

The hyperxmp package^{*}

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Abstract

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

1 Introduction

Adobe Systems, Inc. has been promoting XMP [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` v2.2, dated 2012/12/13.

```

    </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`)
- 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-generating tool (`pdf:Producer` and `xmp:CreatorTool`)
- PDF version (`pdf:PDFVersion`)
- primary author's position/title (`photoshop:AuthorsPosition`)
- summary (`dc:description`)
- title (`dc:title`)
- contact address (`lptc4xmpCore:CiAdrExtadr`, `lptc4xmpCore:CiAdrCity`, `lptc4xmpCore:CiAdrRegion`, `lptc4xmpCore:CiAdrPcode`, and `lptc4xmpCore:CiAdrCtry`)

- contact telephone number(s) (`lptc4xmpCore:CTelWork`)
- contact email address(es) (`lptc4xmpCore:CiEmailWork`)
- contact URL(s) (`lptc4xmpCore:CTurlWork`)

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`:

- `pdfauthorshorttitle`

- `pdfcaptionwriter`
- `pdfcontactaddress`
- `pdfcontactcity`
- `pdfcontactcountry`
- `pdfcontactemail`
- `pdfcontactphone`
- `pdfcontactpostcode`
- `pdfcontactregion`
- `pdfcontacturl`
- `pdfcopyright`
- `pdflicenseurl`
- `pdfmetalang`

`pdfauthortitle` indicates the primary author’s position or title. `pdfcaptionwriter` specifies the name of the person who added the metadata to the document. 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. `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}
\hypersetup{%
  pdftitle={%
    On a heuristic viewpoint concerning the production and
    transformation of light},
  pdfauthor={Albert Einstein},
  pdfauthortitle={Technical Assistant, Level III},
  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://www.ctan.org/tex-archive/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
- X \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.

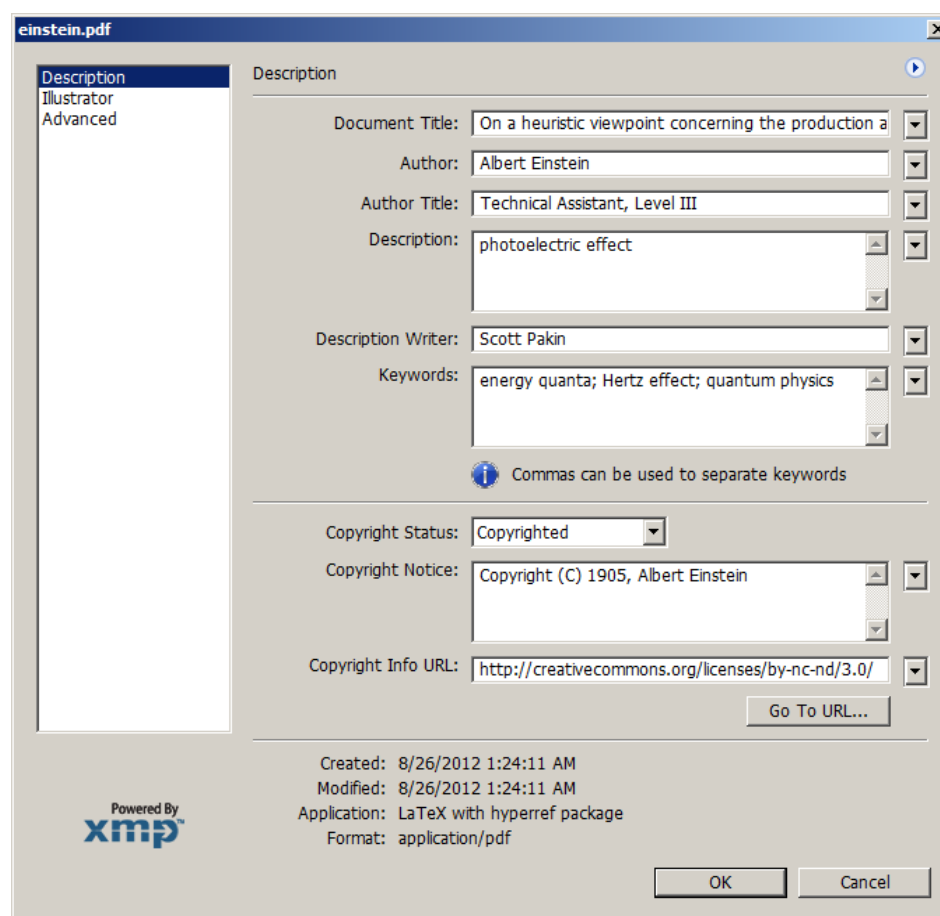


Figure 1: XMP metadata as it appears in Adobe Acrobat

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

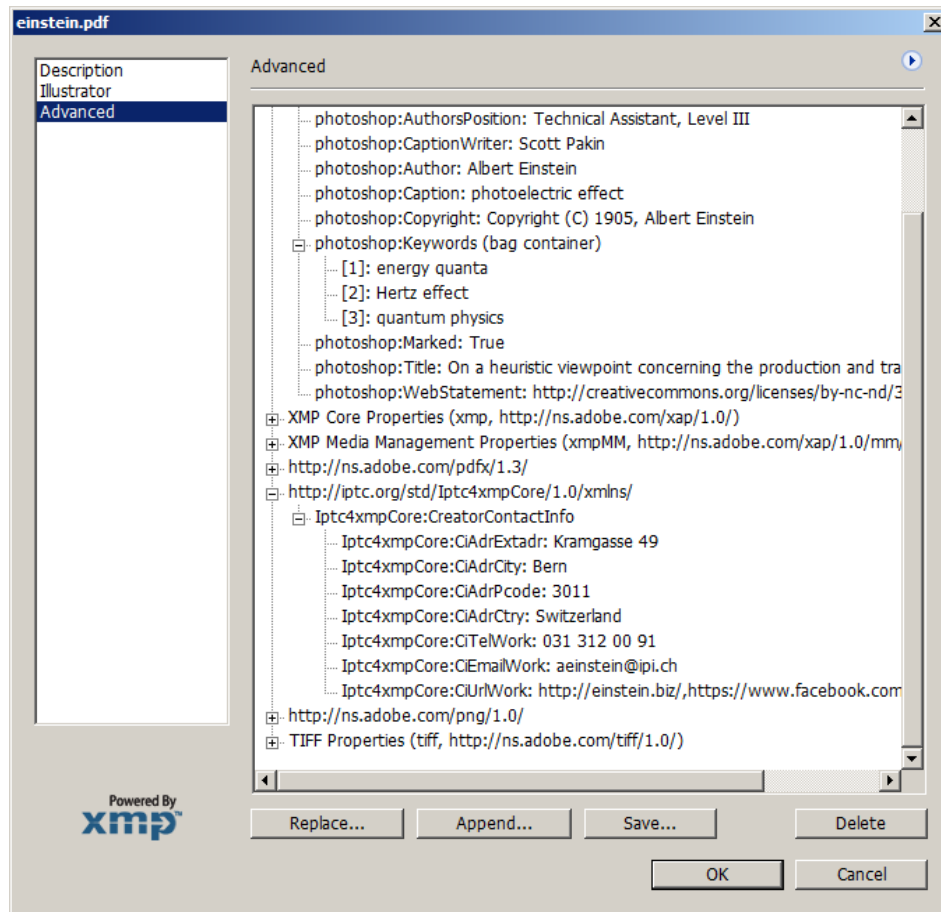


Figure 2: Additional XMP metadata as it appears in Adobe Acrobat

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` 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. 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: X_gL^AT_EX object compression X_gL^AT_EX (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^AT_EX), (2) pass the `--output-driver="xdvipdfmx -z0"` option to X_gL^AT_EX 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` If you need to include a literal comma within an author or keyword list (where
`\xmpquote` 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 those cases, `\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

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

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

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 `pdftitle`, `pdfauthor`, `pdfsubject`, `pdfkeywords`, and `pdflang` options. It also introduces five new options: `pdfcopyright`, `pdflicenseurl`, `pdfauthortitle`, `pdfcaptionwriter`, and `pdfmetalang`. 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: `kvoptions` 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{kvoptions}
11 \RequirePackage{pdfescape}
12 \RequirePackage{stringenc}
13 \RequirePackage{intcalc}
14 \RequirePackage{ifxetex}

\@pdfcopyright Prepare to store the document's copyright statement.
15 \def\@pdfcopyright{}
16 \define@key{Hyp}{pdfcopyright}{\pdfstringdef\@pdfcopyright{#1}}

\@pdflicenseurl Prepare to store the URL containing the document's license agreement.
17 \def\@pdflicenseurl{}
18 \define@key{Hyp}{pdflicenseurl}{\pdfstringdef\@pdflicenseurl{#1}}

\@pdfauthortitle Prepare to store the author's position/title (e.g., Staff Writer).
19 \def\@pdfauthortitle{}
20 \define@key{Hyp}{pdfauthortitle}{\pdfstringdef\@pdfauthortitle{#1}}

\@pdfcaptionwriter Prepare to store the name of the person who inserted the hyperxmp metadata.
21 \def\@pdfcaptionwriter{}
22 \define@key{Hyp}{pdfcaptionwriter}{\pdfstringdef\@pdfcaptionwriter{#1}}

\@pdfmetalang Prepare to store the natural language of the document's metadata, typically as an
ISO 639-1 two-letter abbreviation.
23 \def\@pdfmetalang{}
24 \define@key{Hyp}{pdfmetalang}{\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.

```
25 \def\@pdfcontactaddress{}
26 \define@key{Hyp}{pdfcontactaddress}{%
27   \let\xmpcomma=\hyxmpcomma
28   \def\xmpquote##1{##1}%
29   \pdfstringdef\@pdfcontactaddress{#1}%
30   \def\xmpcomma{,}%
31   \let\xmpquote=\relax
32 }
```

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

```
33 \def\@pdfcontactcity{}
34 \define@key{Hyp}{pdfcontactcity}{\pdfstringdef\@pdfcontactcity{#1}}
```

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

```
35 \def\@pdfcontactregion{}
36 \define@key{Hyp}{pdfcontactregion}{\pdfstringdef\@pdfcontactregion{#1}}
```

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

```
37 \def\@pdfcontactpostcode{}
38 \define@key{Hyp}{pdfcontactpostcode}{\pdfstringdef\@pdfcontactpostcode{#1}}
```

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

```
39 \def\@pdfcontactcountry{}
40 \define@key{Hyp}{pdfcontactcountry}{\pdfstringdef\@pdfcontactcountry{#1}}
```

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

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

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

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

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

```
45 \def\@pdfcontacturl{}
46 \define@key{Hyp}{pdfcontacturl}{\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`.

<code>\hyxmp@pdfauthor</code> <code>\hyxmp@pdfkeywords</code>	Prepare to store the name of the author and a list of keywords. <pre> 47 \def\hyxmp@pdfauthor{} 48 \def\hyxmp@pdfkeywords{} </pre>
<code>\hyxmp@redefine@Hyp</code>	If not already redefined, redefine <code>hyperref</code> 's <code>pdfauthor</code> and <code>pdfkeywords</code> options to properly handle <code>\xmpcomma</code> and <code>\xmpquote</code> . <pre> 49 \newcommand*{\hyxmp@redefine@Hyp}{% </pre>
<code>\hyxmp@Hyp@pdfauthor</code>	Store the old definition of <code>\KV@Hyp@pdfauthor</code> in <code>\hyxmp@Hyp@pdfauthor</code> , but only if we see that <code>\KV@Hyp@pdfauthor</code> is defined and <code>\hyxmp@Hyp@pdfauthor</code> isn't. Otherwise, we'd be defining <code>\hyxmp@Hyp@pdfauthor</code> in terms of itself and creating an infinite loop. <pre> 50 \ifundefined{KV@Hyp@pdfauthor}{\}% 51 \ifundefined{hyxmp@Hyp@pdfauthor}{% 52 \expandafter\let\expandafter\hyxmp@Hyp@pdfauthor 53 \csname KV@Hyp@pdfauthor\endcsname 54 }\}% 55 }% </pre>
<code>\KV@Hyp@pdfauthor</code> <code>\xmpcomma</code> <code>\xmpquote</code> <code>\hyxmp@pdfauthor</code> <code>\@pdfauthor</code>	Redefine <code>\KV@Hyp@pdfauthor</code> to process its argument twice. The first time, <code>\xmpcomma</code> is defined as a placeholder character (<code>\hyxmp@comma</code>) and <code>\xmpquote</code> as the identity function. The result is stored in <code>\hyxmp@pdfauthor</code> for use in structured lists (those surrounding each entry with <code><rdf:li></code>). The second time, <code>\xmpcomma</code> is defined as an ordinary comma, and <code>\xmpquote</code> is defined as a macro that puts its argument within double quotes. The result is stored in <code>\@pdfauthor</code> for use in unstructured lists (those in which the entire list appears within a single pair of tags). <pre> 56 \define@key{Hyp}{pdfauthor}{% 57 \let\xmpcomma=\hyxmp@comma 58 \def\xmpquote####1{####1}% 59 \hyxmp@Hyp@pdfauthor{##1}% 60 \global\let\hyxmp@pdfauthor=\@pdfauthor 61 \def\xmpcomma{,%} </pre>

```

62   \def\xmpquote####1{"####1"}%
63   \hyxmp@Hyp@pdfauthor{##1}%
64   \def\xmpcomma{,}%
65   \let\xmpquote=\relax
66   }%

```

`\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`.

```

67   \@ifundefined{KV@Hyp@pdfkeywords}{}{%
68     \@ifundefined{hyxmp@Hyp@pdfkeywords}{%
69       \expandafter\let\expandafter\hyxmp@Hyp@pdfkeywords
70       \csname KV@Hyp@pdfkeywords\endcsname
71     }{}%
72   }%

```

`\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).

```

73   \define@key{Hyp}{pdfkeywords}{%
74     \let\xmpcomma=\hyxmp@comma
75     \def\xmpquote####1{####1}%
76     \hyxmp@Hyp@pdfkeywords{##1}%
77     \global\let\hyxmp@pdfkeywords=\@pdfkeywords
78     \def\xmpcomma{,}%
79     \def\xmpquote####1{"####1"}%
80     \hyxmp@Hyp@pdfkeywords{##1}%
81     \def\xmpcomma{,}%
82     \let\xmpquote=\relax
83   }%
84 }

```

`\hyxmp@ProcessKeyvalOptions` Redefine `kvoptions's \ProcessOptions` command to invoke `\hyxmp@redefine@Hyp` before performing its normal option processing.

```

85 \let\hyxmp@ProcessKeyvalOptions=\ProcessKeyvalOptions
86 \renewcommand*\ProcessKeyvalOptions{%
87   \hyxmp@redefine@Hyp
88   \hyxmp@ProcessKeyvalOptions
89 }

```

`\hyxmp@hypersetup` Redefine `hyperref's \hypersetup` command to invoke `\hyxmp@redefine@Hyp` before performing its normal option processing.

```

90 \let\hyxmp@hypersetup=\hypersetup
91 \def\hypersetup{%

```

```

92 \hyxmp@redefine@Hyp
93 \hyxmp@hypersetup
94 }

```

`\hyxmp@find@metadata` Issue a warning message if the author failed to include any metadata at all. Note that we don't consider `\@pdfmetlang` as metadata as that value is meaningful only when used in conjunction with other information.

```

95 \newcommand*{\hyxmp@find@metadata}{%
96   \edef\hyxmp@concat@metadata{%
97     \@baseurl
98     \@pdfauthor
99     \@pdfauthortitle
100    \@pdfcaptionwriter
101    \@pdfcontactaddress
102    \@pdfcontactcity
103    \@pdfcontactcountry
104    \@pdfcontactemail
105    \@pdfcontactphone
106    \@pdfcontactpostcode
107    \@pdfcontactregion
108    \@pdfcontacturl
109    \@pdfcopyright
110    \@pdfkeywords
111    \@pdflang
112    \@pdflicenseurl
113    \@pdfsubject
114    \@pdftitle
115  }%
116   \ifx\hyxmp@concat@metadata\@empty
117     \PackageWarningNoLine{hyperxmp}{%
118 \jobname.tex did not specify any metadata to\MessageBreak
119 include in the XMP packet.\space\space Please see the hyperxmp\MessageBreak
120 documentation for instructions on how to provide\MessageBreak
121 metadata values to hyperxmp}%
122   \fi
123 }

```

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

```

124 \AtBeginDocument{%
125   \@ifpackageloaded{hyperref}{%

```

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

```

126     \ifx\@pdflang\@empty

```

```

127     \let\@pdfmetalang=\hyxmp@x@default
128     \else
129         \edef\@pdfmetalang{\@pdflang}%
130     \fi
131     \hyxmp@xmlify\@pdfmetalang

```

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.

```

132     \hyxmp@at@end{%
133         \hyxmp@find@metadata
134         \hyxmp@embed@packet
135     }%
136 }%
137 {\PackageWarningNoLine{hyperxmp}{%
138 \jobname.tex failed to include a\MessageBreak
139 \string\usepackage\string{hyperref\string}
140 in the preamble.\MessageBreak
141 Consequently, all hyperxmp functionality will be\MessageBreak
142 disabled}%
143 }%
144 }

```

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.)
145 \newcommand*{\hyxmp@commas@to@list}[2]{%
146     \gdef#1{%
147         \expandafter\hyxmp@commas@to@list\i\expandafter#1#2,,%
148     }

\hyxmp@commas@to@list\i Recursively construct macro #1 from comma-separated list #2. Stop if #2 is empty.
\next 149 \def\hyxmp@commas@to@list\i#1#2,{%
150     \gdef\hyxmp@sublist{#2}%

```

```

151 \ifx\hyxmp@sublist\@empty
152   \let\next=\relax
153 \else
154   \hyxmp@trimspaces\hyxmp@sublist
155   \@cons{#1}{\hyxmp@sublist}}%
156   \def\next{\hyxmp@commas@to@list@i{#1}}%
157 \fi
158 \next
159 }

```

\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.

```
160 \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.

```

161 \bgroup
162 \catcode'\^^C=11
163 \gdef\hyxmp@comma{^^C}
164 \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.

```
165 \let\xmpquote=\relax
```

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

```

166 \newcommand{\XMPTruncateList}[1]{%
167   \edef\hyxmp@temp@str{\csname hyxmp@#1\endcsname}%
168   \hyxmp@commas@to@list{\hyxmp@temp@list}{\hyxmp@temp@str}%
169   \def\@elt##1{%
170     \expandafter\gdef\csname @#1\endcsname{##1}%
171     \let\@elt=\@gobble
172   }
173   \hyxmp@temp@list
174 }

```


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.

```
175 \catcode'\Q=3
\hyxmp@trimspaces\x redefines \x to have the same replacement text sans leading
and trailing space tokens.
176 \newcommand{\hyxmp@trimspaces}[1]{%
  Use grouping to emulate a multi-token afterassignment queue.
177  \begingroup
  Put “\toks 0 {” into the afterassignment queue.
178  \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.
179  \expandafter\hyxmp@trimb\expandafter\noexpand#1Q Q}%
  Transfer the trimmed text back into #1.
180  \edef#1{\the\toks0}%
181 }
```

`\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.

```
182 \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.

```
183 \def\hyxmp@trimc#1Q#2{\afterassignment\endgroup \vfuzz\the\vfuzz#1}
184 \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` X_YTeX and LuaTeX natively support Unicode. We define the conditional `\ifhyxmp@unicodetex` to check for these so we can properly handle encoding

`\hyxmp@unicodetextrue`

`\hyxmp@unicodetexfalse`

conversions. The trick here is that Unicode T_EX implementations compare decimal 64 to hexadecimal 40 (decimal 64), specified with four carets, and take the TRUE branch; non-Unicode T_EX implementations compare decimal 64 to character “^” (decimal 94), ignore the “^^0040” and the rest of the TRUE branch, and take the FALSE branch.

```
185 \newif\ifhyxmp@unicodetex
186 \ifnum64='^^^^0040\relax
187   \hyxmp@unicodetextrue
188 \else
189   \hyxmp@unicodetexfalse
190 \fi
```

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

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

`\SE->pdfdoc@03` 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.

```
192 \expandafter\def\csname SE->pdfdoc@03\endcsname{0003}
```

`\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
`\hyxmp@text` with `>`; and all occurrences of “&” replaced with `&`.

```
193 \newcommand*{\hyxmp@xmlify}[1]{%
194   \gdef\hyxmp@xmlified{}
```

Escaped PDF string → PDFDocEncoding/Unicode

```
195   \EdefUnescapeString\hyxmp@text{#1}%
196   \ifhyxmp@unicodetex
```

PDFDocEncoding/Unicode → UTF-32BE

```
197     \hyxmp@is@unicode\hyxmp@text{%
198       \StringEncodingConvert
199       \hyxmp@text\hyxmp@text{utf16be}{utf32be}%
200     }{%
201       \ifxetex
202         \hyxmp@xetex@crap
203       \else
204         \StringEncodingConvert
205         \hyxmp@text\hyxmp@text{pdfdoc}{utf32be}%
206       \fi
207     }%
```

UTF-32BE → UTF-32BE as hex string

```
208     \EdefEscapeHex\hyxmp@text{\hyxmp@text}%
```

UTF-32BE → XML in ASCII

```

209 \edef\hyxmp@text{%
210 \expandafter
211 }\expandafter\hyxmp@toxml@unicodetex\hyxmp@text
212 \relax\relax\relax\relax\relax\relax\relax
213 \else

```

PDFDocEncoding/Unicode → UTF-8

```

214 \hyxmp@is@unicode\hyxmp@text{%
215 \StringEncodingConvert
216 \hyxmp@text\hyxmp@text{utf16be}{utf8}%
217 }{%
218 \StringEncodingConvert
219 \hyxmp@text\hyxmp@text{pdfdoc}{utf8}%
220 }%

```

UTF-8 → UTF-8 as hex string

```

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

```

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

```

222 \edef\hyxmp@text{%
223 \expandafter\hyxmp@toxml\hyxmp@text\@empty\@empty
224 }%

```

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

```

225 \EdefUnescapeHex\hyxmp@text{\hyxmp@text}%
226 \fi
227 \global\let\hyxmp@xmlified\hyxmp@text
228 }

```

\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.

```

229 \begingroup
230 \lccode'\<=254 %
231 \lccode'\>=255 %
232 \catcode254=12 %
233 \catcode255=12 %
234 \lowercase{\endgroup
235 \def\hyxmp@is@unicode#1{%
236 \expandafter\hyxmp@@is@unicode#1<>\@nil
237 }%
238 \def\hyxmp@@is@unicode#1<>#2\@nil{%
239 \ifx\#1\%
240 \expandafter\@firstoftwo
241 \else
242 \expandafter\@secondoftwo
243 \fi
244 }%
245 }

```

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

```

246 \def\hyxmp@toxml#1#2{%
247   \ifx#1\@empty
248   \else
249     \ifnum"#1#2='\& %
250       26616D703B% &amp;
251     \else\ifnum"#1#2='\< %
252       266C743B% &lt;
253     \else\ifnum"#1#2='\> %
254       2667743B% &gt;
255     \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.

```

256   \@ifundefined{pdfmark}{%
257     #1#2%
258   }{%
259     \ifnum"#1#2='\( %
260       5C28% \(
261     \else\ifnum"#1#2='\) %
262       5C29% \)
263     \else
264       #1#2%
265     \fi\fi
266   }%
267   \fi\fi\fi
268   \expandafter\hyxmp@toxml
269 \fi
270 }

```

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

`\hyxmp@text`

```

271 \def\hyxmp@toxml@unicodetex#1#2#3#4#5#6#7#8{%
272   \ifx#1\relax
273   \else
274     \ifnum"#1#2#3#4#5#6#7#8>127 %
275     \uccode'\*="#1#2#3#4#5#6#7#8\relax
276     \uppercase{%
277       \edef\hyxmp@text{\hyxmp@text *}%

```

```

278     }%
279     \else\ifnum"#7#8='< %
280         \edef\hyxmp@text{\hyxmp@text &lt;}%
281     \else\ifnum"#7#8='& %
282         \edef\hyxmp@text{\hyxmp@text &amp;}%
283     \else\ifnum"#7#8='> %
284         \edef\hyxmp@text{\hyxmp@text &gt;}%
285     \else\ifnum"#7#8='\ %
286         \edef\hyxmp@text{\hyxmp@text\space}%
287     \else
288         \uccode'\*="#7#8\relax
289         \uppercase{%
290             \edef\hyxmp@text{\hyxmp@text *}%
291         }%
292     \fi\fi\fi\fi\fi
293     \expandafter\hyxmp@toxml@unicodetex
294 \fi
295 }

```

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

```

296 \def\hyxmp@skipzeros#1{%
297   \ifx#10%
298     \expandafter\hyxmp@skipzeros
299   \fi
300 }

```

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

```

\hyxmp@crap \hyxmp@try 301 \begingroup
\hyxmp@crap@result 302 \def\x#1{\endgroup
\hyxmp@text 303 \def\hyxmp@xetex@crap{%
304   \edef\hyxmp@try{%
305     \expandafter\hyxmp@SpaceOther\hyxmp@text#1\@nil
306   }%
307   \let\hyxmp@crap@result=N%
308   \expandafter\hyxmp@crap@test\hyxmp@try\relax
309   \ifx\hyxmp@crap@result Y%
310     \let\hyxmp@text\@empty
311     \expandafter\hyxmp@crap@convert\hyxmp@try\relax
312   \else
313     \StringEncodingConvert\hyxmp@text\hyxmp@text{pdfdoc}{utf32be}%
314   \fi
315 }%
316 }
317 \x{ }

```

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

```

318 \begingroup
319 \catcode'\~ =12 %

```

```

320 \lccode'\~='\' %
321 \lowercase{\endgroup
322 \def\hyxmp@SpaceOther#1 #2\@nil{%
323   #1%
324   \ifx\relax#2\relax
325     \expandafter\@gobble
326   \else
327     ~%
328     \expandafter\@firstofone
329   \fi
330   {\hyxmp@SpaceOther#2\@nil}%
331 }%
332 }

```

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

```

333 \def\hyxmp@crap@test#1{%
334   \ifx#1\relax
335   \else
336     \ifnum'#1>127 %
337       \let\hyxmp@crap@result=Y%
338       \expandafter\expandafter\expandafter\hyxmp@skiptorelax
339     \else
340       \expandafter\expandafter\expandafter\hyxmp@crap@test
341     \fi
342   \fi
343 }

```

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

```

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

```

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

```

\hyxmp@num 345 \def\hyxmp@crap@convert#1{%
\hyxmp@text 346   \ifx#1\relax
347   \else
348     \edef\hyxmp@num{\number'#1}%
349     \ifnum\hyxmp@num>"FFFFFF %
350       \lccode'\!=\intcalcdDiv{\hyxmp@num}{\number"1000000}\relax
351       \lowercase{\edef\hyxmp@text{\hyxmp@text!}}%
352       \edef\hyxmp@num{\intcalcmMod{\hyxmp@num}{\number"1000000}}%
353     \else
354       \edef\hyxmp@text{\hyxmp@text\hyxmp@zero}%
355     \fi
356     \ifnum\hyxmp@num>"FFFF %
357       \lccode'\!=\intcalcdDiv{\hyxmp@num}{\number"10000}\relax
358       \lowercase{\edef\hyxmp@text{\hyxmp@text!}}%
359       \edef\hyxmp@num{\intcalcmMod{\hyxmp@num}{\number"10000}}%
360     \else
361       \edef\hyxmp@text{\hyxmp@text\hyxmp@zero}%
362     \fi

```

```

363 \ifnum\hyxmp@num>"FF %
364 \lccode'\!=\intcalDiv{\hyxmp@num}{\number"100}\relax
365 \lowercase{\edef\hyxmp@text{\hyxmp@text!}}%
366 \edef\hyxmp@num{\intcalMod{\hyxmp@num}{\number"100}}%
367 \else
368 \edef\hyxmp@text{\hyxmp@text\hyxmp@zero}%
369 \fi
370 \ifnum\hyxmp@num>0 %
371 \lccode'\!=\hyxmp@num\relax
372 \lowercase{\edef\hyxmp@text{\hyxmp@text!}}%
373 \else
374 \edef\hyxmp@text{\hyxmp@text\hyxmp@zero}%
375 \fi
376 \expandafter\hyxmp@crap@convert
377 \fi
378 }

```

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

```

379 \begingroup
380 \catcode0=12 %
381 \gdef\hyxmp@zero{^^00}%
382 \endgroup

```

3.4 UUID generation

We use a linear congruential generator to produce pseudorandom UUIDs. True, this method has its flaws but it’s simple to implement in T_EX 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.

```

383 \def\hyxmp@modulo@a#1{%
384 \@tempcntb=\@tempcnta
385 \divide\@tempcntb by #1
386 \multiply\@tempcntb by #1
387 \advance\@tempcnta by -\@tempcntb
388 }

```

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

```

\hyxmp@big@prime@ii 389 \def\hyxmp@big@prime{536870923}
390 \def\hyxmp@big@prime@ii{536870027}

```

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

```

\hyxmp@one@token 391 \def\hyxmp@seed@rng#1{%
392 \@tempcnta=\hyxmp@big@prime
393 \futurelet\hyxmp@one@token\hyxmp@seed@rng@i#1\@empty
394 }

```

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

```

\hyxmp@one@token
\next 395 \def\hyxmp@seed@rng@i{%
396   \ifx\hyxmp@one@token\@empty
397     \let\next=\relax
398   \else
399     \def\next##1{%
400       \multiply\@tempcnta by 3
401       \advance\@tempcnta by '##1
402       \hyxmp@modulo@a{\hyxmp@big@prime}%
403       \futurelet\hyxmp@one@token\hyxmp@seed@rng@i
404     }%
405   \fi
406 \next
407 }

```

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

```

\hyxmp@rand@num
408 \def\hyxmp@set@rand@num{%
409   \@tempcnta=\hyxmp@rand@num
410   \multiply\@tempcnta by 3
411   \advance\@tempcnta by \hyxmp@big@prime@ii
412   \hyxmp@modulo@a{\hyxmp@big@prime}%
413   \xdef\hyxmp@rand@num{\the\@tempcnta}%
414 }

```

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

```

415 \def\hyxmp@append@hex#1{%
416   \hyxmp@set@rand@num
417   \@tempcnta=\hyxmp@rand@num
418   \hyxmp@modulo@a{16}%
419   \ifnum\@tempcnta<10
420     \xdef#1{#1\the\@tempcnta}%
421   \else
422     \advance\@tempcnta by -10
423     \ifcase\@tempcnta
424       \xdef#1{#1a}%
425     \or\xdef#1{#1b}%
426     \or\xdef#1{#1c}%
427     \or\xdef#1{#1d}%
428     \or\xdef#1{#1e}%
429     \or\xdef#1{#1f}%
430   \fi
431 \fi
432 }

```

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

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

```
433 \def\hyxmp@append@hex@iv#1{%  
434   \hyxmp@append@hex#1%  
435   \hyxmp@append@hex#1%  
436   \hyxmp@append@hex#1%  
437   \hyxmp@append@hex#1%  
438 }
```

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

```
439 \def\hyxmp@create@uuid#1{%  
440   \def#1{uuid:}%  
441   \hyxmp@append@hex@iv#1%  
442   \hyxmp@append@hex@iv#1%  
443   \g@addto@macro#1{-}%  
444   \hyxmp@append@hex@iv#1%  
445   \g@addto@macro#1{-}%  
446   \hyxmp@append@hex@iv#1%  
447   \g@addto@macro#1{-}%  
448   \hyxmp@append@hex@iv#1%  
449   \hyxmp@append@hex@iv#1%  
450   \hyxmp@append@hex@iv#1%  
451 }
```

`\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.

```
452 \newcommand*{\hyxmp@def@DocumentID}{%  
453   \edef\hyxmp@seed@string{\jobname:\@pdftitle:\@pdfauthor}%  
454   \expandafter\hyxmp@seed@rng\expandafter{\hyxmp@seed@string}%  
455   \edef\hyxmp@rand@num{\the\@tempcnta}%  
456   \hyxmp@create@uuid\hyxmp@DocumentID  
457 }
```

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

```
458 \newcommand*{\hyxmp@def@InstanceID}{%  
459   \edef\hyxmp@seed@string{%  
460     \jobname:\@pdftitle:\@pdfauthor:%  
461     \the\year/\the\month/\the\day:%  
462     \the\time  
463   }%  
464   \expandafter\hyxmp@seed@rng\expandafter{\hyxmp@seed@string}%  
465   \edef\hyxmp@rand@num{\the\@tempcnta}%
```

```

466 \hyxmp@create@uuid\hyxmp@InstanceID
467 }

```

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), and IPTC Photo Metadata (Section 3.5.8). The `\hyxmp@construct@packet` macro constructs the XMP packet into `\hyxmp+xml`. It first writes the appropriate XML header, then calls the various schema-writing macros, then injects `\hyxmp@padding` as padding, and finally writes the appropriate XML trailer.

3.5.1 XMP utility functions

`\hyxmp@add@to+xml` Given a piece of text, replace all underscores with category-code 11 (“other”) spaces and all `^C` characters with commas, then append the result to the `\hyxmp+xml` macro.

```

468 \newcommand*{\hyxmp@add@to+xml}[1]{%
469   \bgroup
470   \@tempcnta=0
471   \loop
472     \lccode\@tempcnta=\@tempcnta
473     \advance\@tempcnta by 1
474     \ifnum\@tempcnta<256
475       \repeat
476       \lccode'\_='\ \relax
477       \lccode'\^C='\,\relax
478       \lowercase{\xdef\hyxmp+xml{\hyxmp+xml#1}}%
479   \egroup
480 }

```

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

```

481 \bgroup
482 \catcode'\#=11
483 \gdef\hyxmp@hash{#}
484 \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.

```

485 \bgroup
486 \xdef\hyxmp+xml{%
487   \hyxmp@add@to+xml{%

```

```

488 -----^^J%
489   }
490   \xdef\hyxmp@padding{\hyxmp+xml}%
491 \egroup
492 \xdef\hyxmp@padding{\hyxmp@padding\hyxmp@padding}
493 \xdef\hyxmp@padding{\hyxmp@padding\hyxmp@padding}
494 \xdef\hyxmp@padding{\hyxmp@padding\hyxmp@padding}
495 \xdef\hyxmp@padding{\hyxmp@padding\hyxmp@padding}
496 \xdef\hyxmp@padding{\hyxmp@padding\hyxmp@padding}

```

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

```

497 \xdef\hyxmp@today{\the\year}%
498 \ifnum\month<10
499   \xdef\hyxmp@today{\hyxmp@today-0\the\month}%
500 \else
501   \xdef\hyxmp@today{\hyxmp@today-\the\month}%
502 \fi
503 \ifnum\day<10
504   \xdef\hyxmp@today{\hyxmp@today-0\the\day}%
505 \else
506   \xdef\hyxmp@today{\hyxmp@today-\the\day}%
507 \fi

```

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

```

508 \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.

```

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

```

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

```

510   \let\hyxmp@have@any=!%
511   \ifx\@pdfkeywords\@empty
512     \ifx\@pdfproducer\@empty
513       \let\hyxmp@have@any=\@empty
514     \fi
515   \fi
516   \ifx\hyxmp@have@any\@empty
517   \else

```

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

```

518   \hyxmp@add@to+xml{%
519   -----<rdf:Description rdf:about=""^^J%
520   -----xmlns:pdf="http://ns.adobe.com/pdf/1.3/">^^J%
521   }%

```

```

522 \hyxmp@add@simple{pdf:Keywords}{\@pdfkeywords}%
523 \hyxmp@add@simple{pdf:Producer}{\@pdfproducer}%
524 \@ifundefined{pdfminorversion}{}{%
525 \hyxmp@add@simple{pdf:PDFVersion}{1.\the\pdfminorversion}%
526 }%
527 \hyxmp@add@to@xml{%
528 -----</rdf:Description>^^J%
529 }%
530 \fi
531 }

```

`\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.

`\hyxmp@string`

```

532 \newcommand*{\hyxmp@add@simple}[2]{%
533 \edef\hyxmp@string{#2}%
534 \ifx\hyxmp@string\@empty
535 \else
536 \hyxmp@xmlify{\hyxmp@string}%
537 \hyxmp@add@to@xml{%
538 -----<#1>\hyxmp@xmlified</#1>^^J%
539 }%
540 \fi
541 }

```

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.

```

542 \newcommand*{\hyxmp@rdf@dc}[2]{%
543 \ifx#2\@empty
544 \else
545 \hyxmp@xmlify{#2}%
546 \hyxmp@add@to@xml{%
547 -----<dc:#1>^^J%
548 -----<rdf:Alt>^^J%
549 }%
550 \ifx\@pdfmetalang\hyxmp@x@default
551 \else
552 \hyxmp@add@to@xml{%
553 -----<rdf:li xml:lang="\@pdfmetalang">\hyxmp@xmlified</rdf:li>^^J%
554 }%
555 \fi
556 \hyxmp@add@to@xml{%
557 -----<rdf:li xml:lang="\hyxmp@x@default">\hyxmp@xmlified</rdf:li>^^J%
558 -----</rdf:Alt>^^J%
559 -----</dc:#1>^^J%
560 }%

```

```

561 \fi%
562 }%

```

`\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.

```

563 \newcommand*{\hyxmp@list@to@xml}[3]{%
564   \ifx#3\empty
565   \else
566     \hyxmp@add@to@xml{%
567       -----<dc:#1>^^J%
568       -----<rdf:#2>^^J%
569     }%
570   \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`.

```

571   \hyxmp@xmlify{#3}%
572   \hyxmp@commas@to@list\hyxmp@list{\hyxmp@xmlified}%
573   \def\@elt##1{%
574     \hyxmp@add@to@xml{%
575       -----<rdf:li>##1</rdf:li>^^J%
576     }%
577   }%
578   \hyxmp@list
579   \egroup
580   \hyxmp@add@to@xml{%
581     -----</rdf:#2>^^J%
582     -----</dc:#1>^^J%
583   }%
584 \fi
585 }

```

`\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.

```

586 \newcommand*{\hyxmp@dc@schema}{%
587   \hyxmp@add@to@xml{%
588     -----<rdf:Description rdf:about=""^^J%
589     -----xmlns:dc="http://purl.org/dc/elements/1.1/"^^J%
590     -----<dc:format>application/pdf</dc:format>^^J%
591   }%

```

```

592 \hyxmp@rdf@dc{title}{\@pdftitle}%
593 \hyxmp@rdf@dc{description}{\@pdfsubject}%
594 \hyxmp@rdf@dc{rights}{\@pdfcopyright}%
595 \hyxmp@list@to@xml{creator}{Seq}{\hyxmp@pdfauthor}%
596 \hyxmp@list@to@xml{subject}{Bag}{\hyxmp@pdfkeywords}%
597 \hyxmp@list@to@xml{date}{Seq}{\hyxmp@today}%
598 \hyxmp@add@simple{dc:language}{\@pdflang}%
599 \hyxmp@add@simple{dc:source}{\jobname.tex}%
600 \hyxmp@add@to@xml{%
601 -----</rdf:Description>^^J%
602 }%
603 }

```

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.

```

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

```

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

```

605 \let\hyxmp@rights=\@empty
606 \ifx\@pdflicenseurl\@empty
607 \else
608 \def\hyxmp@rights{YES}%
609 \fi
610 \ifx\@pdfcopyright\@empty
611 \else
612 \def\hyxmp@rights{YES}%
613 \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.

```

614 \ifx\hyxmp@rights\@empty
615 \else

```

Header

```

616 \hyxmp@add@to@xml{%
617 -----<rdf:Description rdf:about=""^^J%
618 -----xmlns:xmpRights="http://ns.adobe.com/xap/1.0/rights/">^^J%
619 }%

```

Copyright indication

```

620 \ifx\@pdfcopyright\@empty
621 \else
622 \hyxmp@add@to@xml{%
623 -----<xmpRights:Marked>True</xmpRights:Marked>^^J%
624 }%
625 \fi

```

License URL

```
626 \hyxmp@add@simple{xmpRights:WebStatement}{\@pdflicenseurl}%  
Trailer  
627 \hyxmp@add@to@xml{%  
628 -----</rdf:Description>^^J%  
629 }%  
630 \fi  
631 }
```

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.

```
632 \gdef\hyxmp@mm@schema{%  
633 \hyxmp@def@DocumentID  
634 \hyxmp@def@InstanceID  
635 \hyxmp@add@to@xml{%  
636 -----<rdf:Description rdf:about=""^^J%  
637 -----_xmlns:xmpMM="http://ns.adobe.com/xap/1.0/mm/"^^J%  
638 -----<xmpMM:DocumentID>\hyxmp@DocumentID</xmpMM:DocumentID>^^J%  
639 -----<xmpMM:InstanceID>\hyxmp@InstanceID</xmpMM:InstanceID>^^J%  
640 -----</rdf:Description>^^J%  
641 }%  
642 }
```

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`.

```
643 \newcommand*{\hyxmp@xmp@basic@schema}{%  
644 \hyxmp@add@to@xml{%  
645 -----<rdf:Description rdf:about=""^^J%  
646 -----_xmlns:xmp="http://ns.adobe.com/xap/1.0/"^^J%  
647 }%  
648 \hyxmp@add@simple{xmp:CreateDate}{\hyxmp@today}%  
649 \hyxmp@add@simple{xmp:ModifyDate}{\hyxmp@today}%  
650 \hyxmp@add@simple{xmp:MetadataDate}{\hyxmp@today}%  
651 \hyxmp@add@simple{xmp:CreatorTool}{\@pdfcreator}%  
652 \hyxmp@add@simple{xmp:BaseURL}{\@baseurl}%  
653 \hyxmp@add@to@xml{%  
654 -----</rdf:Description>^^J%  
655 }%  
656 }
```

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.

```

657 \gdef\hyxmp@photoshop@schema{%
658   \edef\hyxmp@photoshop@data{\@pdfauthortitle\@pdfcaptionwriter}%
659   \ifx\hyxmp@photoshop@data\@empty
660     \else
661       \hyxmp@add@to@xml{%
662         <rdf:Description rdf:about=""^^J%
663         -----xmlns:photoshop="http://ns.adobe.com/photoshop/1.0/">^^J%
664       }%
665     \fi
666     \hyxmp@add@simple{photoshop:AuthorsPosition}{\@pdfauthortitle}%
667     \hyxmp@add@simple{photoshop:CaptionWriter}{\@pdfcaptionwriter}%
668     \ifx\hyxmp@photoshop@data\@empty
669     \else
670       \hyxmp@add@to@xml{%
671         </rdf:Description>^^J%
672       }%
673     \fi
674 }
```

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.

```

675 \begingroup
676   \catcode'\&=12
677   \catcode'\#=12
678   \gdef\xmplinesep{&#xA;}
679 \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.

```

680 \newcommand*{\hyxmp@list@to@lines}[2]{%
681   \ifx#2\@empty
682     \else
683       \bgroup
684         \hyxmp@add@to@xml{%
685         -----<#1>%
686       }%
```

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

```

687   \def\@elt@first##1{%
688     \hyxmp@add@to@xml{##1}%
689     \let\@elt=\@elt@rest
```



```

690      }%

\@elt@rest  The remaining elements of the list are output with a preceding line separator
              (\xmplinesep).
691      \def\@elt@rest##1{%
692          \hyxmp@add@to@xml{\xmplinesep##1}%
693      }%

\@elt  Re-encode the text from Unicode if necessary. Then redefine \@elt to insert a line
        separator between terms.
694      \let\@elt=\@elt@first
695      \hyxmp@xmlify{#2}%
696      \hyxmp@commas@to@list\hyxmp@list{\hyxmp@xmlified}%
697      \hyxmp@list
698      \hyxmp@add@to@xml{</#1>^^J}%
699      \egroup
700  \fi
701 }

\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:CiAdrExtadr, Iptc4xmpCore:CiAdrCity,
                          Iptc4xmpCore:CiAdrRegion, Iptc4xmpCore:CiAdrPcode, Iptc4xmpCore:CiAdrCtry,
                          Iptc4xmpCore:CiTelWork, Iptc4xmpCore:CiEmailWork, and Iptc4xmpCore:CiUrlWork
                          properties.
702 \gdef\hyxmp@photometa@schema{%
703   \edef\hyxmp@photometa@data{%
704     \@pdfcontactaddress
705     \@pdfcontactcity
706     \@pdfcontactregion
707     \@pdfcontactpostcode
708     \@pdfcontactcountry
709     \@pdfcontactphone
710     \@pdfcontactemail
711     \@pdfcontacturl
712   }%
713   \ifx\hyxmp@photometa@data\@empty
714     \else
715       \hyxmp@iptc@extensions
716       \hyxmp@add@to@xml{%
717         <rdf:Description rdf:about=""^^J%
718         _____xmlns:Iptc4xmpCore="http://iptc.org/std/Iptc4xmpCore/1.0/xmlns/">^^J%
719         <Iptc4xmpCore:CreatorContactInfo rdf:parseType="Resource">^^J%
720       }%
721     \fi
722     \hyxmp@list@to@lines{Iptc4xmpCore:CiAdrExtadr}{\@pdfcontactaddress}%
723     \hyxmp@add@simple{Iptc4xmpCore:CiAdrCity}{\@pdfcontactcity}%
724     \hyxmp@add@simple{Iptc4xmpCore:CiAdrRegion}{\@pdfcontactregion}%
725     \hyxmp@add@simple{Iptc4xmpCore:CiAdrPcode}{\@pdfcontactpostcode}%

```

726 \hyxmp@add@simple{Iptc4xmpCore: CiAdrCtry}{\@pdfcontactcountry}%

\xmplinesep The IPTC standard states that sets of telephone numbers, email address, 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.

```

727 \bgroup
728   \def\xmplinesep{,}%
729   \hyxmp@list@to@lines{Iptc4xmpCore: CiTelWork}{\@pdfcontactphone}%
730   \hyxmp@list@to@lines{Iptc4xmpCore: CiEmailWork}{\@pdfcontactemail}%
731   \hyxmp@list@to@lines{Iptc4xmpCore: CiUrlWork}{\@pdfcontacturl}%
732 \egroup
733 \ifx\hyxmp@photometa@data\@empty
734 \else
735   \hyxmp@add@to@xml{%
736     <Iptc4xmpCore:CreatorContactInfo>^^J%
737     </rdf:Description>^^J%
738   }%
739 \fi
740 }
```

\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 [8], 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.

```

741 \newcommand*{\hyxmp@iptc@extensions}{%
742   \hyxmp@add@to@xml{%
743     <rdf:Description rdf:about=""^^J%
744     <xmlns:pdfaExtension="http://www.aiim.org/pdfa/ns/extension/"^^J%
745     <xmlns:pdfaSchema="http://www.aiim.org/pdfa/ns/schema\hyxmp@hash"^^J%
746     <xmlns:pdfaProperty="http://www.aiim.org/pdfa/ns/property\hyxmp@hash"^^J%
747     <xmlns:pdfaType="http://www.aiim.org/pdfa/ns/type\hyxmp@hash"^^J%
748     <xmlns:pdfaField="http://www.aiim.org/pdfa/ns/field\hyxmp@hash">^^J%
749     <pdfaExtension:schemas>^^J%
750     <rdf:Bag>^^J%
751     <rdf:li rdf:parseType="Resource">^^J%
752     <pdfaSchema:schema>IPTC Core Schema</pdfaSchema:schema>^^J%
753     <pdfaSchema:namespaceURI>http://iptc.org/std/Iptc4xmpCore/1.0/xmlns/</pdfaSchema:
754     <pdfaSchema:prefix>Iptc4xmpCore</pdfaSchema:prefix>^^J%
755     <pdfaSchema:property>^^J%
756     <rdf:Seq>^^J%
757     <rdf:li rdf:parseType="Resource">^^J%
758     <pdfaProperty:name>CreatorContactInfo</pdfaProperty:name>^^J%
```

```

759 -----<pdfaProperty:valueType>contactinfo</pdfaProperty:valueType>^^J%
760 -----<pdfaProperty:category>external</pdfaProperty:category>^^J%
761 -----<pdfaProperty:description>contact information for the document's creator</p
762 -----</rdf:li>^^J%
763 -----</rdf:Seq>^^J%
764 -----</pdfaSchema:property>^^J%
765 -----<pdfaSchema:valueType>^^J%
766 -----<rdf:Seq>^^J%
767 -----<rdf:li rdf:parseType="Resource">^^J%
768 -----<pdfaType:type>contactinfo</pdfaType:type>^^J%
769 -----<pdfaType:namespaceURI>http://iptc.org/std/Iptc4xmpCore/1.0/xmlns/contactin
770 -----<pdfaType:prefix>Iptc4xmpCore</pdfaType:prefix>^^J%
771 -----<pdfaType:description>contact information</pdfaType:description>^^J%
772 -----<pdfaType:field>^^J%
773 -----<rdf:Seq>^^J%
774 }%

775 \hyxmp@text@resource{CiAdrExtadr}{contact address}%
776 \hyxmp@text@resource{CiAdrCity}{contact city}%
777 \hyxmp@text@resource{CiAdrRegion}{contact region}%
778 \hyxmp@text@resource{CiAdrPcode}{contact postal code}%
779 \hyxmp@text@resource{CiAdrCtry}{contact country}%
780 \hyxmp@text@resource{CiTelWork}{contact telephone number}%
781 \hyxmp@text@resource{CiEmailWork}{contact email address}%
782 \hyxmp@text@resource{CiUrlWork}{contact url}%

783 \hyxmp@add@to@xml{%
784 -----</rdf:Seq>^^J%
785 -----</pdfaType:field>^^J%
786 -----</rdf:li>^^J%
787 -----</rdf:Seq>^^J%
788 -----</pdfaSchema:valueType>^^J%
789 -----</rdf:li>^^J%
790 -----</rdf:Bag>^^J%
791 -----</pdfaExtension:schemas>^^J%
792 -----</rdf:Description>^^J%
793 }%
794 }

```

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

```

795 \newcommand*{\hyxmp@text@resource}[2]{%
796   \hyxmp@add@to@xml{%
797 -----<rdf:li rdf:parseType="Resource">^^J%
798 -----<pdfaField:name>#1</pdfaField:name>^^J%
799 -----<pdfaField:valueType>Text</pdfaField:valueType>^^J%
800 -----<pdfaField:description>#2</pdfaField:description>^^J%
801 -----</rdf:li>^^J%
802   }
803 }

```

3.5.9 Constructing the XMP packet

```
\hyxmp@bom Define a macro for the Unicode byte-order marker (BOM).
804 \begingroup
805   \ifhyxmp@unicodetex
806     \lccode'\!="FEFF %
807     \lowercase{%
808       \gdef\hyxmp@bom{!}
809     }%
810   \else
811     \catcode'\^^ef=12
812     \catcode'\^^bb=12
813     \catcode'\^^bf=12
814     \gdef\hyxmp@bom{^^ef^^bb^^bf}%
815   \fi
816 \endgroup

\hyxmp@construct@packet Successively add XML data to \hyxmp+xml until we have something we can insert
\hyxmp+xml into the document's PDF catalog.
817 \def\hyxmp@construct@packet{%
818   \gdef\hyxmp+xml{%
819     \hyxmp@add@to+xml{<?xpacket begin="\hyxmp@bom" %
820 id="W5M0MpCehiHzreSzNTczkc9d"?>^^J%
821 <x:xmpmeta xmlns:x="adobe:ns:meta/" x:xmptk="3.1-702">^^J%
822 ___<rdf:RDF
823 xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns\hyxmp@hash">^^J%
824   }%
825   \hyxmp@pdf@schema
826   \hyxmp@xmpRights@schema
827   \hyxmp@dc@schema
828   \hyxmp@photoshop@schema
829   \hyxmp@photometa@schema
830   \hyxmp@xmp@basic@schema
831   \hyxmp@mm@schema
832   \hyxmp@add@to+xml{%
833 ___</rdf:RDF>^^J%
834 </x:xmpmeta>^^J%
835 \hyxmp@padding
836 <?xpacket end="w"?>^^J%
837   }%
838 }
```

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.
```

```

839 \newcommand*{\hyxmp@embed@packet}{%
840   \hyxmp@construct@packet
841   \def\hyxmp@driver{hpdftex}%
842   \ifx\hyxmp@driver\Hy@driver
843     \hyxmp@embed@packet@pdftex
844   \else
845     \def\hyxmp@driver{hdvipdfm}%
846     \ifx\hyxmp@driver\Hy@driver
847       \hyxmp@embed@packet@dvipdfm
848     \else
849       \def\hyxmp@driver{hxtex}%
850       \ifx\hyxmp@driver\Hy@driver
851         \hyxmp@embed@packet@xetex
852       \else
853         \@ifundefined{pdfmark}{%
854           \PackageWarningNoLine{hyperxmp}{%
855             Unrecognized hyperref driver ‘\Hy@driver’.\MessageBreak
856             \jobname.tex’s XMP metadata will *not* be\MessageBreak
857             embedded in the resulting file}%
858         }{%
859           \hyxmp@embed@packet@pdfmark
860         }%
861       \fi
862     \fi
863   \fi
864 }

```

3.6.1 Embedding using pdfTeX

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

```

865 \newcommand*{\hyxmp@embed@packet@pdftex}{%
866   \bgroup
867   \pdfcompresslevel=0
868   \immediate\pdfobj stream attr {%
869     /Type /Metadata
870     /Subtype /XML
871   }\hyxmp@xml}%
872   \pdfcatalog {/Metadata \the\pdflastobj\space 0 R}%
873   \egroup
874 }

```

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.

```

875 \newcommand*{\hyxmp@embed@packet@pdfmark}{%
876   \pdfmark{%
877     pdfmark=/NamespacePush

```

```

878 }%
879 \pdfmark{%
880   pdfmark=/OBJ,
881   Raw={/_objdef \string{hyxmp@Metadata\string} /type /stream}%
882 }%
883 \pdfmark{%
884   pdfmark=/PUT,
885   Raw={\string{hyxmp@Metadata\string}
886     2 dict begin
887       /Type /Metadata def
888       /Subtype /XML def
889       currentdict
890     end
891   }%
892 }%
893 \pdfmark{%
894   pdfmark=/PUT,
895   Raw={\string{hyxmp@Metadata\string} (\hyxmp@xml)}%
896 }%
897 \pdfmark{%
898   pdfmark=/Metadata,
899   Raw={\string{Catalog\string} \string{hyxmp@Metadata\string}}%
900 }%
901 \pdfmark{%
902   pdfmark=/NamespacePop
903 }%
904 }

```

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.

```

905 \newcommand*{\hyxmp@embed@packet@dvipdfm}{%
906   \hyxmp@string@len{\hyxmp@xml}%
907   \special{pdf: object @hyxmp@Metadata
908     <<
909       /Type /Metadata
910       /Subtype /XML
911       /Length \the\@tempcnta
912     >>
913     stream^^J\hyxmp@xml endstream%
914   }%
915   \special{pdf: docview
916     <<
917       /Metadata @hyxmp@Metadata
918     >>
919   }%
920 }

```

`\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.

```

921 \newcommand*{\hyxmp@string@len}[1]{%
922   \@tempcnta=0
923   \expandafter\hyxmp@count@spaces#1 {} %
924   \expandafter\hyxmp@count@non@spaces#1{}%
925 }
```

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

```

926 \def\hyxmp@count@spaces#1 {%
927   \def\hyxmp@one@token{#1}%
928   \ifx\hyxmp@one@token\empty
929     \advance\@tempcnta by -1
930   \else
931     \advance\@tempcnta by 1
932     \expandafter\hyxmp@count@spaces
933   \fi
934 }
```

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

```

935 \newcommand*{\hyxmp@count@non@spaces}[1]{%
936   \def\hyxmp@one@token{#1}%
937   \ifx\hyxmp@one@token\empty
938     \else
939       \advance\@tempcnta by 1
940       \expandafter\hyxmp@count@non@spaces
941     \fi
942 }
```

3.6.4 Embedding using `XqTEX`

`\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.

```

943 \newcommand*{\hyxmp@embed@packet@xetex}{%
944   \special{pdf:stream @hyxmp@Metadata (\hyxmp@xml)}
945   <<
946     /Type /Metadata
947     /Subtype /XML
948   >>
949 }
```

```

950 \special{pdf:put @catalog
951   <<
952     /Metadata @hyxmp@Metadata
953   >>
954 }%
955 }

```

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.

```

956 \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 (pdf\TeX , Lua\TeX , X\TeX , 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 \LaTeX document presented on page 5. 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>2012-12-14</rdf:li>
    </rdf:Seq>
</dc:date>
<dc:language>en</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/contactinfo/
                            </pdfaType:namespaceURI>

```

```

<pdfaType:prefix>Iptc4xmpCore</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:li rdf:parseType="Resource">
      <pdfaField:name>CiTelWork</pdfaField:name>
      <pdfaField:valueType>Text</pdfaField:valueType>
      <pdfaField:description>
        contact telephone number
      </pdfaField:description>
    </rdf:li>
  </rdf:Seq>
</pdfaType:field>

```

```

        </pdfaField:description>
      </rdf:li>
      <rdf:li rdf:parseType="Resource">
        <pdfaField:name>CiEmailWork</pdfaField:name>
        <pdfaField:valueType>Text</pdfaField:valueType>
        <pdfaField:description>
          contact email address
        </pdfaField:description>
      </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/">
  <Iptc4xmpCore:CreatorContactInfo rdf:parseType="Resource">
    <Iptc4xmpCore:CiAdrExtadr>Kramgasse 49</Iptc4xmpCore:CiAdrExtadr>
    <Iptc4xmpCore:CiAdrCity>Bern</Iptc4xmpCore:CiAdrCity>
    <Iptc4xmpCore:CiAdrPcode>3011</Iptc4xmpCore:CiAdrPcode>
    <Iptc4xmpCore:CiAdrCtry>Switzerland</Iptc4xmpCore:CiAdrCtry>
    <Iptc4xmpCore:CiTelWork>031 312 00 91</Iptc4xmpCore:CiTelWork>
    <Iptc4xmpCore:CiEmailWork>aeinstein@ipi.ch</Iptc4xmpCore:CiEmailWork>
    <Iptc4xmpCore:CiUrlWork>
      <a href="http://einstein.biz/">http://einstein.biz/</a>
      <a href="https://www.facebook.com/AlbertEinstein">https://www.facebook.com/AlbertEinstein</a>
    </Iptc4xmpCore:CiUrlWork>
  </Iptc4xmpCore:CreatorContactInfo>
</rdf:Description>
<rdf:Description rdf:about=""
  xmlns:xmp="http://ns.adobe.com/xap/1.0/">
  <xmp:CreateDate>2012-12-14</xmp:CreateDate>
  <xmp:ModifyDate>2012-12-14</xmp:ModifyDate>
  <xmp:MetadataDate>2012-12-14</xmp:MetadataDate>
  <xmp:CreatorTool>LaTeX with hyperref package</xmp:CreatorTool>

```

```

    <xmp:BaseURL>
      http://www.ctan.org/tex-archive/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	General: Initial version	1	ardless of the specified meta- data language	28
v1.1	<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	36	<code>\hyxmp@xmpRights@schema</code> : Renamed the <code>xapRights</code> namespace prefix to <code>xmpRights</code>	30
v1.2	General: Added support for the X _Y TeX backend (<code>xdvipdfmx</code>) . .	1	v1.5	General: Made the XMP inclusion more robust. Thanks to Heiko Oberdiek for the bug report and suggested modifications.
	Added support for the Photoshop schema	1		9
	Made the package compatible with <code>ngerman</code> . Thanks to Tobias Mueller for the bug report. . . .	9	v2.0	General: Added support for the XMP Basic schema and miscellaneous other bits of metadata
v1.3	General: Introduced the <code>pdfmetalang</code> package option, which enables an author to specify the language in which he wrote the document’s metadata	14		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	18		1
v1.4	<code>\hyxmp@mm@schema</code> : Renamed the <code>xapMM</code> namespace prefix to <code>xmpMM</code>	31		14
	<code>\hyxmp@rdf@dc</code> : Included metadata in the <code>x-default</code> language re-			26
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Heiko Oberdiek	22	v2.1	
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\hyxmp@SpaceOther: Added by		order. This addresses a bug re-	
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\hyxmp@toxml: Added by Heiko		\hyxmp@hypersetup: Added this	
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\@pdfcontactphone		dc:date	2, 29	537, 546, 552,
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\@pdfcontactregion		dc:rights	2, 29	635, 644, 653,
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