxmp@num}{\number"1000000}}}%
394 \else
395 \edef\hyxmp@text{\hyxmp@text\hyxmp@zero}%
396 \fi
397 \ifnum\hyxmp@num>"FFFF %
398 \lccode'\!=\intcalcdDiv{\hyxmp@num}{\number"10000}\relax
399 \lowercase{\edef\hyxmp@text{\hyxmp@text!}}}%
400 \edef\hyxmp@num{\intcalcmMod{\hyxmp@num}{\number"10000}}}%
401 \else
402 \edef\hyxmp@text{\hyxmp@text\hyxmp@zero}%
403 \fi
404 \ifnum\hyxmp@num>"FF %
405 \lccode'\!=\intcalcdDiv{\hyxmp@num}{\number"100}\relax
406 \lowercase{\edef\hyxmp@text{\hyxmp@text!}}}%
407 \edef\hyxmp@num{\intcalcmMod{\hyxmp@num}{\number"100}}}%
408 \else
409 \edef\hyxmp@text{\hyxmp@text\hyxmp@zero}%
410 \fi
411 \ifnum\hyxmp@num>0 %
412 \lccode'\!=\hyxmp@num\relax
413 \lowercase{\edef\hyxmp@text{\hyxmp@text!}}}%
414 \else
415 \edef\hyxmp@text{\hyxmp@text\hyxmp@zero}%
416 \fi
417 \expandafter\hyxmp@crap@convert
418 \fi
419 }

```

`\hyxmp@zero` Define a null character with category code 12 (“other”).

```

420 \begingroup
421 \catcode0=12 %
422 \gdef\hyxmp@zero{^^00}%
423 \endgroup

```

3.4 UUID generation

We use a linear congruential generator to produce pseudorandom version 4 UUIDs [8]. True, this method has its flaws but it’s simple to implement in \TeX and is good enough for producing the XMP `xmpMM:DocumentID` and `xmpMM:InstanceID` fields.

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

```

424 \def\hyxmp@modulo@a#1{%
425 \@tempcntb=\@tempcnta
426 \divide\@tempcntb by #1
427 \multiply\@tempcntb by #1

```

```

428 \advance\@tempcnta by -\@tempcntb
429 }

\hyxmp@big@prime Define a couple of large prime numbers that can still be stored in a TEX counter.
\hyxmp@big@prime@ii 430 \def\hyxmp@big@prime{536870923}
431 \def\hyxmp@big@prime@ii{536870027}

\hyxmp@seed@rng Seed hyperxmp's random-number generator from a given piece of text.
\hyxmp@one@token 432 \def\hyxmp@seed@rng#1{%
433 \@tempcnta=\hyxmp@big@prime
434 \futurelet\hyxmp@one@token\hyxmp@seed@rng@i#1\@empty
435 }

\hyxmp@seed@rng@i Do all of the work for \hyxmp@seed@rng. For each character code  $c$  of the input
\hyxmp@one@token text, assign  $\@tempcnta \leftarrow 3 \cdot \@tempcnta + c \pmod{\hyxmp@big@prime}$ .
\next 436 \def\hyxmp@seed@rng@i{%
437 \ifx\hyxmp@one@token\@empty
438 \let\next=\relax
439 \else
440 \def\next##1{%
441 \multiply\@tempcnta by 3
442 \advance\@tempcnta by '##1
443 \hyxmp@modulo@a{\hyxmp@big@prime}%
444 \futurelet\hyxmp@one@token\hyxmp@seed@rng@i
445 }%
446 \fi
447 \next
448 }

\hyxmp@set@rand@num Advance \hyxmp@rand@num to the next pseudorandom number in the se-
\hyxmp@rand@num quence. Specifically, we assign  $\hyxmp@rand@num \leftarrow 3 \cdot \hyxmp@rand@num + \hyxmp@big@prime@ii \pmod{\hyxmp@big@prime}$ . Note that both  $\@tempcnta$ 
and  $\@tempcntb$  are overwritten in the process.
449 \def\hyxmp@set@rand@num{%
450 \@tempcnta=\hyxmp@rand@num
451 \multiply\@tempcnta by 3
452 \advance\@tempcnta by \hyxmp@big@prime@ii
453 \hyxmp@modulo@a{\hyxmp@big@prime}%
454 \xdef\hyxmp@rand@num{\the\@tempcnta}%
455 }

\hyxmp@append@hex Append a randomly selected hexadecimal digit to macro #1. Note that both
\@tempcnta and \@tempcntb are overwritten in the process.
456 \def\hyxmp@append@hex#1{%
457 \hyxmp@set@rand@num
458 \@tempcnta=\hyxmp@rand@num
459 \hyxmp@modulo@a{16}%
460 \ifnum\@tempcnta<10
461 \xdef#1{#1\the\@tempcnta}%
462 \else

```

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

```

463     \advance\@tempcnta by -10
464     \ifcase\@tempcnta
465         \xdef#1{#1a}%
466         \or\xdef#1{#1b}%
467         \or\xdef#1{#1c}%
468         \or\xdef#1{#1d}%
469         \or\xdef#1{#1e}%
470         \or\xdef#1{#1f}%
471     \fi
472 \fi
473 }

```

`\hyxmp@append@hex@iii` Invoke `\hyxmp@append@hex` three times.

```

474 \def\hyxmp@append@hex@iii#1{%
475     \hyxmp@append@hex#1%
476     \hyxmp@append@hex#1%
477     \hyxmp@append@hex#1%
478 }

```

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

```

479 \def\hyxmp@append@hex@iv#1{%
480     \hyxmp@append@hex@iii#1%
481     \hyxmp@append@hex#1%
482 }

```

`\hyxmp@create@uuid` As per the definition of a version 4 UUID [8], define macro `#1` as a UUID of the form “`uuid:xxxxxxxx-xxxx-4xxx-yxxx-xxxxxxxxxxxx`” in which each “*x*” is a lowercase hexadecimal digit and “*y*” is one of “8”, “9”, “a”, or “b”. We assume that the random-number generator is already seeded. Note that `\hyxmp@create@uuid` overwrites both `\@tempcnta` and `\@tempcntb`.

```

483 \def\hyxmp@create@uuid#1{%
484     \def#1{uuid:}%
485     \hyxmp@append@hex@iv#1%
486     \hyxmp@append@hex@iv#1%
487     \g@addto@macro#1{-}%
488     \hyxmp@append@hex@iv#1%
489     \g@addto@macro#1{-4}%
490     \hyxmp@append@hex@iii#1%
491     \g@addto@macro#1{-}%

```

Randomly select one of “8”, “9”, “a”, or “b”.

```

492     \hyxmp@set@rand@num
493     \@tempcnta=\hyxmp@rand@num
494     \hyxmp@modulo@a{4}%
495     \ifcase\@tempcnta
496         \g@addto@macro#1{8}%
497         \or\g@addto@macro#1{9}%
498         \or\g@addto@macro#1{a}%

```

```

499     \or\g@addto@macro#1{b}%
500     \fi
501     \hyxmp@append@hex@iii#1%
502     \g@addto@macro#1{-}%
503     \hyxmp@append@hex@iv#1%
504     \hyxmp@append@hex@iv#1%
505     \hyxmp@append@hex@iv#1%
506 }

```

`\hyxmp@def@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.

```

507 \newcommand*{\hyxmp@def@DocumentID}{%
508   \edef\hyxmp@seed@string{\jobname:\@pdftitle:\@pdfauthor}%
509   \expandafter\hyxmp@seed@rng\expandafter{\hyxmp@seed@string}%
510   \edef\hyxmp@rand@num{\the\@tempcnta}%
511   \hyxmp@create@uuid\hyxmp@DocumentID
512 }

```

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

```

513 \newcommand*{\hyxmp@def@InstanceID}{%
514   \edef\hyxmp@seed@string{\jobname:\@pdftitle:\@pdfauthor:\hyxmp@today}%
515   \expandafter\hyxmp@seed@rng\expandafter{\hyxmp@seed@string}%
516   \edef\hyxmp@rand@num{\the\@tempcnta}%
517   \hyxmp@create@uuid\hyxmp@InstanceID
518 }

```

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” [4]. (“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), XMP Media Management (Section 3.5.5), XMP Basic (Section 3.5.6), Photoshop (Section 3.5.7), IPTC Photo Metadata (Section 3.5.8), and PDF/A Identification (Section 3.5.9). The `\hyxmp@construct@packet` macro (Section 3.5.10) 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 all `^C` characters with commas, then append the result to the `\hyxmp+xml` macro.

```

519 \newcommand*{\hyxmp@add@to@xml}[1]{%
520   \bgroup
521     \@tempcnta=0
522     \ifhyxmp@unicodetex
523       \@tempcntb=65536%
524     \else
525       \@tempcntb=256%
526     \fi
527     \loop
528       \lccode\@tempcnta=\@tempcnta
529       \advance\@tempcnta by 1
530       \ifnum\@tempcnta<\@tempcntb
531         \repeat
532       \lccode'\_='\ \relax
533       \lccode'\^C='\,\relax
534       \lccode'\^U='\_\relax
535       \lowercase{\xdef\hyxmp@new@xml{#1}}%
536       \xdef\hyxmp@xml{\hyxmp@xml\hyxmp@new@xml}%
537   \egroup
538 }

```

`\hyxmp@hash` Define a category-code 11 (“other”) version of the “#” character.

```

539 \bgroup
540 \catcode'\#=11
541 \gdef\hyxmp@hash{#}
542 \egroup

```

`\hyxmp@padding` The XMP specification recommends leaving approximately 2000 bytes of whitespace at the end of each XMP packet to facilitate editing the packet in place [4].
`\hyxmp@xml` `\hyxmp@padding` is defined to contain 32 lines of 50 spaces and a newline apiece for a total of 1632 characters of whitespace.

```

543 \bgroup
544 \xdef\hyxmp@xml{%
545   \hyxmp@add@to@xml{%
546     -----^^J%
547   }
548   \xdef\hyxmp@padding{\hyxmp@xml}%
549 \egroup
550 \xdef\hyxmp@padding{\hyxmp@padding\hyxmp@padding}
551 \xdef\hyxmp@padding{\hyxmp@padding\hyxmp@padding}
552 \xdef\hyxmp@padding{\hyxmp@padding\hyxmp@padding}
553 \xdef\hyxmp@padding{\hyxmp@padding\hyxmp@padding}
554 \xdef\hyxmp@padding{\hyxmp@padding\hyxmp@padding}

```

`\hyxmp@pdf@to@xmp@date` Convert a timestamp from PDF’s D:YYYYMMDDhhmmss-TT’tt’ format (e.g., D:20160405223736-06’00’) to XMP’s YYYY-MM-DDThh:mm:ss+TT:tt format (e.g., 2016-04-05T22:37:36-06:00) [4]. This macro is fully expandable.

```

555 \def\hyxmp@pdf@to@xmp@date#1:#2#3#4#5#6#7#8#9{%
556   #2#3#4#5-#6#7-#8#9%

```

```

557 \hyxmp@parse@time
558 }

\hyxmp@parse@time This is a helper function for \hyxmp@pdf@to@xmp@date.
\hyxmp@pdf@to@xmp@date proper parses only the year, month, and day
then calls \hyxmp@parse@time. \hyxmp@parse@time parses the hours, minutes,
and seconds then calls \hyxmp@parse@tz@char.
559 \def\hyxmp@parse@time#1#2#3#4#5#6{%
560   T#1#2:#3#4:#5#6%
561   \hyxmp@parse@tz@char
562 }

\hyxmp@parse@tz@char This is another helper function for \hyxmp@pdf@to@xmp@date. So far, the date and
time have been parsed. \hyxmp@parse@tz@char parses the first character of the
timezone descriptor. This can be one of “+” for eastern timezones (UTC+ $x$ , includ-
ing Asia, Oceania, and most of Europe), “-” for western timezones (UTC- $x$ , pri-
marily the Americas), or “Z” for Zulu time (UTC+0). Timezones beginning with “+”
or “-” are followed by an offset in hours and minutes (parsed by \hyxmp@parse@tz;
timezones beginning with “Z” are not.
563 \def\hyxmp@parse@tz@char#1{%
564   #1%
565   \ifx#1-%
566     \expandafter\hyxmp@parse@tz
567   \else
568     \ifx#1+%
569       \expandafter\hyxmp@parse@tz
570     \fi
571   \fi
572 }

\hyxmp@parse@tz This is the final helper function for \hyxmp@pdf@to@xmp@date. It parses the piece
of the timezone comprising the offset from Coordinated Universal Time, measured
in hours and minutes.
573 \def\hyxmp@parse@tz#1'#2' {%
574   #1:#2%
575 }

\hyxmp@today@define Use TEX's \year, \month, and \day primitives to define \hyxmp@today as today's
date in YYYY-MM-DD format.
576 \def\hyxmp@today@define{%
577   \xdef\hyxmp@today{\the\year}%
578   \ifnum\month<10
579     \xdef\hyxmp@today{\hyxmp@today-0\the\month}%
580   \else
581     \xdef\hyxmp@today{\hyxmp@today-\the\month}%
582   \fi
583   \ifnum\day<10
584     \xdef\hyxmp@today{\hyxmp@today-0\the\day}%

```

```

585 \else
586 \xdef\hyxmp@today{\hyxmp@today-\the\day}%
587 \fi
588 }

```

`\hyxmp@today` Define `\hyxmp@today` as the current date and (if available) time and timezone in XMP Date format [4].

```

589 \expandafter\ifx\csname pdfcreationdate\endcsname\relax
590 \hyxmp@today@define
591 \else
592 \edef\hyxmp@today{\expandafter\hyxmp@pdf@to@xmp@date\pdfcreationdate}%
593 \fi

```

`\hyxmp@x@default` Define an `x-default` string that we can use in comparisons with `\@pdfmetalang`.

```

594 \newcommand*{\hyxmp@x@default}{x-default}

```

3.5.2 The Adobe PDF schema

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

```

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

```

Add a block of XML to `\hyxmp@xml` that lists the document’s keywords (the `pdf:Keywords` property), the tools used to produce the PDF file (the `pdf:Producer` property), and the version of the PDF standard adhered to (the `pdf:PDFVersion` property). Unlike most of the other schemata that `hyperxmp` supports, the Adobe PDF schema is *always* included in the document, even if all of its keys are empty. This is because PDF/A-1b requires the keywords and producer to be the same in the XMP metadata and the PDF metadata. Because `hyperref` always specifies the `Keywords` and `Producer` fields, even when they’re empty, `hyperxmp` has to follow suit and define `pdf:Keywords` and `pdf:Producer` in the XMP packet.

```

596 \hyxmp@add@to@xml{%
597 -----<rdf:Description rdf:about=""^^J%
598 -----xmlns:pdf="http://ns.adobe.com/pdf/1.3/">^^J%
599 }%
600 \hyxmp@add@simple@var{pdf:Keywords}{@pdfkeywords}%
601 \hyxmp@add@simple@var{pdf:Producer}{@pdfproducer}%
602 \@ifundefined{pdfminorversion}{}{%
603 \hyxmp@add@simple{pdf:PDFVersion}{1.\the\pdfminorversion}%
604 }%
605 \hyxmp@add@to@xml{%
606 -----</rdf:Description>^^J%
607 }%
608 }

```

`\hyxmp@add@simple` Given an XMP tag (#1) and a string (#2), if the string is nonempty, add a begin tag, the string, and an end tag to the packet. The “`simple`” in the macro name indicates that the string is output without variations for different languages.

```

609 \newcommand*{\hyxmp@add@simple}[2]{%

```

```

610 \edef\hyxmp@string{#2}%
611 \ifx\hyxmp@string\@empty
612 \else
613 \hyxmp@xmlify{\hyxmp@string}%
614 \hyxmp@add@to@xml{%
615 -----<#1>\hyxmp@xmlified</#1>^^J%
616 }%
617 \fi
618 }

```

\hyxmp@add@simple@var Given an XMP tag (#1) and a variable name (#2), if the string is defined, add a begin tag, the string, and an end tag to the packet. The “simple” in the macro name indicates that the string is output without variations for different languages. **\hyxmp@add@simple@var** differs from **\hyxmp@add@simple** in that the former includes defined but empty values in the XMP packet while the latter excludes both undefined and defined but empty values.

```

619 \newcommand*{\hyxmp@add@simple@var}[2]{%
620 \expandafter\ifx\csname#2\endcsname\relax
621 \else
622 \hyxmp@xmlify{\csname#2\endcsname}%
623 \hyxmp@add@to@xml{%
624 -----<#1>\hyxmp@xmlified</#1>^^J%
625 }%
626 \fi
627 }

```

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.

```

628 \newcommand*{\hyxmp@rdf@dc}[2]{%
629 \ifx#2\@empty
630 \else
631 \hyxmp@xmlify{#2}%
632 \hyxmp@add@to@xml{%
633 -----<dc:#1>^^J%
634 -----<rdf:Alt>^^J%
635 }%
636 \ifx\@pdfmetalang\hyxmp@x@default
637 \else
638 \hyxmp@add@to@xml{%
639 -----<rdf:li xml:lang="\@pdfmetalang">\hyxmp@xmlified</rdf:li>^^J%
640 }%
641 \fi
642 \hyxmp@add@to@xml{%
643 -----<rdf:li xml:lang="\hyxmp@x@default">\hyxmp@xmlified</rdf:li>^^J%
644 -----</rdf:Alt>^^J%
645 -----</dc:#1>^^J%

```



```

646     }%
647   \fi%
648 }%

```

`\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.

```

649 \newcommand*{\hyxmp@list@to@xml}[3]{%
650   \ifx#3\@empty
651   \else
652     \hyxmp@add@to@xml{%
653       -----<dc:#1>^^J%
654       -----<rdf:#2>^^J%
655     }%
656   \bgroup

```

`\@elt` Re-encode the text from Unicode if necessary. Then redefine `\@elt` to XML-ify each element of the list and append it to `\hyxmp@xmlified`.

```

657     \hyxmp@xmlify{#3}%
658     \hyxmp@commas@to@list\hyxmp@list{\hyxmp@xmlified}%
659     \def\@elt##1{%
660       \hyxmp@add@to@xml{%
661         -----<rdf:li>##1</rdf:li>^^J%
662       }%
663     }%
664     \hyxmp@list
665     \egroup
666     \hyxmp@add@to@xml{%
667       -----</rdf:#2>^^J%
668       -----</dc:#1>^^J%
669     }%
670   \fi
671 }

```

`\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`, the `dc:subject` property if the author specified `pdfkeywords`, and the `dc:language` property if the author specified `pdflang`. We also specify the `dc:date` property using the date the document was run through L^AT_EX and the `dc:source` property using the base name of the source file with `.tex` appended.

```

672 \newcommand*{\hyxmp@dc@schema}{%
673   \hyxmp@add@to@xml{%
674     -----<rdf:Description rdf:about=""^^J%
675     -----xmlns:dc="http://purl.org/dc/elements/1.1/"^^J%
676     -----<dc:format>application/pdf</dc:format>^^J%
677   }%
678   \hyxmp@rdf@dc{title}{\@pdftitle}%

```

```

679 \hyxmp@rdf@dc{description}{\@pdfsubject}%
680 \hyxmp@rdf@dc{rights}{\@pdfcopyright}%
681 \hyxmp@list@to@xml{creator}{Seq}{\hyxmp@pdfauthor}%
682 \hyxmp@list@to@xml{subject}{Bag}{\hyxmp@pdfkeywords}%
683 \hyxmp@list@to@xml{date}{Seq}{\hyxmp@today}%
684 \hyxmp@list@to@xml{language}{Bag}{\@pdflang}%
685 \hyxmp@add@simple{dc:source}{\jobname.tex}%
686 \hyxmp@add@to@xml{%
687 -----</rdf:Description>^^J%
688 }%
689 }

```

3.5.4 The XMP Rights Management schema

`\hyxmp@xmpRights@schema` Add properties defined by the XMP Rights Management schema to the `\hyxmp@xml` macro. Currently, these are only the `xmpRights:Marked` property and the `xmpRights:WebStatement` property. If the author specified a copyright statement we mark the document as copyrighted. If the author specified a license statement we include the URL in the metadata.

```

690 \newcommand*{\hyxmp@xmpRights@schema}{%

```

`\hyxmp@legal` Set `\hyxmp@rights` to YES if either `pdfcopyright` or `pdflicenseurl` was specified.

```

691 \let\hyxmp@rights=\@empty
692 \ifx\@pdflicenseurl\@empty
693 \else
694 \def\hyxmp@rights{YES}%
695 \fi
696 \ifx\@pdfcopyright\@empty
697 \else
698 \def\hyxmp@rights{YES}%
699 \fi

```

Include the license-statement URL and/or the copyright indication. The copyright statement itself is included by `\hyxmp@dc@schema` in Section 3.5.3.

```

700 \ifx\hyxmp@rights\@empty
701 \else

```

Header

```

702 \hyxmp@add@to@xml{%
703 -----<rdf:Description rdf:about=""^^J%
704 -----xmlns:xmpRights="http://ns.adobe.com/xap/1.0/rights/">^^J%
705 }%

```

Copyright indication

```

706 \ifx\@pdfcopyright\@empty
707 \else
708 \hyxmp@add@to@xml{%
709 -----<xmpRights:Marked>True</xmpRights:Marked>^^J%
710 }%
711 \fi

```

License URL

```
712 \hyxmp@add@simple{xmpRights:WebStatement}{\@pdflicenseurl}%  
Trailer  
713 \hyxmp@add@to@xml{%  
714 -----</rdf:Description>^^J%  
715 }%  
716 \fi  
717 }
```

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 `xmpMM:DocumentID` property is supposed to uniquely identify a document, and the `xmpMM:InstanceID` property is supposed to change with each save operation [4]. As seen in Section 3.4, we do what we can to honor this intention from within a \TeX -based workflow.

```
718 \gdef\hyxmp@mm@schema{%  
719 \hyxmp@def@DocumentID  
720 \hyxmp@def@InstanceID  
721 \hyxmp@add@to@xml{%  
722 -----<rdf:Description rdf:about=""^^J%  
723 -----xmlns:xmpMM="http://ns.adobe.com/xap/1.0/mm/"^^J%  
724 -----<xmpMM:DocumentID>\hyxmp@DocumentID</xmpMM:DocumentID>^^J%  
725 -----<xmpMM:InstanceID>\hyxmp@InstanceID</xmpMM:InstanceID>^^J%  
726 -----</rdf:Description>^^J%  
727 }%  
728 }
```

3.5.6 The XMP Basic schema

`\hyxmp@xmp@basic@schema` Add properties defined by the XMP Basic schema to the `\hyxmp@xml` macro. These include a bunch of dates (all set to the same value) and the base URL for the document if specified with `baseurl`.

```
729 \newcommand*{\hyxmp@xmp@basic@schema}{%  
730 \hyxmp@add@to@xml{%  
731 -----<rdf:Description rdf:about=""^^J%  
732 -----xmlns:xmp="http://ns.adobe.com/xap/1.0/"^^J%  
733 }%  
734 \hyxmp@add@simple{xmp:CreateDate}{\hyxmp@today}%  
735 \hyxmp@add@simple{xmp:ModifyDate}{\hyxmp@today}%  
736 \hyxmp@add@simple{xmp:MetadataDate}{\hyxmp@today}%  
737 \hyxmp@add@simple{xmp:CreatorTool}{\@pdfcreator}%  
738 \hyxmp@add@simple{xmp:BaseURL}{\@baseurl}%  
739 \hyxmp@add@to@xml{%  
740 -----</rdf:Description>^^J%  
741 }%  
742 }
```

3.5.7 The Photoshop schema

`\hyxmp@photoshop@schema` Add properties defined by the Photoshop schema to the `\hyxmp@xml` macro. We
`\hyxmp@photoshop@data` currently support only the `photoshop:AuthorsPosition` and `photoshop:CaptionWriter` properties.

```

743 \gdef\hyxmp@photoshop@schema{%
744   \edef\hyxmp@photoshop@data{\@pdfauthortitle\@pdfcaptionwriter}%
745   \ifx\hyxmp@photoshop@data\@empty
746     \else
747       \hyxmp@add@to@xml{%
748         -----<rdf:Description rdf:about=""^^J%
749         -----_xmlns:photoshop="http://ns.adobe.com/photoshop/1.0/">^^J%
750       }%
751     \fi
752     \hyxmp@add@simple{photoshop:AuthorsPosition}{\@pdfauthortitle}%
753     \hyxmp@add@simple{photoshop:CaptionWriter}{\@pdfcaptionwriter}%
754     \ifx\hyxmp@photoshop@data\@empty
755       \else
756         \hyxmp@add@to@xml{%
757         -----</rdf:Description>^^J%
758       }%
759     \fi
760 }
```

3.5.8 The IPTC Photo Metadata schema

`\xmplinesep` Lines in multiline fields are separated by `\xmplinesep` in the generated XML. This defaults to an LF (`^^J`) character but written as an XML character entity for consistency across operating systems.

```

761 \begingroup
762   \catcode'\&=12
763   \catcode'\#=12
764   \gdef\xmplinesep{&#xA;}
765 \endgroup
```

`\hyxmp@list@to@lines` Given a property (#1) and a macro containing a comma-separated list (#2), replace commas with `\xmplinesep`. Do nothing if the list is empty.

```

766 \newcommand*{\hyxmp@list@to@lines}[2]{%
767   \ifx#2\@empty
768     \else
769       \bgroup
770         \hyxmp@add@to@xml{%
771         -----<#1>%
772       }%
```

`\@elt@first` The first element of the list is output as is.

```

773   \def\@elt@first##1{%
774     \hyxmp@add@to@xml{##1}%
775     \let\@elt=\@elt@rest
```

```

776      }%

\@elt@rest  The remaining elements of the list are output with a preceding line separator
              (\xmplinesep).
777      \def\@elt@rest##1{%
778          \hyxmp@add@to@xml{\xmplinesep##1}%
779      }%

\@elt  Re-encode the text from Unicode if necessary. Then redefine \@elt to insert a line
        separator between terms.
780      \let\@elt=\@elt@first
781      \hyxmp@xmlify{#2}%
782      \hyxmp@commas@to@list\hyxmp@list{\hyxmp@xmlified}%
783      \hyxmp@list
784      \hyxmp@add@to@xml{</#1>^^J}%
785      \egroup
786  \fi
787 }

\hyxmp@photometa@schema  Add properties defined by the IPTC Photo Metadata schema [6] to the
\hyxmp@photometa@data    \hyxmp@xml macro. We currently support only the contact-information
                          details structure, viz. the Iptc4xmpCore:CreatorContactInfo/CiAdrExtadr,
                          Iptc4xmpCore:CreatorContactInfo/CiAdrCity, Iptc4xmpCore:CreatorContactInfo/
                          CiAdrRegion, Iptc4xmpCore:CreatorContactInfo/CiAdrPcode,
                          Iptc4xmpCore:CreatorContactInfo/CiAdrCtry, Iptc4xmpCore:CreatorContactInfo/
                          CiTelWork, Iptc4xmpCore:CreatorContactInfo/CiEmailWork, and
                          Iptc4xmpCore:CreatorContactInfo/CiUrlWork properties.
788 \gdef\hyxmp@photometa@schema{%
789   \edef\hyxmp@photometa@data{%
790     \@pdfcontactaddress
791     \@pdfcontactcity
792     \@pdfcontactregion
793     \@pdfcontactpostcode
794     \@pdfcontactcountry
795     \@pdfcontactphone
796     \@pdfcontactemail
797     \@pdfcontacturl
798   }%
799   \ifx\hyxmp@photometa@data\@empty
800   \else
801     \hyxmp@iptc@extensions
802     \hyxmp@add@to@xml{%
803       <rdf:Description rdf:about=""^^J%
804       _____xmlns:Iptc4xmpCore="http://iptc.org/std/Iptc4xmpCore/1.0/xmlns/"^^J%
805       _____xmlns:IptcContInfo="http://iptc.org/std/Iptc4xmpCore/1.0/xmlns/contactinfo/">^^J%
806       <Iptc4xmpCore:CreatorContactInfo rdf:parseType="Resource">^^J%
807     }%
808   \fi
809   \hyxmp@list@to@lines{IptcContInfo:CiAdrExtadr}{\@pdfcontactaddress}%

```

```

810 \hyxmp@add@simple{IptcContInfo: CiAdrCity}{\@pdfcontactcity}%
811 \hyxmp@add@simple{IptcContInfo: CiAdrRegion}{\@pdfcontactregion}%
812 \hyxmp@add@simple{IptcContInfo: CiAdrPcode}{\@pdfcontactpostcode}%
813 \hyxmp@add@simple{IptcContInfo: CiAdrCtry}{\@pdfcontactcountry}%

```

`\xmplinesep` The IPTC standard states that sets of telephone numbers, email addresses, and URLs for the contact person or institution, “[m]ay have to be separated by a comma in the user interface” [6]. This is rather ambiguous: Does the comma appear *only* in the user interface or also in the generated XML? Here we assume the latter interpretation and temporarily redefine `\xmplinesep` as a comma and use `\hyxmp@list@to@lines` to insert the data. Unlike `\hyxmp@add@simple`, this approach trims all spaces surrounding commas.

```

814 \bgroup
815   \def\xmplinesep{,}%
816   \hyxmp@list@to@lines{IptcContInfo: CiTelWork}{\@pdfcontactphone}%
817   \hyxmp@list@to@lines{IptcContInfo: CiEmailWork}{\@pdfcontactemail}%
818   \hyxmp@list@to@lines{IptcContInfo: CiUrlWork}{\@pdfcontacturl}%
819 \egroup
820 \ifx\hyxmp@photometa@data\@empty
821   \else
822     \hyxmp@add@to@xml{%
823 -----</Iptc4xmpCore:CreatorContactInfo>^^J%
824 -----</rdf:Description>^^J%
825   }%
826 \fi
827 }

```

`\hyxmp@iptc@extensions` Because IPTC metadata are not recognized by the PDF/A standard, PDF/A conversion would normally fail for documents that utilize `\pdfcontactaddress`, `\pdfcontactcity`, etc. However, there exists a technique, described in a PDF Association technical note [10], for describing nonstandard XMP metadata within the XMP packet itself. We use that technique here to describe all of the metadata that `\hyxmp@photometa@schema` can produce. Doing so enables the document to be converted to PDF/A format.

```

828 \newcommand*{\hyxmp@iptc@extensions}{%
829   \hyxmp@add@to@xml{%
830 -----<rdf:Description rdf:about=""^^J%
831 -----xmlns:pdfaExtension="http://www.aiim.org/pdfa/ns/extension/"^^J%
832 -----xmlns:pdfaSchema="http://www.aiim.org/pdfa/ns/schema\hyxmp@hash"^^J%
833 -----xmlns:pdfaProperty="http://www.aiim.org/pdfa/ns/property\hyxmp@hash"^^J%
834 -----xmlns:pdfaType="http://www.aiim.org/pdfa/ns/type\hyxmp@hash"^^J%
835 -----xmlns:pdfaField="http://www.aiim.org/pdfa/ns/field\hyxmp@hash"^^J%
836 -----<pdfaExtension:schemas>^^J%
837 -----<rdf:Bag>^^J%
838 -----<rdf:li rdf:parseType="Resource">^^J%
839 -----<pdfaSchema:schema>IPTC Core Schema</pdfaSchema:schema>^^J%
840 -----<pdfaSchema:namespaceURI>http://iptc.org/std/Iptc4xmpCore/1.0/xmlns/</pdfaSchema:
841 -----<pdfaSchema:prefix>Iptc4xmpCore</pdfaSchema:prefix>^^J%
842 -----<pdfaSchema:property>^^J%

```

```

843 -----<rdf:Seq>^^J%
844 -----<rdf:li rdf:parseType="Resource">^^J%
845 -----<pdfaProperty:name>CreatorContactInfo</pdfaProperty:name>^^J%
846 -----<pdfaProperty:valueType>contactinfo</pdfaProperty:valueType>^^J%
847 -----<pdfaProperty:category>external</pdfaProperty:category>^^J%
848 -----<pdfaProperty:description>contact information for the document's creator</p
849 -----</rdf:li>^^J%
850 -----</rdf:Seq>^^J%
851 -----</pdfaSchema:property>^^J%
852 -----<pdfaSchema:valueType>^^J%
853 -----<rdf:Seq>^^J%
854 -----<rdf:li rdf:parseType="Resource">^^J%
855 -----<pdfaType:type>contactinfo</pdfaType:type>^^J%
856 -----<pdfaType:namespaceURI>http://iptc.org/std/Iptc4xmpCore/1.0/xmlns/contactin
857 -----<pdfaType:prefix>IptcContInfo</pdfaType:prefix>^^J%
858 -----<pdfaType:description>contact information</pdfaType:description>^^J%
859 -----<pdfaType:field>^^J%
860 -----<rdf:Seq>^^J%
861 }%

862 \hyxmp@text@resource{CiAdrExtadr}{contact address}%
863 \hyxmp@text@resource{CiAdrCity}{contact city}%
864 \hyxmp@text@resource{CiAdrRegion}{contact region}%
865 \hyxmp@text@resource{CiAdrPcode}{contact postal code}%
866 \hyxmp@text@resource{CiAdrCtry}{contact country}%
867 \hyxmp@text@resource{CiTelWork}{contact telephone number}%
868 \hyxmp@text@resource{CiEmailWork}{contact email address}%
869 \hyxmp@text@resource{CiUrlWork}{contact url}%

870 \hyxmp@add@to@xml{%
871 -----</rdf:Seq>^^J%
872 -----</pdfaType:field>^^J%
873 -----</rdf:li>^^J%
874 -----</rdf:Seq>^^J%
875 -----</pdfaSchema:valueType>^^J%
876 -----</rdf:li>^^J%
877 -----</rdf:Bag>^^J%
878 -----</pdfaExtension:schemas>^^J%
879 -----</rdf:Description>^^J%
880 }%
881 }

```

\hyxmp@text@resource Output a single Text resource given its name and description.

```

882 \newcommand*{\hyxmp@text@resource}[2]{%
883   \hyxmp@add@to@xml{%
884 -----<rdf:li rdf:parseType="Resource">^^J%
885 -----<pdfaField:name>#1</pdfaField:name>^^J%
886 -----<pdfaField:valueType>Text</pdfaField:valueType>^^J%
887 -----<pdfaField:description>#2</pdfaField:description>^^J%
888 -----</rdf:li>^^J%
889   }

```

890 }

3.5.9 The PDF/A Identification schema

`\hyxmp@pdfa@id@schema` Add properties defined by the PDF/A Identification schema [9] to the `\hyxmp@xml` macro. These properties identify a document as conforming to a particular PDF/A standard. Currently, we assume PDF/A-1b if any PDF/A compliance is detected.

```
891 \newcommand*{\hyxmp@pdfa@id@schema}{%
892   \ifHy@pdfa
893     \hyxmp@add@to@xml{%
894       <rdf:Description rdf:about=""^^J%
895       _____xmlns:pdfaid="http://www.aiim.org/pdfa/ns/id/">^^J%
896     }%
897     \hyxmp@add@simple{pdfaid:part}{1}%
898     \hyxmp@add@simple{pdfaid:conformance}{B}%
899     \hyxmp@add@to@xml{%
900       </rdf:Description>^^J%
901     }%
902   \fi
903 }
```

3.5.10 Combining schemata into an XMP packet

`\hyxmp@bom` Define a macro for the Unicode byte-order marker (BOM).

```
904 \begingroup
905   \ifhyxmp@unicodetex
906     \lccode'\!="FEFF %
907     \lowercase{%
908       \gdef\hyxmp@bom{!}
909     }%
910   \else
911     \catcode'\^^ef=12
912     \catcode'\^^bb=12
913     \catcode'\^^bf=12
914     \gdef\hyxmp@bom{^^ef^^bb^^bf}%
915   \fi
916 \endgroup
```

`\hyxmp@construct@packet` Successively add XML data to `\hyxmp@xml` until we have something we can insert into the document's PDF catalog.

`\hyxmp@xml`

```
917 \def\hyxmp@construct@packet{%
918   \gdef\hyxmp@xml{%
919     \hyxmp@add@to@xml{<?xpacket begin="\hyxmp@bom" %
920 id="W5M0MpCehiHzreSzNTczkc9d"?>^^J%
921 <x:xmpmeta xmlns:x="adobe:ns:meta/" x:xmptk="3.1-702">^^J%
922 ___<rdf:RDF
923 xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns\hyxmp@hash">^^J%
924   }%
925   \hyxmp@pdf@schema
```



```

926 \hyxmp@xmpRights@schema
927 \hyxmp@dc@schema
928 \hyxmp@photoshop@schema
929 \hyxmp@photometa@schema
930 \hyxmp@xmp@basic@schema
931 \hyxmp@pdfa@id@schema
932 \hyxmp@mm@schema
933 \hyxmp@add@to+xml{%
934 ___</rdf:RDF>^^J%
935 </x:xmpmeta>^^J%
936 \hyxmp@padding
937 <?xpacket end="w"?>^^J%
938 }%
939 }

```

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” [3] so that’s what we do here.

```

\hyxmp@embed@packet Determine which hyperref driver is in use and invoke the appropriate embedding
\hyxmp@driver function.
940 \newcommand*{\hyxmp@embed@packet}{%
941 \hyxmp@construct@packet
942 \def\hyxmp@driver{hpdfTeX}%
943 \ifx\hyxmp@driver\Hy@driver
944 \hyxmp@embed@packet@pdfTeX
945 \else
946 \def\hyxmp@driver{hdvipdfm}%
947 \ifx\hyxmp@driver\Hy@driver
948 \hyxmp@embed@packet@dvipdfm
949 \else
950 \def\hyxmp@driver{hXeTeX}%
951 \ifx\hyxmp@driver\Hy@driver
952 \hyxmp@embed@packet@XeTeX
953 \else
954 \@ifundefined{pdfmark}{%
955 \PackageWarningNoLine{hyperxmp}{%
956 Unrecognized hyperref driver ‘\Hy@driver’. \MessageBreak
957 \jobname.tex’s XMP metadata will *not* be \MessageBreak
958 embedded in the resulting file}%
959 }{%
960 \hyxmp@embed@packet@pdfmark
961 }%
962 \fi
963 \fi
964 \fi
965 }

```

3.6.1 Embedding using pdfTeX

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

```
966 \newcommand*{\hyxmp@embed@packet@pdftex}{%
967   \bgroup
968     \pdfcompresslevel=0
969     \immediate\pdfobj stream attr {%
970       /Type /Metadata
971       /Subtype /XML
972     }\hyxmp@xml}%
973   \pdfcatalog {/Metadata \the\pdflastobj\space 0 R}%
974   \egroup
975 }
```

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.

```
976 \newcommand*{\hyxmp@embed@packet@pdfmark}{%
977   \pdfmark{%
978     pdfmark=/NamespacePush
979   }%
980   \pdfmark{%
981     pdfmark=/OBJ,
982     Raw={/_objdef \string{hyxmp@Metadata\string} /type /stream}%
983   }%
984   \pdfmark{%
985     pdfmark=/PUT,
986     Raw={\string{hyxmp@Metadata\string}
987       2 dict begin
988         /Type /Metadata def
989         /Subtype /XML def
990         currentdict
991       end
992     }%
993   }%
994   \pdfmark{%
995     pdfmark=/PUT,
996     Raw={\string{hyxmp@Metadata\string} (\hyxmp@xml)}%
997   }%
998   \pdfmark{%
999     pdfmark=/Metadata,
1000     Raw={\string{Catalog\string} \string{hyxmp@Metadata\string}}%
1001   }%
1002   \pdfmark{%
1003     pdfmark=/NamespacePop
1004   }%
1005 }
```

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.

```

1006 \newcommand*{\hyxmp@embed@packet@dvipdfm}{%
1007   \hyxmp@string@len{\hyxmp@xml}%
1008   \special{pdf: object @hyxmp@Metadata
1009     <<
1010       /Type /Metadata
1011       /Subtype /XML
1012       /Length \the\@tempcnta
1013     >>
1014     stream^^J\hyxmp@xml endstream%
1015   }%
1016   \special{pdf: docview
1017     <<
1018       /Metadata @hyxmp@Metadata
1019     >>
1020   }%
1021 }
```

`\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.

```

1022 \newcommand*{\hyxmp@string@len}[1]{%
1023   \@tempcnta=0
1024   \expandafter\hyxmp@count@spaces#1 {} %
1025   \expandafter\hyxmp@count@non@spaces#1{}%
1026 }
```

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

```

1027 \def\hyxmp@count@spaces#1 {%
1028   \def\hyxmp@one@token{#1}%
1029   \ifx\hyxmp@one@token\@empty
1030     \advance\@tempcnta by -1
1031   \else
1032     \advance\@tempcnta by 1
1033     \expandafter\hyxmp@count@spaces
1034   \fi
1035 }
```

`\hyxmp@count@non@spaces` Count the number of non-spaces in a given string. Ideally, we'd count both spaces and non-spaces but T_EX 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.

```

1036 \newcommand*{\hyxmp@count@non@spaces}[1]{%
1037   \def\hyxmp@one@token{#1}%
1038   \ifx\hyxmp@one@token\@empty
1039   \else
1040     \advance\@tempcnta by 1
1041     \expandafter\hyxmp@count@non@spaces
1042   \fi
1043 }

```

3.6.4 Embedding using X_YTeX

`\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.

```

1044 \newcommand*{\hyxmp@embed@packet@xetex}{%
1045   \special{pdf:stream @hyxmp@Metadata (\hyxmp@xml)
1046     <<
1047       /Type /Metadata
1048       /Subtype /XML
1049     >>
1050   }%
1051   \special{pdf:put @catalog
1052     <<
1053       /Metadata @hyxmp@Metadata
1054     >>
1055   }%
1056 }

```

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.

```

1057 \catcode'\="=\hyxmp@dq@code

```

4 Future Work

Help wanted Ideally, `\xmpquote` should automatically replace all commas with `\xmpcomma`. Unfortunately, my TeX skills are insufficient to pull that off. If you know a way to make `\xmpquote{Hello, world}` work with both Unicode and non-Unicode encodings and with all TeX engines (pdfTeX, LuaTeX, X_YTeX, etc.), please send me a code patch.

A Sample XMP packet

The following is an example of a complete XMP packet as may be produced by hyperxmp. This packet corresponds to the metadata included in the sample L^ATeX

document presented on pages 5–6. For clarity, metadata values, either specified explicitly by the document or introduced automatically by hyperxmp, are colored blue.

```
<?xpacket begin="\357\273\277" 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>pdfTeX-1.40.10</pdf:Producer>
    </rdf:Description>
    <rdf:Description rdf:about=""
      xmlns:xmpRights="http://ns.adobe.com/xap/1.0/rights/"
      <xmpRights:Marked>True</xmpRights:Marked>
      <xmpRights:WebStatement>
        http://creativecommons.org/licenses/by-nc-nd/3.0/
      </xmpRights:WebStatement>
    </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:li xml:lang="x-default">
            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:li xml:lang="x-default">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:li xml:lang="x-default">
            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>1905-03-17</rdf:li>
    </rdf:Seq>
</dc:date>
<dc:language>
    <rdf:Bag>
        <rdf:li>en</rdf:li>
    </rdf:Bag>
</dc:language>
<dc:source>einstein.tex</dc:source>
</rdf:Description>
<rdf:Description rdf:about=""
    xmlns:photoshop="http://ns.adobe.com/photoshop/1.0/">
    <photoshop:AuthorsPosition>
        Technical Assistant, Level III
    </photoshop:AuthorsPosition>
    <photoshop:CaptionWriter>Scott Pakin</photoshop:CaptionWriter>
</rdf:Description>
<rdf:Description rdf:about=""
    xmlns:pdfaExtension="http://www.aiim.org/pdfa/ns/extension/"
    xmlns:pdfaSchema="http://www.aiim.org/pdfa/ns/schema#"
    xmlns:pdfaProperty="http://www.aiim.org/pdfa/ns/property#"
    xmlns:pdfaType="http://www.aiim.org/pdfa/ns/type#"
    xmlns:pdfaField="http://www.aiim.org/pdfa/ns/field#">
    <pdfaExtension:schemas>
        <rdf:Bag>
            <rdf:li rdf:parseType="Resource">

```

```

<pdfaSchema:schema>IPTC Core Schema</pdfaSchema:schema>
<pdfaSchema:namespaceURI>http://iptc.org/std/Iptc4xmpCore/1.0/xmlns/</pdfaSchema:namespaceURI>
<pdfaSchema:prefix>Iptc4xmpCore</pdfaSchema:prefix>
<pdfaSchema:property>
  <rdf:Seq>
    <rdf:li rdf:parseType="Resource">
      <pdfaProperty:name>CreatorContactInfo</pdfaProperty:name>
      <pdfaProperty:valueType>contactinfo</pdfaProperty:valueType>
      <pdfaProperty:category>external</pdfaProperty:category>
      <pdfaProperty:description>contact information for the document's creator</pdfaProperty:description>
    </rdf:li>
  </rdf:Seq>
</pdfaSchema:property>
<pdfaSchema:valueType>
  <rdf:Seq>
    <rdf:li rdf:parseType="Resource">
      <pdfaType:type>contactinfo</pdfaType:type>
      <pdfaType:namespaceURI>http://iptc.org/std/Iptc4xmpCore/1.0/xmlns/</pdfaType:namespaceURI>
      <pdfaType:prefix>IptcContInfo</pdfaType:prefix>
      <pdfaType:description>contact information</pdfaType:description>
      <pdfaType:field>
        <rdf:Seq>
          <rdf:li rdf:parseType="Resource">
            <pdfaField:name>CiAdrExtadr</pdfaField:name>
            <pdfaField:valueType>Text</pdfaField:valueType>
            <pdfaField:description>contact address</pdfaField:description>
          </rdf:li>
          <rdf:li rdf:parseType="Resource">
            <pdfaField:name>CiAdrCity</pdfaField:name>
            <pdfaField:valueType>Text</pdfaField:valueType>
            <pdfaField:description>contact city</pdfaField:description>
          </rdf:li>
          <rdf:li rdf:parseType="Resource">
            <pdfaField:name>CiAdrRegion</pdfaField:name>
            <pdfaField:valueType>Text</pdfaField:valueType>
            <pdfaField:description>contact region</pdfaField:description>
          </rdf:li>
          <rdf:li rdf:parseType="Resource">
            <pdfaField:name>CiAdrPcode</pdfaField:name>
            <pdfaField:valueType>Text</pdfaField:valueType>
            <pdfaField:description>contact postal code</pdfaField:description>
          </rdf:li>
          <rdf:li rdf:parseType="Resource">
            <pdfaField:name>CiAdrCtry</pdfaField:name>
            <pdfaField:valueType>Text</pdfaField:valueType>
            <pdfaField:description>contact country</pdfaField:description>
          </rdf:li>
        </rdf:Seq>
      </pdfaType:field>
    </rdf:li>
  </rdf:Seq>
</pdfaSchema:valueType>

```

```

        </rdf:li>
        <rdf:li rdf:parseType="Resource">
            <pdfaField:name>CiTelWork</pdfaField:name>
            <pdfaField:valueType>Text</pdfaField:valueType>
            <pdfaField:description>contact telephone number</pdfaField:de
        </rdf:li>
        <rdf:li rdf:parseType="Resource">
            <pdfaField:name>CiEmailWork</pdfaField:name>
            <pdfaField:valueType>Text</pdfaField:valueType>
            <pdfaField:description>contact email address</pdfaField:de
        </rdf:li>
        <rdf:li rdf:parseType="Resource">
            <pdfaField:name>CiUrlWork</pdfaField:name>
            <pdfaField:valueType>Text</pdfaField:valueType>
            <pdfaField:description>contact url</pdfaField:description>
        </rdf:li>
    </rdf:Seq>
</pdfaType:field>
</rdf:li>
</rdf:Seq>
</pdfaSchema:valueType>
</rdf:li>
</rdf:Bag>
</pdfaExtension:schemas>
</rdf:Description>
<rdf:Description rdf:about=""
    xmlns:Iptc4xmpCore="http://iptc.org/std/Iptc4xmpCore/1.0/xmlns/"
    xmlns:IptcContInfo="http://iptc.org/std/Iptc4xmpCore/1.0/xmlns/contactinf
<Iptc4xmpCore:CreatorContactInfo rdf:parseType="Resource">
    <IptcContInfo:CiAdrExtadr>Kramgasse 49</IptcContInfo:CiAdrExtadr>
    <IptcContInfo:CiAdrCity>Bern</IptcContInfo:CiAdrCity>
    <IptcContInfo:CiAdrPcode>3011</IptcContInfo:CiAdrPcode>
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    <IptcContInfo:CiTelWork>031 312 00 91</IptcContInfo:CiTelWork>
    <IptcContInfo:CiEmailWork>aeinstein@ipi.ch</IptcContInfo:CiEmailWork>
    <IptcContInfo:CiUrlWork>
        http://einstein.biz/,
        https://www.facebook.com/AlbertEinstein
    </IptcContInfo:CiUrlWork>
</Iptc4xmpCore:CreatorContactInfo>
</rdf:Description>
<rdf:Description rdf:about=""
    xmlns:xmp="http://ns.adobe.com/xap/1.0/">
    <xmp:CreateDate>2016-04-05T22:37:36-06:00</xmp:CreateDate>
    <xmp:ModifyDate>2016-04-05T22:37:36-06:00</xmp:ModifyDate>
    <xmp:MetadataDate>2016-04-05T22:37:36-06:00</xmp:MetadataDate>

```



```

        <xmp:CreatorTool>LaTeX with hyperref package</xmp:CreatorTool>
        <xmp:BaseURL>
            http://mirror.ctan.org/macros/latex/contrib/hyperxmp/
        </xmp:BaseURL>
    </rdf:Description>
    <rdf:Description rdf:about=""
        xmlns:xmpMM="http://ns.adobe.com/xap/1.0/mm/">
        <xmpMM:DocumentID>
            uuid:0595fdce-41dc-e4c4-6c418dc4ce46
        </xmpMM:DocumentID>
        <xmpMM:InstanceID>
            uuid:efd754c4-1d7f-200a-ef754ce413ea
        </xmpMM:InstanceID>
    </rdf:Description>
</rdf:RDF>
</x:xmpmeta>
<?xpacket end="w"?>

```

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Change History

v1.0				ify the language in which he wrote the document's metadata	16
	General: Initial version	1		
v1.1				<code>\hyxmp@reencode</code> : 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	20
	<code>\hyxmp@construct@packet</code> : Explicitly set the category codes of characters $\langle EF \rangle$, $\langle BB \rangle$, and $\langle BF \rangle$ to “letter”. Thanks to Daniel Schömer for the bug report	40		
				v1.4	
v1.2				<code>\hyxmp@mm@schema</code> : Renamed the <code>xapMM</code> namespace prefix to <code>xmpMM</code>	35
	General: Added support for the X _Y L ^A T _E X backend (<code>xdvipdfmx</code>)	..	1		
	Added support for the Photoshop schema	1	<code>\hyxmp@rdf@dc</code> : Included metadata in the <code>x-default</code> language regardless of the specified metadata language	32
	Made the package compatible with <code>ngerman</code> . Thanks to Tobias Mueller for the bug report.	..	10	<code>\hyxmp@xmpRights@schema</code> : Renamed the <code>xapRights</code> namespace prefix to <code>xmpRights</code>	34
v1.3					
	General: Introduced the <code>pdfmetalang</code> package option, which enables an author to spec-			v1.5	
				General: Made the XMP inclusion	

more robust. Thanks to Heiko Oberdiek for the bug report and suggested modifications.	10	Escaped parentheses written with pdfmarks to prevent dvips from line-wrapping the XMP packet	22
v2.0		\hyxmp@toxml@unicodetex: Added by Heiko Oberdiek	23
General: Added support for the XMP Basic schema and miscellaneous other bits of metadata	1	\hyxmp@xetex@crap: Added by Heiko Oberdiek	23
Heiko Oberdiek's major rewrite of the code to better support native-Unicode T _E X implementations (X _E T _E X and LuaT _E X)	1	\hyxmp@xmlyfy: Completely rewritten by Heiko Oberdiek to better support Unicode-enabled T _E X programs	20
New \AtBeginDocument code from Heiko Oberdiek to properly encode \pdfmetalang	16	\hyxmp@xmp@basic@schema: Added this macro	35
\hyxmp@add@to@xml: Updated also to replace commas	28	\hyxmp@xmpRights@schema: Modified to include xmpRights:Marked only when pdfcopyright is specified and xmpRights:WebStatement only when pdflicenseurl is specified	34
\hyxmp@bom: Added by Heiko Oberdiek	40	\hyxmp@zero: Added by Heiko Oberdiek	25
\hyxmp@comma: Added this macro	18	\ifhyxmp@unicodetex: Added by Heiko Oberdiek	20
\hyxmp@construct@packet: Modified by Heiko Oberdiek to use an appropriate BOM representation via \hyxmp@bom	40	\ProcessKeyvalOptions: Added this macro	15
\hyxmp@crap@convert: Added by Heiko Oberdiek	24	\xmpcomma: Added this macro	18
\hyxmp@crap@test: Added by Heiko Oberdiek	24	\xmpquote: Added this macro	18
\hyxmp@dc@schema: Added support for dc:language and dc:source	33	\XMPTruncateList: Added this macro	18
\hyxmp@is@unicode: Added by Heiko Oberdiek	21	v2.1	
\hyxmp@list@to@xml: Modified by Heiko Oberdiek to use the new Unicode-processing macros	33	General: Enabled hyperxmp and hyperref to be loaded in either order. This addresses a bug report by Yury Donskoy	13
\hyxmp@photoshop@schema: Simplified using \hyxmp@add@simple	36	\hypersetup: Added this macro	15
\hyxmp@ProcessKeyvalOptions: Added this macro	15	\hyxmp@hypersetup: Added this macro	15
\hyxmp@reencode: Replaced with an empty macro by Heiko Oberdiek	20	\hyxmp@redefine@Hyp: Added this macro	13
\hyxmp@skiptorelax: Added by Heiko Oberdiek	24	v2.2	
\hyxmp@skipzeros: Added by Heiko Oberdiek	23	General: Added support for the IPTC Photo Metadata schema	1
\hyxmp@SpaceOther: Added by Heiko Oberdiek	24	\hyxmp@iptc@extensions: Added this macro to support PDF/A generation	38
\hyxmp@string: Added this macro	31	\hyxmp@list@to@lines: Added this macro	36
\hyxmp@toxml: Added by Heiko Oberdiek	22	\hyxmp@photometa@schema: Added this macro	37

<code>\hyxmp@text@resource</code> : Added this macro	39	include the Adobe PDF schema, even when empty. Florian Breitwieser noted that this is necessary for PDF/A-1b compliance	31
<code>\xmpcomma</code> : Changed the default from <code>\relax</code> to an ordinary comma	18	<code>\hyxmp@pdf@to@xmp@date</code> : Added this macro	29
<code>\xmplinesep</code> : Added this macro ..	36	<code>\hyxmp@pdfa@id@schema</code> : Added this macro	40
v2.3		<code>\hyxmp@today</code> : Modified the code to parse the time and timezone from <code>\pdfcreationdate</code> , as proposed by Florian Breitwieser ..	31
<code>\hyxmp@iptc@extensions</code> : Gave the <code>lptc4xmpCore:CreatorContactInfo</code> fields a unique <code>pdfaType:prefix</code> to better support conversion of the document to PDF/A	38	<code>\hyxmp@today@define</code> : Added this macro	30
v2.3a		<code>\xmptilde</code> : Added this macro ...	18
General: Bug fix: Redefine <code>\@pdflang</code> as <code>\@empty</code> when <code>hyperref</code> has set it to <code>\relax</code> ..	16	v2.5	
v2.3b		General: Enabled “_” to work within email addresses, as requested by Leonid Sinev	1
<code>\XMPTruncateList</code> : Made all definitions local to avoid spurious <code>Too many unprocessed floats</code> errors when running with <code>memoir</code> ..	18	<code>\hyxmp@add@to+xml</code> : Updated also to replace underscores and to modify only the text being added, not the already-modified text	28
v2.4		<code>\hyxmp@textunderscore</code> : Added this macro	11
General: Added support for the PDF/A Identification schema, as requested by Florian Breitwieser	1	<code>\hyxmp@uscore</code> : Added this macro ..	18
<code>\hyxmp@add@simple@var</code> : Added this macro	32	v2.6	
<code>\hyxmp@create@uuid</code> : Modified this macro to produce a proper version 4 (random or pseudorandom) UUID	27	General: Added support for a new <code>pdfdate</code> key to explicitly specify the document date (and optionally time)	1
<code>\hyxmp@dc@schema</code> : Made <code>dc:language</code> a Bag instead of an individual item so as to conform to the latest XMP specifications, a detail identified by Florian Breitwieser	33	v2.7	
<code>\hyxmp@parse@time</code> : Added this macro	30	General: Automatically use <code>\title</code> and <code>\author</code> if <code>pdftitle</code> and <code>pdfauthor</code> are left unspecified. Thanks to Maciej Radziejewski for the suggestion	16
<code>\hyxmp@parse@tz</code> : Added this macro	30	v2.8	
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