Generation of PDF/X- and PDF/A-compliant PDFs with pdfTEX—pdfx.sty

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QUICK LINKS

1. Introduction

This package[1] currently supports generation of PDF/X-, PDF/A- and PDF/E-compliant documents, using pdfTEX, in most of their variants; see the complete list in Section 2.1 below. As of TEX Live 2016 it now also works with LuaLATEX and XeLATEX, when using appropriate command-line options[2], but with some limitations — see Sections 3.1.1 and 3.1.2. By 'supports', we mean that the package provides correct and sufficient means to declare that a document conforms with a stated PDF variant (PDF/X, PDF/A, PDF/E, PDF/VT, PDF/UA, etc.) along with the version and/or level of conformance. This package also allows appropriate Metadata and Color Profile to be specified, according to the requirements of the PDF variant.

Metadata elements, most of which must ultimately be written as XML using the UTF-8 encoding, is provided via a file named `\jobname.xmpdata`, for the running LATEX job. Without such a file, providing some required information as well as a large range of optional data, a fully validating PDF file cannot be achieved. The PDF can be created, having the correct visual appearance on all pages, but it will not pass validation checks. Sections 2.2 and 4.1 describe how this file should be constructed.

What this package *does not do* is to check for all the details of document structure and type of content that may be required (or restricted) within a PDF variant. For example, PDF/VT [14] requires well-structured parts, using Form XObject sections tagged as '/DPart'. Similarly PDF/A-1a (and 2a and 3a) [16, 17, 18] require a fully 'Tagged PDF', including a detailed structure tagging which envelops the complete contents of the document, as does also PDF/UA [24]. This is beyond the current version of LATEX engines, as commonly shipped. So while this package provides enough to meet the declaration, metadata and font-handling aspects for these PDF/A variants, it is not sufficient to produce fully conforming PDFs. However, with extra pdfTEX-based software or macro coding that *is* capable of producing 'Tagged PDF', this package can be used as part of the overall workflow to produce fully conforming documents.

1.1. PDF standards

PDF/X and PDF/A are umbrella terms used to denote several ISO standards [8, 9, 10, 12, 13, 16, 17, 18] that define different subsets of the PDF standard [1, 20]. The objective of PDF/X is to facilitate graphics exchange between document creator and printer and therefore, has all requirements related to printing. For instance, in PDF/X, all fonts need to be embedded and all images need to be CMYK or spot colors. PDF/X-2 and PDF/X-3 accept calibrated RGB and CIELAB colors along with all other specifications of PDF/X. Since 2005 other variants of PDF/X have emerged, as extra effects (such as layering and transparency) have been supported within the PDF standard itself. The full range of versions and conformance supported in this package is discussed below in Section 2.1.

PDF/A defines a profile for archiving PDF documents, which ensures the documents can be reproduced in the exact same way in years to come. A key element to achieving this is that PDF/A documents are 100% self-contained. All the information needed to display the document in the same manner every time is embedded in the file. A PDF/A document is not permitted to be reliant on information from external sources. Other restrictions include avoidance of audio/video content, JavaScript and encryption. Mandatory inclusion of fonts, color profile and standards-based metadata are absolutely essential for PDF/A. Later versions allow for use of image compression and file attachments.

PDF/E is an ISO standard [19] intended for documents used in engineering workflows. PDF/VT [14] allows for high-volume customised form printing, such as utility bills. PDF/UA

[1] An earlier version of this documentation was published as [27]. All the changes since then have been developed and coded by the 3rd-listed author.

[2] The required invokation is: `xelatex --shell-escape -output-driver="xdvipdfmx -z 0" <filename>.tex`

('Universal Accessibility') has emerged as a standard [24, 3, 4] supporting Assistive Technologies, incorporating web-accessibility guidelines (WCAG) for electronic documents. In future, PDF/H may emerge for health records and medical-related documents. Other applications can be envisaged. Declarations and Metadata are supported for the first three of these. The others are the subject of further work; revised versions of this package can be expected in later years.

More complete descriptions of these standards and their usage can be found on Wikipedia pages [30]. These pages also include comprehensive links to web resources, guides, commentaries, discussions and whatever else is relevant to how the standards have been established and how they can be used.

2. Usage

The package can be loaded with the command:

```
\usepackage[<option>]{pdfx}
```

where the options are as follows.

2.1. Package options

2.1.1. PDF/A options

PDF/A is an ISO standard [16, 17, 18] intended for long-term archiving of electronic documents. It therefore emphasizes self-containedness and reproducibility, as well as machine-readable metadata. The PDF/A standard has three conformance levels 'a', 'b', and 'u'. Level 'a' is the strictest, but is not yet fully implemented by the pdfx package. Conformance level 'u' has the same requirements as level 'b', but with the additional requirement that all text in the document must have a Unicode mapping. However, the pdfx package produces such Unicode mappings even in level 'b' files. The standard also has three different versions 1, 2, and 3, which were standardized in 2005, 2011 and 2012, respectively. Earlier versions contain a subset of the features of later versions, so for maximum portability, it is preferable to use a lower-numbered version, when the extra features allowed in higher versions are not used. There is no conformance level 'u' in version 1 of the standard. Thus for many typical uses of PDF/A, it is sufficient to use PDF/A-1b.

- a-1a: generate PDF/A-1a. Experimental, not fully implemented.
- a-1b: generate PDF/A-1b.
- a-2a: generate PDF/A-2a. Experimental, not fully implemented.
- a-2b: generate PDF/A-2b.
- a-2u: generate PDF/A-2u.
- a-3a: generate PDF/A-3a. Experimental, not fully implemented.
- a-3b: generate PDF/A-3b.
- a-3u: generate PDF/A-3u.

By 'Experimental, not fully implemented' here we mean primarily that the document structure, as required for 'Tagged PDF', is not handled by this package. Using other pdfTEX-based software that *is* capable of producing such complete tagging, conforming documents can indeed be produced.

2.1.2. PDF/E options

PDF/E is an ISO standard [19] intended for documents used in engineering workflows. There is only one version of the PDF/E standard so far, and it is called PDF/E-1.

- `e-1`: generate PDF/E-1.
- `e`: same as `e-1`.

2.1.3. PDF/UA options

PDF/UA is an ISO and ANSI standard [24, 4] intended for making structured documents readable and navigable using Assistive Technology; e.g., screen-readers, Braille keyboards and such-like. Documents prepared this way can be easily saved in other formats which preserve the structure, such as XML, HTML, and (Microsoft) Word-based formats.

- `ua-1`: generate PDF/UA-1.
- `ua`: same as `ua-1`.

2.1.4. PDF/VT options

PDF/VT is an ISO standard intended as an exchange format for variable and transactional printing, and is an extension of the PDF/X-4 standard. The standard specifies three PDF/VT conformance levels. Level 1 is for single-file exchange, level 2 is for multi-file exchange, and level 2s is for streamed delivery. Currently, none of the PDF/VT conformance levels are fully implemented by the `pdfx` package.

- `vt-1`: generate PDF/VT-1, based on PDF/X-4. Experimental, not fully implemented
- `vt-2`: generate PDF/VT-2, based on PDF/X-5pg. Experimental, not fully implemented.
- `vt-2s`: generate PDF/VT-2s. Experimental, not fully implemented.

By 'Experimental, not fully implemented' here we mean primarily that the structuring of a document into '/DPart' sections, as Form XObjects, is not handled by this package. This *is* possible with current pdfTEX software, but not yet in a way that lends itself easily to full automation, due to requirements of knowing the internal object number of certain internal PDF constructs. All the other aspects: PDFInfo declaration, Metadata and Color Profile, of the PDF/VT variants are correctly handled.

2.1.5. PDF/X options

PDF/X is an ISO standard intended for graphics interchange. It emphasizes printing-related requirements, such as embedded fonts and color profiles. The PDF/X standard has a large number of variants and conformance levels. The basic variants are X-1, X-1a, X-3, X-4, and X-5. (Note that a revised version of the X-2 standard was published in 2003 but withdrawn as an ISO standard in 2011, basically due to lack of interest in using it). The PDF/X-1a standard exists in revisions of 2001 and 2003, the PDF/X-3 standard exists in revisions of 2002 and 2003, and the PDF/X-4 and PDF/X-5 standards exist in revisions of 2008 and 2010. Moreover, some of these standards have a 'p' version, which permits the use of an externally supplied color profile (instead of an embedded one), and/or a 'g' version, which permits the use of external graphical content. Moreover, PDF/X-5 has an 'n' version, which extends PDF/X-4p by permitting additional 'Custom' color spaces other than Grayscale, RGB, and CMYK. For many typical uses of PDF/X, it is sufficient to use PDF/X-1a.

- `x-1`: generate PDF/X-1; now obsolete, doesn't validate.

- x-1a: generate PDF/X-1a. Options x-1a1 and x-1a3 are also available to specify PDF/X-1a:2001 or PDF/X-1a:2003 explicitly.
- x-2: generate PDF/X-2; unpublished, doesn't validate.
- x-3: generate PDF/X-3. Options x-302 and x-303 are also available to specify PDF/X-3:2002 or PDF/X-3:2003 explicitly.
- x-4: generate PDF/X-4. Options x-408 and x-410 are also available to specify PDF/X-4:2008 or PDF/X-4:2010 explicitly.
- x-4p: generate PDF/X-4p. Options x-4p08 and x-4p10 are also available to specify PDF/X-4p:2008 or PDF/X-4p:2010 explicitly.
- x-5g: generate PDF/X-5g. Options x-5g08 and x-5g10 are also available to specify PDF/X-5g:2008 or PDF/X-5g:2010 explicitly.
- x-5n: generate PDF/X-5n. Options x-5n08 and x-5n10 are also available to specify PDF/X-5n:2008 or PDF/X-5n:2010 explicitly. Experimental, not fully implemented.
- x-5pg: generate PDF/X-5pg. Options x-5pg08 and x-5pg10 are also available to specify PDF/X-5pg:2008 or PDF/X-5pg:2010 explicitly.

2.1.6. Other options

These options are experimental and should not normally be used.

- useBOM: generate an explicit UTF-8 byte-order marker in the embedded XMP metadata, and make the XMP packet writable. Neither of these features are required by the PDF/A standard, but there exist some PDF/A validators (reportedly validatepdfa.com) that seem to require them. Note: the implementation of this feature is experimental and may break with future updates to the xmpincl package.
- noBOM: do not generate the optional byte-order marker. (default)
- noerr: avoids stopping when making PDF/X with an RGB profile, and at other unusual situations; e.g., PDF/UA without also PDF/A.
- pdf12: use PDF 1.2, overriding the version specified by the applicable standard. This may produce a non-standard-conforming PDF file.
- pdf13: use PDF 1.3, overriding the version specified by the applicable standard. This may produce a non-standard-conforming PDF file.
- pdf14: use PDF 1.4, overriding the version specified by the applicable standard. This may produce a non-standard-conforming PDF file.
- pdf15: use PDF 1.5, overriding the version specified by the applicable standard. This may produce a non-standard-conforming PDF file.
- pdf16: use PDF 1.6, overriding the version specified by the applicable standard. This may produce a non-standard-conforming PDF file.
- pdf17: use PDF 1.7, overriding the version specified by the applicable standard. This may produce a non-standard-conforming PDF file.
- nocharset: do not generate the Charset entry for fonts (pdfTEX only).
- usecharset: generate the Charset entry for fonts (pdfTEX only).

The latter two options affect the value of the \pdfomitcharset primitive, added to pdfTEX in 2019, due to differing requirements for PDF/A-1 and other PDF/A versions. Indeed use of the /Charset entry for a font is deprecated entirely for PDF 2.0 [21] and later.

2.1.7. XMP language options

These options allow for characters in alphabets other than those used for English and Western European languages to be used within the `.xmpdata` file (see Section 2.2), supported through LaTeX character representation macros.

- `latxmp`: extended Latin blocks, `Ux0180–Ux024F` and `Ux1E00–Ux1EFF`
- `armxmp`: armenian letters and ligatures, `Ux0530–Ux058F`, via macros `\armyba`, `\armfe`, `\armcomma`, etc.
- `cyrxmp`: cyrillic letters and accents, `Ux0400–Ux04FF` and `Ux0500–Ux0527` via macros `\cyra`, `\CYRN`, etc.
- `grkxmp`: greek letters and diacritics, `Ux0370–Ux03FF` and `Ux1F00–Ux1FFF` via macros `\textalpha`, `\textPi`, etc.
- `hebxmp`: some hebrew letters and marks, `Ux05C0–Ux05F4` via macros `\hebalef`, `\hebtav`, `\doubleyod`, etc.
- `arbxmp`: some arabic letters and marks, `Ux0600–Ux06FF` via macros `\hamza`, `\alef`, `\sukun`, etc.
- `vnmxmp`: vietnamese letters and accents, `Ux1EA0–Ux1EFF` via macros `\abreve`, `\uhorn`, `\ECIRCUMFLEX`, etc.
- `ipaxmp`: phonetic extensions, `Ux0250–Ux02AF` and `Ux1D00–Ux1DFF`
- `mathxmp`: mathematical letters, symbols, operators arrows, alphanumeric forms.
- `allxmp`: all of the above, as well as those listed next; used primarily for testing compatibility with other packages.

The characters supported by these options include those supported by `hyperref.sty` via the `PDFdoc` encodings (`PD1` and `PU`) for inclusion in PDF files. Extra support is provided for math alphabets. For Armenian, the macros defined by ArmTEX are supported.

Further options allow direct (enclosed) input of upper 8-bit characters, from encodings such as Latin-1–Latin-9, KOI8-R, LGR (Greek), ArmSSCI8, and a few more. Use of these requires a carefully controlled parsing regime. Here we list the package options that declare such content may be present in the `.xmpdata` file. A detailed account of how these are used is given in Section 4.1 (“Multilingual Metadata”).

- `LATxmp`: support for direct use of the upper-range characters (byte codes 160–255) for input encodings Latin1–Latin9, for Latin-based alphabets as used in European countries and elsewhere. This defines parser macros `\textLAT`, `\textLII`, …, `\textLIX`. All support from `latxmp` is loaded also.
- `KOIxmp`: support for direct use of cyrillic letters by use of upper-range characters (byte codes 148–255) under input encodings KOI8-R and KOIR8-RU, using `\textKOI` as parser macro. All support from `cyrxmp` is loaded also.
- `LGRxmp`: support for greek letters entered using either the LGR input transliteration of ASCII characters, or the ISO-8859-7 encoding of upper-range characters (byte codes 160–255), or a combination of both, using `\textLGR` as parser macro. All support from `grkxmp` is loaded also.
- `AR8xmp`: support for armenian letters entered using the ArmTEX 2.0 input transliteration of ASCII characters, or the ArmSCII8 encoding of upper-range characters (byte codes 160–255), or a combination of both, using `\textARM` as parser macro. All support from `armxmp` is loaded also.

- HEBxmp: support for hebrew letters entered using either LHE input transliteration of ASCII characters, or the CP1255, CP862 or ISO-8859-8 (HE8) encoding of upper-range characters (byte codes 160–255), or a combination of these using \textLHE, \textHEBO, \textHEB as parser macros. All support from hebxmp is loaded also.

These 'parser' options have received limited testing, so please report any mistakes in the UTF-8 output that you may encounter.

2.2. Data file for metadata

As mentioned above, standards-compliant PDF documents require document-level metadata to be included. This, known as an 'XMP packet' [2, 15], is like having a library catalog card included within the PDF itself. It is an unencrypted portion of the PDF file, with data expressed in Extensible Markup Language (XML), using Resource Description Format (RDF [29]) syntax, encoded as UTF-8 so readable by any text editing software on any modern computing platform.

Some advantages of doing this are clear.

- For a librarian: cataloguing information is available within the file itself, without the need to search explicitly in the visual layout of the content or elsewhere;
- All actual libraries cataloguing this PDF can have consistent information; including web-based indexing sites such as Google.
- For the author(s): who can specify the kind of information most appropriate to help readers understand the nature and purpose of the document.

The pdfx package builds the XMP metadata from information supplied via a special data file called \jobname.xmpdata. Here, \jobname is usually the basename of the document's main .tex file. For example, if your document source is in the file main.tex, then the metadata must be in a file called main.xmpdata. None of the individual metadata fields are mandatory, but for most documents, it makes sense to specify at least the title and the author. For more technical aspects of metadata and its uses, consult the work of the Dublin Core Initiative [6] and PRISM [26].

Here is a short .xmpdata file:

```
\Title{Baking through the ages}
\Author{A. Baker\sep C. Kneader}
\Language{en-GB}
\Keywords{cookies\sep muffins\sep cakes}
\Publisher{Baking International}
```

You should note that multiple authors and keywords have been separated by \sep. This \sep macro serves a technical purpose and is permitted within the \Author, \Keywords, and \Publisher fields, as well as some others. See §2.3 below for a complete listing of the supported author-supplied metadata fields.

After processing, the local directory contains a file named such as pdfa.xmpi or pdfe.xmpi or pdfx.xmpi according to the PDF variant desired. This file is the complete XMP Metadata packet. It can be checked for validity, using an online validator, such as at www.pdflib.com. veraPDF [28] is Open Source software providing validation for PDF/A, and other checkers useful in a PDF/A production setting.

Warning: The \jobname.xmpdata file may be included in the main document source, within a {filecontents*} environment, provided this comes *before* the \documentclass command, as follows.

```
\begin{filecontents*}{\jobname.xmpdata}
  \Title{Baking through the ages}
  \Author{A. Baker\sep C. Kneader}
  \Language{en-GB}
  \Keywords{cookies\sep muffins\sep cakes}
  \Publisher{Baking International}
\end{filecontents*}
\documentclass[11pt,a4paper]{article}
...
```

Including the metadata with the LaTeX source is very convenient. Having it at the top of the file also brings attention to it, placing emphasis on the desirability of including metadata, and keeping it accurate while the main content of the document is subject to changes or revision. Macro definitions can also occur prior to the `\documentclass` command, including any that may be needed within the metadata. An example of this is apparent in Figure 2 occurring later.

However, this ordering is also extremely important, else any non-ascii UTF-8 byte sequences can become active characters and expand upon data being written out, rather than remaining as inactive bytes. If you edit the metadata supplied this way, remember to remove the existing copy of `\jobname.xmpdata` file before the next processing run, as LaTeX does not write a new copy of the file when it exists on disk already, within the current working directory or elsewhere that LaTeX may find. In development or testing situations the filename may need to be given as `./\jobname.xmpdata`, else an older version may be loaded in error.

Experienced users/programmers can employ the `\write18` mechanism [3], together with the `--shell-escape` command-line option, to automatically execute a shell command that removes `\jobname.xmpdata` on every (or on selected) processing runs. This is only useful when the metadata changes, for whatever reason.

Other places for the `{filecontents*}` environment can work, but *only* when it contains *no* non-ascii UTF-8 byte sequences. Since 2018, with default See Section 2.4 below for more information on the macros that can be safely used within `.xmpdata` metadata files.

2.3. List of supported metadata fields

Following is a complete list of user-definable metadata fields currently supported, separated into particular groupings. Each command is accompanied by the specific XML tagged field name (with namespace) that is placed into the document-level Metadata packet, as well as the kind of information being conveyed. More may be added in the future. These commands can *only* be used within the `.xmpdata` file.

Most commands take an optional argument specifying the natural language, using RFC5646 (BCP 47) [7] codes, in which the metadata field is given. Languages for multiple entries can use e.g., `\sep[de] ...`. Only those fields requiring a specific format (e.g. dates) do *not* support language specifiers; these are indicated with [f]. Fields allowing more than one value are indicated with *. Multiple values may be given as separate instances of the macro, or as a single instance with the values delimited by `\sep`, as in the example above.

2.3.1. General information:

- *`\Author`: (`dc:creator`)
  the document's human author(s). Separate multiple authors with `\sep`.
- *`\Title`: (`dc:title`)
  the document's title; multiple language versions are supported.

[3] If you don't already know what this is, they you probably should not try using it `:-)`.

- *f\Language: (dc:language)
  list of languages used within the document.
- *\Keywords: (dc:subject)
  list of keywords, separated with \sep.
- *\Publisher: (dc:publisher)
  the publisher(s). Multiple pieces in a publishing chain should be separated with \sep.
- *\Subject: (dc:description)
  the abstract, or short description.

2.3.2. Copyright information:

- \Copyright: (dc:rights)
  a copyright statement.
- f\CopyrightURL: (xmpRights:WebStatement)
  location of a web page describing the owner and/or rights statement for this document.
- f\Copyrighted: (xmpRights:Marked)
  'True' if the document is copyrighted, and 'False' if it isn't. This is automatically set to 'True' if either \Copyright or \CopyrightURL is specified, but this can be overridden. For example, if the copyright statement is 'Public Domain', then specify also \Copyrighted{False}.
- *\Owner: (xmpRights:Owner)
  specifies the owner(s) of the document or resource.
- f\CertificateURL: (xmpRights:Certificate)
  gives the URL to online proof of ownership, if available.

2.3.3. more Dublin Core metadata:

From version 1.6 of pdfx.sty, the following fields can be used to provide a greater range of information to be specified as metadata.

- *\Contributor: (dc:contributor)
  contributor(s) other than author(s) of the PDF document.
- \Coverage: (dc:coverage)
  statement about the extent or scope of the document's contents.
- *f\Date: (dc:date)
  date(s) when something significant occurred relating to the resource (e.g., version changes); must be in ISO date format YYYY-MM-DD or YYYY-MM.
- f\PublicationType: (dc:type)
  The type of publication. If specified, must be one of 'book', 'catalog', 'feed', 'journal', 'magazine', 'manual', 'newsletter', 'pamphlet'. This is automatically set to 'journal' if \Journaltitle is specified (see below), but can be overridden.
- *\Relation: (dc:relation)
  how this PDF or resource relates to other document(s) or resources.
- f\Source: (dc:source)
  specifies a source document from which the PDF is derived.
- f\Doi: (dc:identifier, prism:doi, prism:url)
  Digital Object Identifier (DOI) for the document, without the leading 'doi:'.
- f\ISBN: (dc:identifier)
  the ISBN for the PDF itself, or Book/Monograph of which it is part.

▶ f\URLlink: (dc:identifier, prism:url)
gives a URL address for an online copy of the document.

The remaining Dublin Core field (dc:format) is always set to 'application/pdf'.

2.3.4. Publication information:

The following macros allow for inclusion of publication related metadata fields, as specified by PRISM [26] to meet publishing requirements.

▶ \Journaltitle: (prism:issueName)
The title of the journal in which the document was published.
▶ f\Journalnumber: (prism:issn)
The ISSN for the journal/series in which the document was published.
▶ f\Volume: (prism:volume)
Journal volume.
▶ f\Issue: (prism:number)
Journal issue/number.
▶ f\Firstpage: (prism:startingPage, prism:pageRange)
First page number of the published version of the document.
▶ f\Lastpage: (prism:endingPage, prism:pageRange)
Last page number of the published version of the document.
▶ \CoverDisplayDate: (prism:coverDisplayDate)
Date on the cover of the journal issue, as a human-readable text string.
▶ f\CoverDate: (prism:coverDate)
Date on the cover of the journal issue, in a format suitable for storing in a database field with a 'date' data type; e.g. YYYY-MM, or YYYY-MM-DD.

This is an area which can be expanded, to deal with more kinds of publication and metadata fields. The ExtensionSchema [23] technique is used to add new fields. Examples of this can be found in the template files pdfx.xmp, pdfa.xmp, pdfe.xmp.

2.3.5. Backward Compatibility

The following macros are also recognised, for backward compatibility with earlier versions of the package.

▶ *\AuthoritativeDomain: (pdfx:AuthoritativeDomain)
specifies extra names (e.g., of companies) associated to the existence of the PDF or resource.
▶ \Creator: (xmp:CreatorTool)
synonymous with \CreatorTool which is usually handled automatically anyway, but can be over-ridden.
▶ \Org: synonymous with \Publisher.
▶ \WebStatement: synonymous with \CopyrightURL.

2.3.6. more XMP metadata:

▶ *\Advisory: (xmp:Advisory)
noteworthy information; e.g., revision data or changes.

- [f] \BaseURL: (xmp:BaseURL)
  base-URL for relative hyperlinks within the PDF.
- [*] \Identifier: (xmp:Identifier)
  more advance forms than (dc:identifier); see [2, 15].
- \Nickname: (xmp:Nickname)
  a pseudonym or 'nickname' as a colloquial identifier for the resource.
- [*] \Thumbnails: (xmp:Thumbnails)
  allows small page images to be associated with each page of the PDF. An appropriate XML-compatible representation is required for such images.

2.3.7. PDF standards metadata:

The following metadata fields are generated automatically by the LaTeX engine. Some are dependent on the particular loading options that specify the desired compliance with a PDF standard, and level of conformance. There are no separate user-macros to alter these. The first three dates are usually set to be identical.

- (xmp:CreateDate) : creation date&time of the PDF.
- (xmp:MetadataDate) : creation date&time of the Metadata for the PDF.
- (xmp:ModifyDate) : date&time of latest modifications to the PDF.
- (xmpMM:DocumentID) : unique identifier for the PDF, based on MD5 sum.
- (xmpMM:InstanceID) : unique identifier based on creation date&time.
- (pdf:Producer) : TeX engine used; either 'LuaTeX', 'XeTeX', 'pdfTeX'.
- (pdf:Trapped) : currently always set to 'False'.
- (pdfaid:part) : 1, 2 or 3 for PDF/A-?
- (pdfaid:conformance) : a, b or u for PDF/A-??
- (pdfuaid:part) : currently 1 for PDF/UA-1
- (pdfe:ISO_PDFEVersion) : currently 1 for PDF/E-1
- (pdf:Version) : PDF/X-1, PDF/X-2 or PDF/X-3
- (pdfx:GTS_PDFXVersion) : e.g., PDF/X-1a:2003 up to PDF/X-3 ; but no year for PDF/X-4 and PDF/X-5 variants
- (pdfx:GTS_PDFXConformance) : e.g., PDF/X-1a:2003 up to PDF/X-2
- (pdfxid:GTS_PDFXVersion) : e.g., PDF/X-4p:2008 after PDF/X-3
- (pdfvtid:GTS_PDFVTVersion) : e.g., PDF/VT-2s for PDF/VT
- (pdfvtid:GTS_PDFVTModDate) : same as xmp:ModifyDate

2.4. Symbols permitted in metadata

Within the metadata, all printable ASCII characters except \, {, } and % represent themselves. Also, all printable Unicode characters from the basic multilingual plane (i.e., up to code point U+FFFF) can be used directly with the UTF-8 encoding. (Please note: encodings other than UTF-8 are not supported in the metadata, except as arguments to 'parser-macros'; see Section 2.1.7). Consecutive whitespace characters are combined into a single space. Whitespace after a macro such as \copyright, \backslash, or \sep is ignored. Blank lines are not permitted. Moreover, the following markup can be used:

- "\ ": a literal space (for example after a macro)

- \%: a literal %
- \{: a literal {
- \}: a literal }
- \backslash: a literal backslash \
- \copyright: the copyright symbol ©

The macro \sep is permitted within \Author, \Keywords, \Publisher, and other macros marked with * above. It's purpose is to separate multiple authors, keywords, etc. to appear as separate list items appropriately and consistently in the different ways that such information is represented within the PDF file. The package takes care of this when \sep is used. For example, in the XMP metadata, it expands as </rdf:li><rdf:li> tagging.

2.4.1. PDF Info strings

When \sep is not used within its argument, the metadata from \Title, \Author and \Keywords is also included in the PDF /Info dictionary. When this is the case, validation for the declared standard will occur only if the corresponding /Info item and XMP metadata field convert to exactly the same Unicode string. This cannot happen when \sep is used, so the /Info items are then not populated.

Unfortunately not all PDF browsers (in particular, older ones and much Apple software) give ready access to the XMP metadata packet. Some authors want to see everything using e.g., the Unix/Linux command: pdfinfo -enc UTF-8 . In fact there is the -meta option to get the complete metadata packet (in UTF-8 encoding). This can give more than what one wants, so use it as follows:

```
pdfinfo -meta <filename>.pdf | grep 'dc:'
```

to extract just the Dublin Core metadata fields.

Another possibility is to *not* use \sep with multiple authors and/or keywords. Instead replace it with simply ', '. We do not recommend doing this, as more sophisticated metadata tools will see the result as a single value, rather than multiple authors, say. Different language codes cannot be applied when done this way. However, some authors may find this a satisfactory solution that suits their own tools.

2.5. Macros permitted in metadata

Other TEX macros actually can be used, provided the author is very careful and not ask for too-complicated TEX or LATEX expansions into internal commands or non-character primitives; basically just accents, macros for Latin-based special characters, and simple textual replacements, perhaps with a simple parameter. A special macro \pdfxEnableCommands{...} is provided to help resolve difficulties that may arise.

Here is an example[4] of the use of \pdfxEnableCommands, which occurs with the name of one of our authors (Hàn Thế Thanh) due to the doubly-accented letter ế. It is usual to define a macro such as: \def\thanh{H\`an Th\'{\^e} Thanh}. In previous versions of the pdfx package, use of such a macro within the .xmpdata file, in the Copyright information say, could result in the accent macros expanding into internal primitives, such as

```
H\unhbox \voidb@x \bgroup \let \unhbox \voidb@x \setbox \@tempboxa ...
```

going on for many lines. This clearly has no place within the XMP metadata. To get around this, one could try using simplified macro definitions

[4] Other use cases are discussed with regard to Figures 12 and 16.

```
\pdfxEnableCommands{
    \def\`#1{#1^^cc^80}\def\'#1{#1^^cc^81}\def\^#1{#1^^cc^82}}
```

where the `^^cc^80`, `^^cc^81`, `^^cc^82` cause TEX to generate the correct UTF-8 bytes for 'combining accent' characters.

This works fine for metadata fields that appear just in the XMP packet. However, it is not sufficient for the PDF `/Author` key, which must exactly match with the `dc:creator` metadata element. What is needed instead is

```
\pdfxEnableCommands{
     \def\thanh{H^^c3^^a0n Th\eee Thanh}\def\eee{^^c3^^aa^^cc^^81 }}
```

or the above with 'à' typed directly as UTF-8 instead of `^^c3^^a0` and 'ê' in UTF-8 for `^^c3^^aa`. The reason for this is due to the `\pdfstringdef` command, which constructs the accented latin letters as single combined characters à and ê, without resorting to combining accents, wherever possible. If the Metadata does not have the same, irrespective of Unicode normalisation, then validation fails.

With version (1.5.6) of the `pdfx` package, such difficulties have been overcome, at least for characters used in Western European, Latin-based languages. The input encoding used when reading the `.xmpdata` file now includes interpretations of TEX's usual accent commands to produce the required UTF-8 byte sequences.

Since version (1.5.8) this input encoding was extended to include macro definitions covering LATEX's internal character representation of other alphabets (e.g., extended Latin, Cyrillic, Greek, etc.). However this can become memory intensive, requiring a large number of macro definitions, most of which will never be used. So loading options are provided, enabling a document author to choose only those that may be relevant. Currently these are as in Section 2.1.7.

A significant portion of the Unicode Basic Plane characters can be covered this way. Modules could even be provided for CJK character sets and mathematical symbols, etc. However, as this can become memory intensive, significant testing will be required before these become a standard part of the `pdfx` package.

2.6. Color profiles

Most standards compliant PDF documents require a *color profile* to be embedded within the file. In a nutshell, such a profile determines precisely how the colors used in the document will be rendered when printed to a physical medium. This can be used to ensure that the document will look exactly the same, even when it is printed on different printers, with different paper types, etc. The inclusion of a color profile is necessary to make the document completely self-contained.

Since most LATEX users are not graphics professionals and are not particularly picky about colors, the `pdfx` package includes default profiles that will be included when nothing else is specified. Therefore, the average user doesn't have to do anything special about color.

For users who have a specific color profile they wish to use, it is possible to do so by including a `\setRGBcolorprofile` or `\setCMYKcolorprofile` command in the `.xmpdata` file. Note that PDF/A and PDF/E require a profile of type '`mnrt`' (monitor) which is usually an RGB color profile, while PDF/X and PDF/VT require type '`prtr`' (printer) which is usually a CMYK color profile; but valid documents can be created with the correct type designed for the other color space. Use the following commands to specify an RGB or CMYK color profile, respectively:

```
\setRGBcolorprofile{⟨filename⟩}{⟨identifier⟩}{⟨info string⟩}{⟨registry URL⟩}
\setCMYKcolorprofile{⟨filename⟩}{⟨output intent⟩}{⟨identifier⟩}{⟨registry URL⟩}
```

Within the arguments of these macros, the characters <, >, &, ^, _, #, $, and ~ can be used as themselves, but % must be escaped as \%.

From version (1.6) the default RGB and CMYK color profiles are now supplied using the colorprofiles package by Norbert Preining and Ross Moore [25]. Earlier versions of pdfx.sty set the defaults via:

```
\setRGBcolorprofile{sRGB_IEC61966-2-1_black_scaled.icc}
                   {sRGB_IEC61966-2-1_black_scaled}
                   {sRGB IEC61966 v2.1 with black scaling}
                   {http://www.color.org}
\setCMYKcolorprofile{coated_FOGRA39L_argl.icc}
                    {Coated FOGRA39}
                    {FOGRA39 (ISO Coated v2 300\% (ECI))}
                    {http://www.argyllcms.com/}
```

These can still be used if the files from earlier version are available on your TEX system, but they will need to be requested, as above. Other color profile files may be obtained from the International Color Consortium. Please take a look at http://www.color.org/iccprofile.xalter.

Alternatively, color profiles are shipped with many Adobe software applications; these are then available for use also with non-Adobe software. Now the pdfx package includes coding to streamline inclusion of these profiles in PDF documents, or to specify them as 'external' profiles, with PDF/X-4p and PDF/X-5pg variants. Two files AdobeColorProfiles.tex and AdobeExternalProfiles.tex are distributed with the pdfx package. The latter is for use with PDF/X-4p and PDF/X-5pg, which do not require color profiles to be embedded, while the former can be used with other PDF/X variants. Both define commands to use Color Profiles as follows.

\FOGRAXXXIX	Coated FOGRA39 (ISO 12647-2:2004)
\SWOPCGATSI	U.S. Web Coated (SWOP) v2
\JapanColorMMICoated	Japan Color 2001 Coated
\JapanColorMMIUncoated	Japan Color 2001 Uncoated
\JapanColorMMIINewspaper	Japan Color 2002 Newspaper
\JapanWebCoatedAd	Japan Web Coated (Ad)
\CoatedGRACoL	Coated GRACoL 2006 (ISO 12647-2:2004)
\SNAPCGATSII	CGATS TR 002
\SWOPCGATSIII	CGATS TR 003
\SWOPCGATSV	CGATS TR 005
\ISOWebCoated	Web Coated FOGRA28 (ISO 12647-2:2004)
\ISOCoatedECI	ISO Coated v2 (ECI)
\CoatedFOGRA	Coated FOGRA27 (ISO 12647-2:2004)
\WebCoatedFOGRA	Web Coated FOGRA28 (ISO 12647-2:2004)
\UncoatedFOGRA	Uncoated FOGRA29 (ISO 12647-2:2004)
\IFRAXXVI	ISOnewspaper26v4 ISO/DIS 12647-3:2004
\IFRAXXX	ISOnewspaper30v4 ISO/DIS 12647-3:2004

As of the time of first compiling this list, only the first six of these result in PDFs which can validate with external profiles (i.e., for PDF/X-4p and PDF/X-5pg) using the then-current versions of Adobe Acrobat Pro software. It is unclear whether the others (incl. \IFRAXXVI and \IFRAXXX) failed due to incorrect data or problems in the validation software. Since then, with updates to Acrobat Pro, almost all the others have been verified to work, except \IFRAXXX which seems

no longer available. Thus these commands come with a 'use at own risk' clause.

For 'external' profiles, there is a command `\setEXTERNALprofile`, taking 9 arguments, that must be used. Consult `AdobeExternalProfiles.tex` for examples of its use.

All but the last of the macros listed above can also be used for valid embedded profiles, providing the corresponding files can be found. The following macros are used to set the (absolute or relative) path, on the local operating system, to the location of color profile files.

```
\pdfxSetRGBcolorProfileDir{⟨path to RGB color profiles⟩}
\pdfxSetCMYKcolorProfileDir{⟨path to CMYK profiles⟩}
```

On a Macintosh, there are various places where the color profiles may be found. One can use either a macro `\MacOSColordir` which expands into the path for system-provided profiles:

```
/System/Library/ColorSync/Profiles/
```

or the macro `\MacOSLibraryColordir` expanding to:

```
/Library/ColorSync/Profiles/
```

or `\AdobeMacOSdir` which expands into the path:

```
/Library/Application Support/Adobe/Color/Profiles/Recommended/
```

Under Windows an available macro is `\WindowsColordir` which expands to:

```
C:\Windows\System32\Spool\Drivers\Color/
```

being the common location for color profiles. Use these within the `.xmpdata` file as, e.g.,

```
\pdfxSetCMYKcolorProfileDir{\AdobeMacOSdir}
```

Authors may change the paths to suit their own circumstances, either *before* loading `pdfx.sty` or within the `.xmpdata` file.

PDF/A and PDF/E usually need an RGB profile, while PDF/X and PDF/VT require a CMYK profile. It is possible to use a CMYK profile with PDF/A or PDF/E by specifying `\setRGBcolorprofile{}{}{}{}` in the `.xmpdata` file. Beware however, that with PDF/A any coloured hyperlink annotations can cause a validation problem, as these are interpreted as RGB colours even when 4 components are given. This may be a bug in validators, as PDF specifies that the number of components should match the color space.

2.6.1. 'Custom' color spaces

It is also possible to specify 'Custom' color spaces, other than RGB or CMYK. Here is an example command `\viiIndigoTAC`, defined as follows:

```
%% Custom profile: 7C Indigo TAC370 (ColorLogic)
\gdef\viiIndigoTAC{\let\CallasMacOSdir\CallasMacOSpdfaPilotdir
 \setCUSTOMcolorprofile
  {7C Indigo_TAC370_ColorLogic.icc}%
  {\CallasProfilesdir}%
  {7C Indigo TAC370 \string\(ColorLogic\string\)}%  /ProfileName
  {http://www.colorlogic.de}% /RegistryName
  {7CLR}% number of colors specifier
  {02400000}%  ICC version
  {/Cyan /Magenta /Yellow /Black /Orange /Green /Violet}%  colour names
  {48110b8b410ee6be015f3932c3167869}%  CheckSum
}
```

which uses a profile that accompanies the pdfaPilot software from Callas Software Gmbh [5]. The macro \CallasMacOSpdfaPilotdir, defined in the file CallasColorProfiles.tex, specifies the directory where this Custom profile is located, when installed under MacOS. One needs to \input CallasColorProfiles.tex *before* loading the pdfx package. Macros for other directories are also defined in this file.

2.7. Notes on the internal representation of metadata

Within the PDF file, metadata is deposited in two places: some data goes into the native PDF /Info dictionary, and some data goes into an XMP packet stored separately within the file. XMP is Adobe's Extensible Metadata Platform [2, 15], and is an XML-based format. See Adobe XMP Development Center for more exhaustive information about XMP. An XMP Toolkit SDK which supports the GNU/Linux, Macintosh and Windows operating systems is also available under modified BSD licence.

Some of the metadata, such as the author, title, and keywords, can be stored *both* in the XMP packet and in the /Info dictionary. For the resulting file to be standards-compliant, the two copies of the data must be identical. This is taken care of automatically by the pdfx package, except when \sep is used to handle multiple entries, as discussed above in §2.4.1. In such cases the string is not included within the /Info dictionary. Note that this is in accordance with the PDF 2.0 specification [21], which deprecates use of the /Info dictionary for such metadata.

In principle, users can resort to alternate ways to create an XMP file for inclusion in PDF. In this case, one should create a customised template file pdfa.xmp or pdfx.xmp or pdfe.xmp (etc., depending on the PDF flavor) containing the pre-defined data. This can be done by modifying the ones supplied with the pdfx package. However, this is an error-prone process and is *not* recommended for most users. If there is a particular field of metadata that you need and that is not currently supported, please contact the package authors.

pdfx makes use of the xmpincl package to include XMP data into the PDF. The documentation of xmpincl package may help interested users to understand the process of XMP data inclusion.

2.8. Tutorials and technical notes

A tutorial with step-by-step instructions for generating PDF/A files can be found at: http://www.mathstat.dal.ca/~selinger/pdfa/.

Some technical notes about production problems the authors have encountered while generating PDF/A compliant documents are available here: http://support.river-valley.com/wiki/index.php?title=Generating_PDF/A_compliant_PDFs_from_pdftex. Be aware that this is based on use of an earlier version of the pdfx package, so some of the advice may have been superseded.

3. Installing

The pdfx.dtx package is available on CTAN as usual, via http://ctan.org/pkg/pdfx. It is also included in TeX distributions such as MacTeX, TeX Live and MiKTeX. Thus most users will not need to handle installation at all.

For those wishing to do a manual installation, here are some notes. The file pdfx.dtx is a composite document of program code and documentation in LaTeX format, in the tradition of *literate programming*. After having installed the package, to get the documentation that you are reading now, run (pdf)LaTeX on the file pdfx.dtx. The resulting PDF should be valid as PDF/A-2u. Or better, use the included Makefile, which will also regenerate the index.

To install the package, first extract the program code; i.e., the file pdfx.sty, by running LaTeX or TeX on the file pdfx.ins. Create a directory named pdfx under $TEXMF/tex/latex and copy the files pdfx.sty, 8bit.def, glyphtounicode-cmr.tex, glyphtounicode-ntx.tex as well as the other *.tex, l8u*-penc.def and *.xmp files, into it. Then update TeX's file database using the appropriate command for your distribution and operating system (such as texhash or mktexlsr, or similar).

3.1. Limitations and dependencies

The pdfx.sty package works with pdfTeX and also LuaTeX and XeTeX with some minor limitations. It further depends on the following other packages.

1. xmpincl for insertion of metadata into PDF.
2. inputenc to establish input-encoding infrastructure — see Section 4.2.
3. hyperref for ensuring data is correctly encoded when being written into the PDF file, and supporting features such as hyperlinking, bookmarks, etc.
4. xcolor for ensuring consistent use of the color model appropriate the PDF variant, within text and hyperlinks (when allowed).
5. glyphtounicode.tex (not XeLaTeX) maps glyph names to corresponding Unicode code-points.
6. ifluatex allowing coding specific to LuaLaTeX.
7. ifxetex allowing coding specific to XeLaTeX.
8. luatex85 or pdftexcmds (LuaTeX only) for access to primitive commands using pdfTeX macro names.
9. stringenc used to help generate proper bookmarks with transliterated input; e.g., with \textLGR or \textARM — see Section 4.1.4.

Other files and packages are loaded as sub-packages or as configuration files for these. Since some of these packages may be loaded by existing documents we provide here advice on how to deal with potential loading and option conflicts.

Firstly, it is best if pdfx is the first package loaded; e.g., directly after the \documentclass line. This is not a strict requirement, but it is worthwhile to deal with the metadata at the top of your LaTeX source, allowing correct options to be loaded to cope with validation aspects.

Secondly, replace \usepackage[<options>]{hyperref} with \hypersetup{<options>}. This deals with most loading issues with the hyperref package. Note that PDF/X is a format intended for printing. It forbids inclusion of hyperlinks and other actions, including via bookmarks. To produce a validating PDF/X document, pdfx overrides internal macros while keeping colors associated with link anchors. To inhibit these colors also, you could specify options as follows.

```
\hypersetup{colorlinks,allcolors=black}
```

Furthermore, options to set metadata components (such as pdfauthor, pdftitle, pdfsubject, pdfkeywords, etc.) are disabled, since pdfx has already taken care of this information.

Thirdly, conflicts with other packages may be dealt with by simply changing \usepackage to \RequirePackage within the document's preamble. But this may not be possible when the \usepackage or \RequirePackage command occurs within another package, or with a specific set of options, thereby causing processing to stop. Few packages have a command analogous to \hypersetup. Instead \PassOptionsToPackage{<options>}{<package>} can help. For <options> specify the ones associated with the loading yet to come. This can give a smooth processing run, but you'll need to check whether the results from those options have actually taken effect. Some examples of this can be seen later, in Figures 2 and 8.

3.1.1. Limitations using XeLaTeX

To process a file using XeLaTeX, to produce a document that can validate to a particular PDF standard, one need to use a command to run the TeX engine, as follows.

```
xelatex -shell-escape -output-driver="xdvipdfmx -z 0" <filename>.tex
```

The -shell-escape option allows a command-line task to be run, which writes the creation-date & time of the running job into a small file on disk. This data, written in a specific format, is then read by the job for inclusion into several metadata fields. This emulates the result of pdfTeX's \pdfcreationdate primitive. As there are security implications in allowing arbitrary commands to be run, this need for -shell-escape must be viewed as imposing a limitation on the work-flows in which this can be safely used.

The -output-driver="xdvipdfmx -z 0" suppresses compression, which is not allowed for the XMP metadata packet. Without this, the resulting PDF may fail to pass validation tests.

XeTeX is designed for processing UTF-8 input only. When presented with LaTeX source using a legacy encoding, such as latin2 or koi8-r, the input is accepted and a PDF produced. Yet there will be garbage characters corresponding to each character entered from the upper range (128–255). This is evident in the PDF content and bookmarks; yet pdfx produces the correct XMP metadata packet. So while the techniques explained later in Section 4.1 are valid, the PDF itself does not contain correct content.

Not all fonts, in particular Open-Type fonts (OTF), naturally come with mappings of the glyphs to Unicode code points. This is a requirement with PDF/A, PDF/E and PDF/UA standards. Use of such fonts can result in validation errors, such as:

- CIDset in subset font is incomplete (font contains glyphs that are not listed).
- Type 2 CID font: CIDToGID map is invalid or missing.

If one has access to Adobe's Acrobat Pro software, then its Preflight utility can rewrite the uncompressed output from XeLaTeX into a valid PDF standard, using compression of the contents but not of the XMP packet. Similarly Preflight can sometimes fix the missing font information.

3.1.2. Limitations using LuaLaTeX

LuaLaTeX can handle the OTF font issues mentioned for XeLaTeX, so can produce valid PDF/A documents where XeLaTeX fails. However, since LuaTeX expects all input source to be UTF8-encoded, it cannot work at all with documents using older legacy encodings. Instead one gets error messages such as:

```
! String contains an invalid utf-8 sequence.
l.5 \Copyright{\textLII{UWAGA dla recenzent
                                        iżœw/tÂłumaczy}}
?
```

from a document using `latin2` encoded characters. Thus most of Section 4.1 is just not applicable for LuaLaTeX, whereas it is for pdfTeX. This is essentially the same problem as described above for XeTeX, but here LuaTeX advises that there are problems as soon as it encounters an invalid (for UTF-8) character. Some would regard this as better than having the job run to completion, only to later discover garbage content within the PDF.

3.2. Files included

The following files are included in the package. Some can be created from `pdfx.dtx`, using the `Makefile`.

3.2.1. Package files

- `pdfx.sty` — main package file generated from `pdfx.dtx`.
- `pdfa.xmp` — specimen `xmp` template for PDF/A.
- `pdfe.xmp` — specimen `xmp` template for PDF/E.
- `pdfvt.xmp` — specimen `xmp` template for PDF/VT.
- `pdfx.xmp` — specimen `xmp` template for PDF/X.
- `8bit.def` — custom input encoding.
- `l8u-penc.def` — input encoding macro declarations.
- `l8uarb-penc.def` — input macro declarations for Arabic.
- `l8uarm-penc.def` — input macro declarations for Armenian.
- `armglyphs.dfu` — Unicode mapping for Armenian letters.
- `l8ucyr-penc.def` — input macro declarations for Cyrillic alphabet.
- `l8udev-penc.def` — input macro declarations for Devanagari.
- `l8ugrk-penc.def` — input macro declarations for Greek alphabet.
- `l8uheb-penc.def` — input macro declarations for Hebrew alphabet.
- `l8ulat-penc.def` — input macro declarations for Latin 1–9 encodings.
- `l8umath-penc.def` — input macro declarations for mathematical symbols.
- `glyphtounicode-cmr.tex`, `glyphtounicode-ntx.tex` — maps glyph names to corresponding Unicode for Computer Modern and other TeX-specific fonts.
- `AdobeColorProfiles.tex` — macros for inclusion of Adobe-supplied color profiles.
- `AdobeExternalProfiles.tex` — macros for use of external color profiles.
- `CallasColorProfiles.tex` — macros for profiles included with Callas pdfaPilot software.

3.2.2. Documentation & Examples

- `README` — usual top-level information.
- `manifest.txt` — file list.
- `pdfx.pdf` — package documentation.

- sample.tex, sample.xmpdata — a sample file with sample metadata.
- small2e-pdfx.tex — sample file with included metadata.

3.2.3. Sources

- src/pdfx.dtx — composite package and documentation.
- src/pdfx.ins — installer batch file.
- src/pdfx.xmpdata — metadata for the documentation.
- src/rvdtx.sty — used by pdfx.dtx.
- src/Makefile — a Makefile for building the documentation.
- src/MANIFEST — list of files in this directory.
- src/text89.def — used with Figure 13 in the documentation.
- src/{arm-start,koi8-example,koi8-example2,latin2-example}.tex — used in the documentation with figures showing example coding.
- src/{TL-POL-meta,TL-RU-LICRs,TL-RU-metadata,TL-RU-toc,Armenian-example-UTF8, armtex-meta,usage-meta,math-assign5}.png — screenshot images showing multilingual and other metadata.

3.3. Miscellaneous information

The package is released under the LaTeX Project Public Licence. Bug reports, suggestions, feature requests, etc., may be sent to the original authors at cvr@river-valley.org and/or thanh@river-valley.org, or to the more recent contributors at ross.moore@mq.edu.au and/or selinger@mathstat.dal.ca.

4. Multilingual and Technical Considerations

TEX and LATEX have an on-going practice of including metadata within the source files and package documentation. Usually this is done as comments at the beginning of the file; such as the following from the English language version of the 2015 TEX Live documentation[5].

```
$Id: texlive-en.tex 37205 2015-05-05 21:36:33Z karl $
TeX Live documentation.  Originally written by Sebastian Rahtz and
Michel Goossens, now maintained by Karl Berry and others.
Public domain.
```

This provides information, ideally suited for copyright metadata fields, as in Section 2.3.2, as well as for \Subject and \CoverDate from Section 2.3.4.

Also near the top of the file one finds front-matter content

```
\title{%
 {\huge \textit{The \TeX\ Live Guide---2015}}
}
\author{Karl Berry, editor \\[3mm]
       \url{http://tug.org/texlive/}
      }
\date{May 2015}
```

which supplies metadata information for the commands \Title, \Author, \CoverDisplayDate also from Section 2.3.4, and \CopyrightURL.

[5] found at /usr/local/texlive/2016/texmf-dist/doc/texlive/texlive-en/.

Most of the hundreds of thousands, if not millions of documents prepared using TEX, LATEX and other TEX-based formats, include similar metadata information, much of which currently does not accompany the resulting PDF. It is becoming increasingly common, if not yet a legal requirement, for PDFs to satisfy a standard that requires inclusion of metadata. This is especially so for government agencies and institutions receiving government funding, in several countries around the world.

It is an aim of the pdfx to simplify the process of capturing and including metadata within LATEX-produced PDFs, from both the author's view and that of archivists. The extra features introduced with version 1.5.8 take a large step in that direction. This includes the ability, described in the next subsection, to reliably include data presented in different text encodings, rather than being restricted to UTF-8 only. It is a role of the software to make the conversion, rather than rely on some 3rd party for a translation.

4.1. Multilingual Metadata

A cursory search of the documentation (.../texmf-dist/doc) subtree of the forthcoming TEX Live 2016 release reveals more than 730 different .tex or .dtx document sources which specify an input encoding, via the \usepackage[...]{inputenc} command. Roughly 380 (a bit more than half) declare UTF-8 as the input encoding. Of the remainder there are ≈ 20 other encodings specified, covering a range of languages for at least part of their content. At some point in time, these documents may be required to have accurate accompanying metadata, as part of conformance to a designated PDF (or other) standard. There are libraries and archives that already must meet such standards.

We have shown above, in Section 2.2, how the .xmpdata file can be inserted into the document source, which then ensures that metadata is reliably transferred along with the source itself. This seems a good strategy, but are there any problems with it, especially in a multilingual context?

Modern editing software can require an encoding to be associated with each file. This is what allows the correct characters to be shown, from what is otherwise just a sequence of 8-bit bytes. The flip-side is that arbitrary editing is not permitted. Add some UTF-8 data into a file that is encoded as Latin-2 then try to save it. You may be asked to specify a new encoding, or the application may even crash out entirely. Maybe this happens *accidentally*. It is not hard for a curly quote (') or endash (–) to be included; many editors have settings which can do this with normal ascii input. Turn *off* such settings.

The approach that we advocate is that when editing to add metadata, best is to:

1. use the *same encoding* as is specified for the file itself, if known (as is usually the case);
2. even if 1. is not possible, use Copy/Paste *within* the document source (e.g., for authors' names, addresses, affiliations, etc.) and from comments, as in Section 4 above;
3. avoid typing new characters, especially quotes and dashes, and be extra careful with back-spacing to preserve the real meaning of copied content.

Even if the original encoding is not known, use of Copy/Paste from other parts of the document is normally not going to change its encoding. This should not cause the file to become invalid due to mixed content. In some situations it may be necessary to use an ASCII-only representation, such as LATEX's LICR[6] macros [22, § 7.11].

4.1.1. Metadata with Cyrillics

Here is a 'real-world' example, with Figure 1 showing the metadata as could be produced for the Russian language version of the TEX Live documentation, from coding as shown in Figure 2.

[6] LICR: LATEX Internal Character Representation; or think 'I = Interchange'.

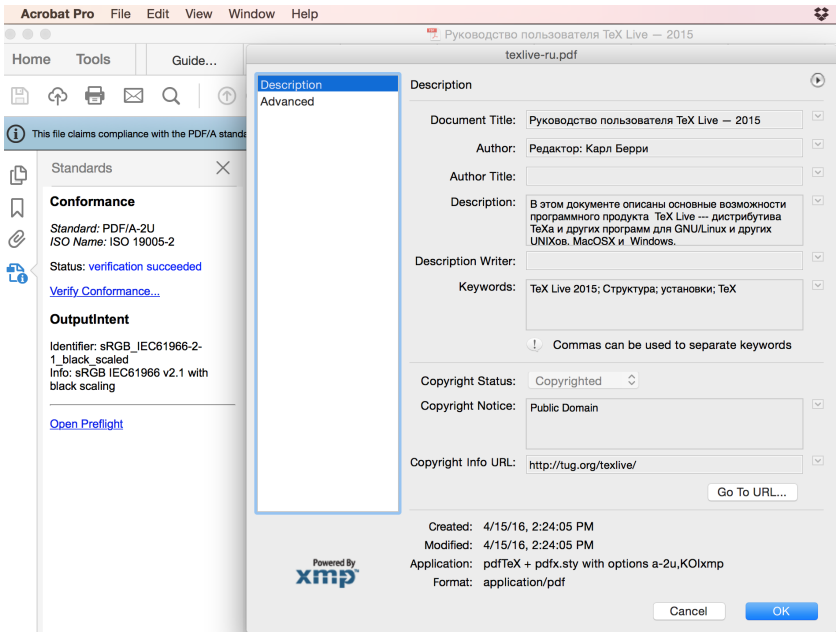

Figure 1: Metadata generated from the coding shown in Figure 2, viewed using Acrobat Pro's 'Additional Metadata ...' panel.

The source file itself is actually encoded for KOI8-R, as indicated by the presence of the code line `\usepackage[koi8-r]{inputenc}`, but is deliberately shown here encoded as `T1` [22, p. 449]. This difference is immaterial for checking the validity of the metadata. For example, the stream of upper (accents, etc.) characters within `\Title{\textKOI{ ... }}` is the same as within `\title{...\textit{ ... }}`. Similarly for `\Author{\textKOI{...}}` and `\author{...}`, and `\CoverDate` and `\date`. Strings for the `\Subject` and `\Keywords` are taken from the first actual paragraph in the document, and from early subsection titles.

It is the 'parser' command/macro `\textKOI{ ... }` that indicates that the upper range characters (having byte codes 128–255) are to be treated as KOI8-R characters, rather than as part of UTF-8 byte sequences. It works by examining each byte in sequence, and returning the appropriate UTF-8 2-byte sequence for the required cyrillic character. This happens during the processing of data from `\jobname.xmpdata` for fleshing-out the XMP metadata packet to be included within the final PDF/A document.

The 'parser' macros defined for various encodings, are given in Figure 3. In Section 2.1.7 the package options are given for loading the appropriate support for desired languages or alphabets. Support for other encodings can be added, if there proves to be a need.

With encoded characters marked in this way with a 'parser' macro, it is actually possible to mix UTF-8 metadata with other bytes; provided, of course, you have an editor that allows such a file to be created and saved. On the other hand, if you are unhappy with mixing content having different encodings, then there is another way, based upon LaTeX's LICR macros [22, § 7.11] for representing accented and non-latin characters. These are normally hidden away ('I = Internal') but in fact can be seen within auxiliary files, such as `.aux` and `.toc`, `.lof` and `.lot`. This is how LaTeX stores the knowledge of such characters for use in a part of the document processing which may not have the same encoding as the document as a whole, or may require characters generated using several different encodings. Thus LICRs allow for a reliable representation passed to a different context; think 'I = Interchange'.

Figure 4 shows how to see this. The document source in the lower portion clearly shows the cyrillic input, whereas the `.log` messages in a command-line window above reveal the LICR

```
% $Id: texlive-ru.tex 34060 2014-05-16 19:52:41Z boris $
%
%\def\Status{1}
\providecommand{\pdfxopts}{a-2u,KOIxmp}
\providecommand{\thisyear}{2015}
%\immediate\write18{rm \jobname.xmpdata}%  uncomment for Unix-based systems
\begin{filecontents*}{\jobname.xmpdata}
\Title{\textKOI{òÕËÏŒÏÄÁÓÔŒÏ ÐÏÌØÚÏŒÁÔÅÌÑ} TeX Live \textemdash \thisyear}
\Author{\textKOI{òÅÄÁËÔÏÒ: ëÁÒÌ âÅÒÔÉ}}
\Subject{\textKOI{œ ÜÕÎÍ ÄÏËÕÍÅÎÔÅ ÏÐÉÓÁÎÙ ÏÓÎÏŒÎÙÅ ŒÏÚÍÏÖÎÏÓÔÉ ÐÒÏÇÒÁÍÍÎÏÇÏ ÐÒÏÄÕËÔÁ }
 TeX Live \textKOI{--- ÄÉÓÔÒÉÂÕÔÉŒÁ }TeX\textKOI{Á É ÄÒÕÇÉÈ ÐÒÏÇÒÁÍÍ ÄÌÑ} GNU/Linux
 \textKOI{É ÄÒÕÇÉÈ }UNIX\textKOI{ÏŒ}, MacOSX\textKOI{ É  Windows.}}
\Keywords{TeX Live \thisyear\sep \textKOI{óÔÒÕËÔÕÒÁ}\sep \textKOI{ÕÓÔÁÎÏŒËÁ}\sep \TeX}
\CoverDisplayDate{\textKOI{íÁÊ} \thisyear}
\CoverDate{2015-05-06}
\Copyrighted{False}
\Copyright{Public Domain}
\CopyrightURL{http://tug.org/texlive/}
\Creator{pdfTeX + pdfx.sty with options \pdfxopts }
\end{filecontents*}
\documentclass{article}
\usepackage[\pdfxopts]{pdfx}[2016/03/09]
\PassOptionsToPackage{obeyspaces}{url}
\let\tldocrussian=1  % for live4ht.cfg
\usepackage{cmap}
\usepackage{tex-live}
\usepackage[koi8-r]{inputenc}
\usepackage[russian]{babel}
 ...
\begin{document}
\title{%
  {\huge \textit{òÕËÏŒÏÄÁÓÔŒÏ ÐÏÌØÚÏŒÁÔÅÌÑ \protect\TL{} '--- \thisyear}}%
}
\author{òÅÄÁËÔÏÒ: ëÁÒÌ âÅÒÔÉ\\[3mm]
        \url{http://tug.org/texlive/}}
\date{íÁÊ \thisyear}
```

Figure 2: Example of cyrillics in metadata, shown as if T1-encoded. See Figure 1 for the actual result.

representation. A command `\showLICRs` is available with `pdfx.sty` version 1.5.8, specifically to allow this. Now the LICR representation can be copied directly from the `.log` file, modulo slight difficulties due to the way long lines are broken. As this representation is entirely with ASCII characters, it should not cause any conflict with any UTF-8 metadata that you want within the same file. The `.xmpdata` file might now look as in Figure 5. Although very verbose, this should be resistant to any corruption due to character encodings, and produces the same result within the PDF, as in Figure 1.

Alternatively one can exploit the `.toc` file, using LaTeX's command `\addtocontents`, as shown in Figure 6. After processing the file, you can copy the LICR representations out of the `.toc` file, taking care to remove anything of a non-character nature (e.g., implementing the size and spacing of the letters in TEX).

Of course once you have harvested the metadata in this format, remove or comment-out those extra `\showLICRs` to get uninterrupted processing. Similarly comment-out the extra `\addtocontents` lines, else the real Table-of-Contents will become corrupted with unwanted

macro	encodings	bytes 128–255 with languages
\textLAT	Latin-1	Western European
\textLII	Latin-2	Middle European
\textLIII	Latin-3	South European
\textLIV	Latin-4	North European
\textLTV	Latin-5	Turkish
\textLVI	Latin-6	Nordic
\textLVII	Latin-7	Baltic Rim
\textLIIX	Latin-8	Celtic
\textLIX	Latin-9	Western European, incl. €
\textKOI	KOI8-R, KOI8-RU	cyrillic alphabets
\textLGR	LGR, ISO-8859-7	Greek & Polytonic Greek
\textARM	ArmTEX, ArmSCII8	Armenian
\textHEB	HE8, ISO-8859-8, CP1255	Hebrew
\textHEBO	CP862	Hebrew
\(...\)	parses simple mathematical expressions	

Figure 3: Parser macros, defined for specific types of input.

entries. A couple more LATEX processing runs should restore the PDF to the way you want it.

4.1.2. Metadata with Polish

The next example has upper-range bytes intended to represent Latin-2 encoded characters, as used in Polish. With the LATEX source starting as in Figure 8, the resulting metadata is shown in Figure 7.

Here the 'parser macro' is \textLII, which can be seen in Figure 8 to surround either complete metadata entries, or just those parts containing polish accented (or other) characters in entries that also contain english words. The macro \textLF provides a line-feed character for the UTF-8 output.

As a technical note, the \jobname.xmpdata file is read with \obeyspaces in effect. This causes space runs in the input to be replaced by a single 'active space' character, which ultimately expands into a normal space upon output. This is needed to preserve inter-word spaces, which would otherwise get lost during parsing, due to TEX's pattern matching when reading macro arguments. Each byte is examined individually, with normal letters a-zA-Z and most punctuation characters passed through unchanged.

Let's understand better how this example was created. There are three files involved.

- pdfx.dtx, the source for this documentation, open in an editor with encoding declared as UTF-8;
- texlive-pl.tex the Polish documentation for TEX Live, open in the same editor with Latin-2 encoding;
- latin2-example.tex which starts life as an empty file on disk.

This latter file must be opened in the editor, with encoding declared as Latin-2 (ISO-8859-2). Next the preamble is copied from texlive-pl.tex and pasted into latin2-example.tex which is then saved to disk. Further editing is done to latin2-example.tex to add verbatim markers (|...|) and adjust line lengths for display within Figure 8. This file's contents is included as part of the documentation via \input{latin2-example} within an environment that handles presentation aspects, and (since 2018) declares \UseRawInputEncoding.

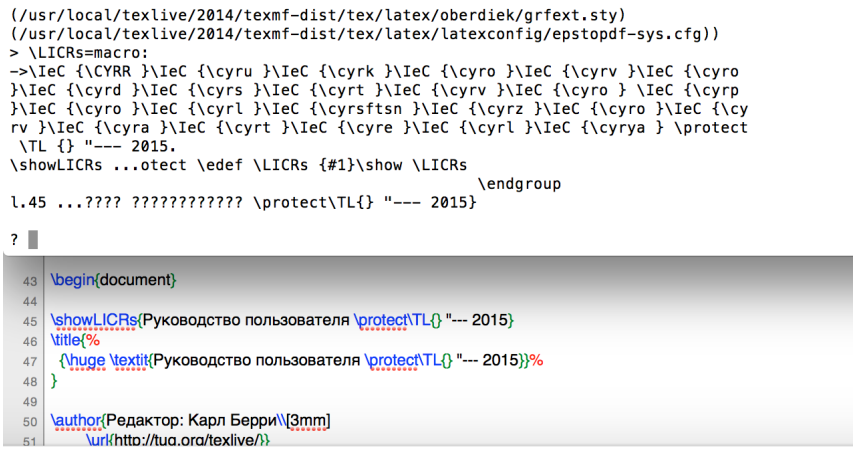

Figure 4: How to see LICRs in the .log window.

What *cannot* be done is to paste the preamble content directly into pdfx.dtx. Consider what would then happen, using 'tłumaczy' ('translators', on line 10 following 'UWAGA'). This word shows correctly in the Latin-2 encoded files. It was typeset here using \l for the 'ł' letter, having Unicode code-point Ux0142 (so UTF-8 byte pair "C5 "82). However, it occurs at slot "B3 within Latin-2 encoding. In the T1 font encoding [22, p. 449] the character glyph name for slot "B3 is /scedilla, which is what shows in Figure 8. When the 'ł' is pasted directly into a UTF-8 file and shown verbatim, the result is the pair of glyphs "C5 (/Aring) and "82 (/Cacute); *viz.* tÅĆumaczy.

As with Figure 2 it is not important that the correct characters are shown here, but that the metadata in \jobname.xmpdata corresponds to what is used on the titlepage of the PDF; e.g., the contents of \Title and \title, \Author and \author, etc.

4.1.3. Metadata with Greek

Prior to proper support for UTF-8 input, a method for preparing document source for the modern Greek language (and also for polytonic Greek), involved the use of LGR encoded fonts. Such a font has Greek (instead of Latin) letters in the slots for a–zA–Z, see [22, §9.4.2]. Thus ordinary ASCII letters are used to produce the Greek characters; the mapping of ASCII to Greek is referred to as a 'transliteration' scheme. It serves as *both* an input encoding, and as a font encoding. Accents and diacritic marks are provided through ligatures built-in to the fonts. Various documents can be found on the web[7] and within TEX Live distributions[8].

Indeed the current maintainer Günther Milde states "The LGR transliteration does not work for PDF metadata". This is because there is no translation of LGR input into LATEX LICRs, as happens with say \usepackage[utf8]{inputenc} for UTF-8 input, or when upper 8-bit characters are present using \usepackage[iso-8859-7]{inputenc}. With these, LICRs such as \textAlpha, \textOmicron, …, \textomega are produced, which result in the correct characters for metadata and bookmarks, perhaps employing Unicode 'combining' characters for accented letters. Using pdfx the UTF-8 characters can be put directly into the .xmpdata file; LICRs are interpreted provided the grkxmp loading option has been specified.

Using the methods of pdfx the metadata difficulty is remedied, as can be seen in Figure 9 using coding as shown in Figure 10. This requires the LGRxmp option and \textLGR 'parser' macro. The original document source, called usage.tex, can be found in the directory specified in the footnote below. As this document is essentially an English description of how to use

[7] e.g., http://milde.users.sourceforge.net/LGR/
[8] TeXLive: .../2016/texmf-dist/doc/generic/babel-greek/

```
% $Id: texlive-ru.tex 34060 2014-05-16 19:52:41Z boris $
%
%\def\Status{1}
\providecommand{\pdfxopts}{a-2u,KOIxmp}
\providecommand{\thisyear}{2015}
%\immediate\write18{rm \jobname.xmpdata}%  uncomment for Unix-based systems
\begin{filecontents*}{\jobname.xmpdata}
\Title{\IeC {\CYRR }\IeC {\cyru }\IeC {\cyrk }\IeC {\cyro }\IeC {\cyrv }\IeC {\cyro }
 \IeC {\cyrd }\IeC {\cyrs }\IeC {\cyrt }\IeC {\cyrv }\IeC {\cyro } \IeC {\cyrp }\IeC {\cyro }
 \IeC {\cyrl }\IeC {\cyrsftsn }\IeC {\cyrz }\IeC {\cyro }\IeC {\cyrv }\IeC {\cyra }\IeC {\cyrt }
 \IeC {\cyre }\IeC {\cyrl }\IeC {\cyrya } TeX Live \textemdash \thisyear}
\Author{\IeC {\CYRR }\IeC {\cyre }\IeC {\cyrd }\IeC {\cyra }\IeC {\cyrk }\IeC {\cyrt }
 \IeC {\cyro }\IeC {\cyrr }: \IeC {\CYRK }\IeC {\cyra }\IeC {\cyrr }\IeC {\cyrl }
 \IeC {\CYRB }\IeC {\cyre }\IeC {\cyrr }\IeC {\cyrr }\IeC {\cyri }
\Keywords{TeX Live \thisyear\sep \IeC {\CYRS }\IeC {\cyrt }\IeC {\cyrr }\IeC {\cyru }
 \IeC {\cyrk }\IeC {\cyrt }\IeC {\cyru }\IeC {\cyrr }\IeC {\cyra }\sep \IeC {\cyru }
 \IeC {\cyrs }\IeC {\cyrt }\IeC {\cyra }\IeC {\cyrn }\IeC {\cyro }\IeC {\cyrv }\IeC {\cyrk }
 \IeC {\cyri }\sep \TeX}
\Subject{\IeC {\CYRV } \IeC {\cyrerev }\IeC {\cyrt }\IeC {\cyro }\IeC {\cyrm } \IeC {\cyrd }
 \IeC {\cyro }\IeC {\cyrk }\IeC {\cyru } ...
 ...
\CoverDisplayDate{\IeC {\CYRM }\IeC {\cyra }\IeC {\cyrishrt } 2015}
\CoverDate{2015-05-06}
\Copyrighted{False}
```

Figure 5: Example of cyrillics in metadata, using LICRs.

LGR for Greek, we have used the 'Keywords' field to provide examples of such usage. Since a macro `\textgreek` can be used for greek portions within such documents, this macro name is aliased to `\textLGR` within the context where metadata is processed. Furthermore, parsing using `\textLGR` generates correct pre-composed characters for letters with accents or diacritics. Bookmarks can also be generated from LGR input, using a technique described in Section 4.1.4.

The features available with different loading options are summarised here.

- no option: all metadata in `.xmpdata` file is in UTF-8 (incl. ASCII)
- `grkxmp`: LICRs can be present; e.g. `\textAlpha`, `\textOmega`, etc.
- `LGRxmp`: supports LGR-encoded input and `ISO-8859-7` upper range characters, using the `\textLGR` 'parser' macro.

With `LGRxmp` specified, the features of `grkxmp` are also available; so any lower-listed option allows data to be mixed with that for higher-listed ones.

The final piece to get validation for PDF/A from LGR input, is to specify a Unicode point for the 'v' used only in the strong 'sv' ligature to obtain a non-final 'sigma' typeset in isolation.

```
\pdfglyphtounicode{internalchar2}{200D}
```

This gives an interpretation as 'zero-width joiner'. There are two instances of this within `usage.tex`. Copy/Paste works as desired. Using pdfTEX the above command is done automatically. Drivers, such as XeLaTeX lacking an implementation of `\pdfglyphtounicode`, can fail to produce a valid PDF due to this rather minor deficiency.

Greek numerals, using `\greeknumeral` or `\Greeknumeral` cannot work directly within a `.xmpdata` file. However if such is desired, the following technique allows correct LICRs to be

```
\begin{document}

\addcontentsline{toc}{title}{Руководство пользователя \protect\TL{} "--- 2015}
\title{%
  {\huge \textit{Руководство пользователя \protect\TL{} "--- 2015}}%
}
\addcontentsline{toc}{author}{Редактор: Карл Берри}
\author{Редактор: Карл Берри\\[3mm]
        \url{http://tug.org/texlive/}}
\date{Май \thisyear}
\addcontentsline{toc}{date}{Май \thisyear}
\addcontentsline{toc}{docs}{Структура}
\addcontentsline{toc}{install}{установки}
\addcontentsline{toc}{Subject}{В этом документе описаны основные возможности программного продукта
\TL{} "--- дистрибутива \TeX{}а и других программ для \acro{GNU}/Linux и других UNIXов, \MacOSX и  Windows.}
\maketitle

```

Figure 6: How to get desired LICRs into the `.toc` file.

found for use in the metadata. At any convenient place within the LaTeX source; e.g., near where the required number is used, insert coding such as:

```
{\pdfxGreeknumeralsHack \textgreek{\edef\num{\greeknumeral{1997}}\show\num}}%
```

Upon processing, the following will be written to the console or `.log`-window.

```
> \num=macro:
->\LGR\textaristerikeraia \LGR\textalpha \LGR\textsampi \let \protect \LGR\text
dexiakeraia \LGR\textqoppa \let \protect \LGR\textdexiakeraia \LGR\textzeta \le
t \protect \LGR\textdexiakeraia \protect \LGR\textdexiakeraia .
<argument> ...um {\greeknumeral {1997}}\show \num

l.90 ...k{\edef\num{\greeknumeral{1997}}\show\num}
                                                  }
?
```

from which the desired string of LICRs, is extracted; *viz.*

```
\textaristerikeraia\textalpha\textsampi\textqoppa\textzeta\textdexiakeraia
```

The corresponding trick does not work with `\Greeknumeral`, but the uppercasing can be done manually from the string obtained using `\greeknumeral`,

```
\textaristerikeraia\textAlpha\textSampi\textQoppa\textZeta\textdexiakeraia
```

leaving the initial and final `\text...keraia` macros as all lowercase. For smooth processing, remove or comment-out the added line after collecting the LICRs.

4.1.4. Metadata with Armenian

The ArmTEX package[9] provides the method to typeset Armenian, with input being specified in various ways including a transliteration scheme from ASCII input. This transliteration is directed at the use of the `OT6` encoding, developed for this purpose. Each way is supported by `pdfx.sty` with appropriate loading options, similar to the support for Greek (see Section 4.1.3).

- no option: all metadata in `.xmpdata` file is in UTF-8 (incl. ASCII)
- `armxmp`: using LICR-like macro names; e.g. `\armAyb`, `\armsha`, `\armfe` etc.

[9] documentation: TeXLive: `.../2016/texmf-dist/doc/generic/armenian/`

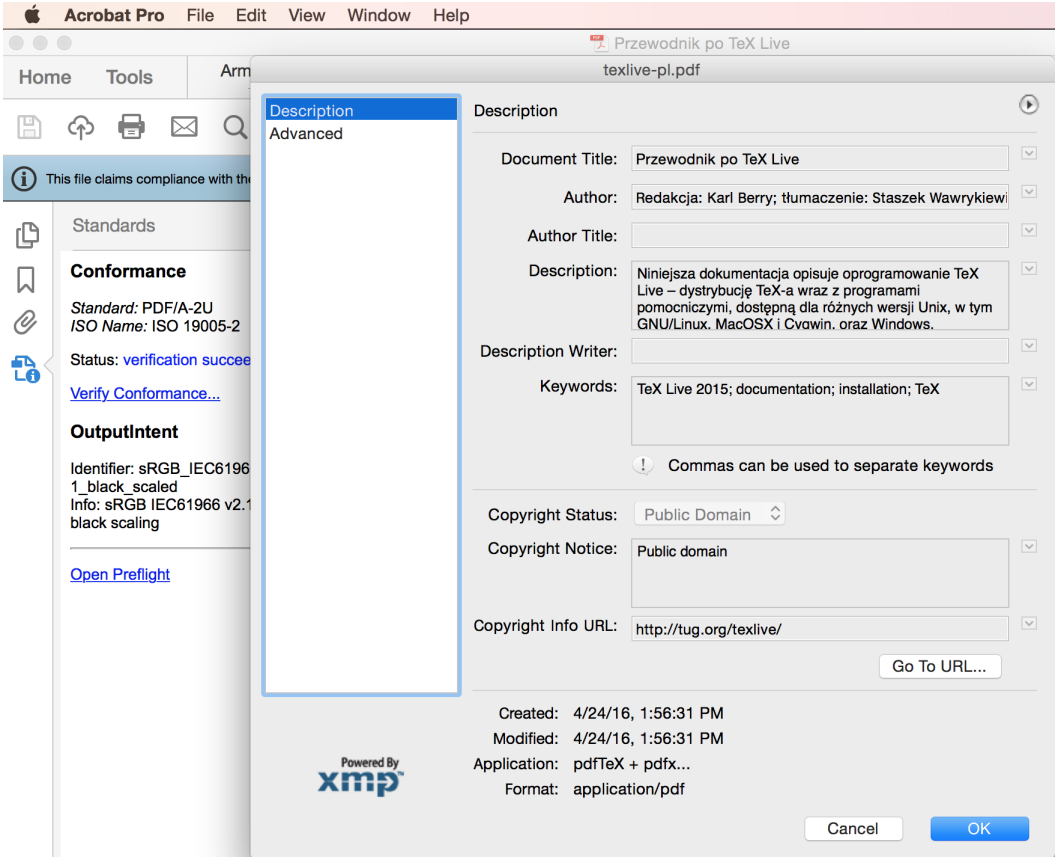

Figure 7: Metadata generated from the coding shown in Figure 8 for the Polish version of TEX Live 2015 documentation, showing Latin-2 encoded characters. The document is valid for PDF/A-2, after having been processed with pdf-LATEX.

- AR8xmp: using the ArmTEX (OT6) transliteration scheme or with upper-range characters in ArmSCII8 encoding, using the 'parser' macro \textARM.

There are 39 letters in the Armenian alphabet, so the transliteration includes many 2-letter combinations to specify the desired character. Whereas Greek uses punctuation symbols to specify diacritics, Armenian requires either ligatures implemented in the OT6-encoded font, or careful parsing of the input into LICR-like macros. LATEX source[10] for the ArmTEX documentation is available in both English and Armenian. Figure 11 shows the result of enriching the Armenian version with relevant metadata, using coding as shown in Figure 12.

As in earlier examples, that metadata has come from the extensive comments at the head of the LATEX source file (represented by . . . in Figure 12), and other title-page material, such as title and author names in both English and Armenian. Within the keywords are armenian words that are mentioned in the documentation as being slightly tricky to represent in transliteration, to verify that the required tricks have been correctly implemented.

Also apparent in Figure 11 is the use of Armenian letters in the Bookmarks pane, having been generated from the transliteration source. This requires a 3-step process, as follows.

1. conversion of transliterated source into UTF-8. This is done as the .xmpdata file is processed, using \pdfxEnableCommands to make global definitions; e.g,

[10] TeXLive: .../2016/texmf-dist/doc/generic/armenian/examples/latex/

```
% iso8859-2
% $Id: texlive-pl.tex, v. 53 2015/05/17
% TeX Live documentation.
% Originally written by Sebastian Rahtz and Michel Goossens,
% now maintained by Karl Berry and others.
% Polish translation and additions by Staszek Wawrykiewicz
% (with a little help from my friends, while my guitar gently weeps ;-)
% Public domain.
%  ----
% UWAGA dla recenzentów/tşumaczy:  %%! to moje komentarze (StaW)
%
\providecommand{\pdfxopts}{a-2u,LATxmp}
\providecommand{\thisyear}{2015}
\begin{filecontents*}{\jobname.xmpdata}
\Title{Przewodnik po TeX Live \thisyear}
\Author{Redakcja: Karl Berry\sep \textLII{tşumaczenie: Staszek Wawrykiewicz}}
\Subject{\textLII{Niniejsza dokumentacja opisuje oprogramowanie \TeX\ Live
 -- dystrybucjê \TeX-a wraz z~programami pomocniczymi, dostêpnś dla ró£nych wersji Unix,
  w~tym GNU/Linux, MacOSX i~Cygwin, oraz Windows.}\textLF\textLF Documentation originally
 written by Sebastian Rahtz and Michel Goossens, now maintained by Karl Berry and others.}
\Keywords{TeX Live \thisyear\sep documentation\sep installation\sep \TeX}
\Copyright{Public domain}\Copyrighted{False}
\CopyrightURL{http://tug.org/texlive/}
\CoverDisplayDate{Maj \thisyear}
\CoverDate{\thisyear-05-17}
\Creator{pdfTeX + pdfx.sty with options \pdfxopts, from TeX Live 2016}
\end{filecontents*}
%
\documentclass{article}
\let\tldocenglish=0 % for live4ht.cfg
\let\textsl\textit
\usepackage[\pdfxopts]{pdfx}[2016/04/13]
\PassOptionsToPackage{obeyspaces}{url}
\PassOptionsToPackage{breaklinks,colorlinks,linkcolor=hypercolor,citecolor=hypercolor,%
  urlcolor=hypercolor,filecolor=hypercolor,bookmarksopen,hyperindex}{hyperref}
\hypersetup{breaklinks,colorlinks,allcolors=hypercolor}
\usepackage{tex-live}
\usepackage{polski}            %% for PL
\usepackage[latin2]{inputenc}  %% for PL
\usepackage[T1]{fontenc}
...
\begin{document}
\title{\huge \textit{Przewodnik po \protect\TL{} 2015}}
\author{Redakcja: Karl Berry; tşumaczenie: Staszek Wawrykiewicz \\[3mm]
        \url{http://tug.org/texlive/}}
\date{Maj 2015}
```

Figure 8: Start of the LaTeX source for the Polish version of TeX Live documentation. Although Latin-2 encoded, the bytes are shown here using LaTeX's T1 encoding [22, p. 449].

```
\xdef\sectAtitle{\textARM{Nerac'uthyun}}
```

capturing the section title in the form supplied in the LaTeX source. This can be seen in

Figure 12, near the end of the {filecontents*} environment, and at the bottom where the \section command would occur.

2. conversion of the UTF-8 representation into UTF16-be, suitable for bookmark strings within the PDF file. With pdfTEX thishis is done using \StringEncodingConvert from Heiko Oberdiek's stringenc.sty package. LuaLATEX and XeLATEX can use the UTF-8 representation directly.
3. integration of the UTF16-be string (pdfTEX) or UTF-8 string (LuaTEX and XeTEX) into the coding that would normally generate the bookmark from a provided section title, in transliterated form.

These last two steps are combined into a single command, to replace the usual command for a section title; \section, \subsection, etc.

```
\pdfxBookmark{\section}{\sectAtitle}{Nerac'uthyun}
```

Now \pdfxBookmark first checks that the macro passed as the 2nd argument actually exists. If it does not, an error message is given and upon continuation would just do \section{Nerac'uthyun} as normal. When it does exist, then step 2 is done (by pdfTEX) storing the result as \pdfx@temp. With LuaTEX and XeTEX, \pdfx@temp stores a copy of the UTF-8 data. Then the commands needing to be executed are essentially

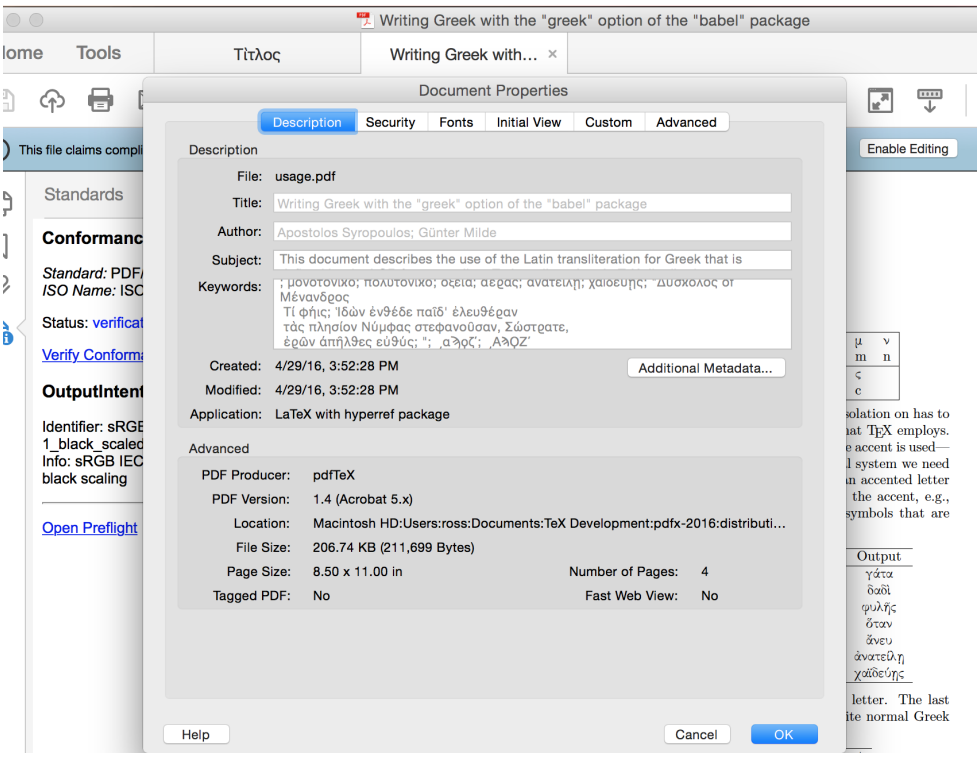

Figure 9: Metadata generated from the coding shown in Figure 10 using the greek language specified via the LGR encoding.

```
% ...
% This file is part of the Babel system.
% --------------------------------------
%
% It may be distributed and/or modified under the
% conditions of the LaTeX Project Public License, either version 1.3
% ...
% The Current Maintainer of this work is Günter Milde.
% ...

\providecommand{\pdfxopts}{a-2u,LGRxmp,LATxmp}
\begin{filecontents*}{\jobname.xmpdata}
\Title{Writing Greek with the "greek" option of the "babel" package}
\Author{Apostolos Syropoulos\sep Günter Milde}
\Subject{This document describes the use of the Latin transliteration for Greek that is
 defined by the LGR font encoding. Today, all modern LaTeX distributions support literal
 input of Greek, which is the preferred method for new documents. [G. Milde 2013/12/02]}
\Keywords{\textLGR{monotonik'o}\sep \textLGR{polutonik'o}\sep \textgreek{oxe'ia} \sep
  \textgreek{>a'erac}\sep \textgreek{>anate'ilh|}\sep \textgreek{qa"ide'uh|c}} \sep
  \textgreek{D'uskoloc} of \textgreek{M'enandroc}\textLF \textLGR{T'i f'hic? <Id`wn
  >enj'ede pa~id'' >eleuj'eran\textLF t`ac plhs'ion N'umfac stefano~usan, S'wstrate,
  \textLF >er~wn 'ap~hljec e>uj'uc? \sep
  \textaristerikeraia\textalpha\textsampi\textqoppa\textzeta\textdexiakeraia\sep
  \textaristerikeraia\textAlpha\textSampi\textQoppa\textZeta\textdexiakeraia}}
\CoverDate{1997-10-15}
\CoverDisplayDate{October 15, 1997}
\Copyright{This file is part of the Babel system.\textLF This file may be distributed and/or
 modified under the conditions of the LaTeX Project Public License, either version 1.3
 of this license or (at your option) any later version.}
\CopyrightURL{http://www.latex-project.org/lppl.txt}
\end{filecontents*}
%
\documentclass[11pt]{article}
\usepackage[\pdfxopts]{pdfx}[2016/04/13]
\hypersetup{colorlinks,allcolors=blue}
\usepackage[american,greek]{babel}
\languageattribute{greek}{polutoniko}
\usepackage{athnum,grmath}
\newcommand{\sg}{\selectlanguage{greek}}
\newcommand{\sa}{\selectlanguage{american}}
\begin{document}
\selectlanguage{american}
\title{Writing Greek with the \ttfamily greek\rmfamily\  option of the
 \ttfamily babel\rmfamily\ package}
\author{Apostolos Syropoulos\\
        ...\\...}
\date{October 15, 1997}
\maketitle
\abstract{\noindent
This document describes the use of the Latin transliteration for Greek that
is defined by the LGR font encoding. Today, all modern LaTeX distributions
support literal input of Greek, which is the preferred method for new
documents. [G. Milde 2013/12/02]}
```

Figure 10: Start of enriched LaTeX source for a document describing how to typeset in Greek, with added metadata demonstrating the LGR transliteration encoding.

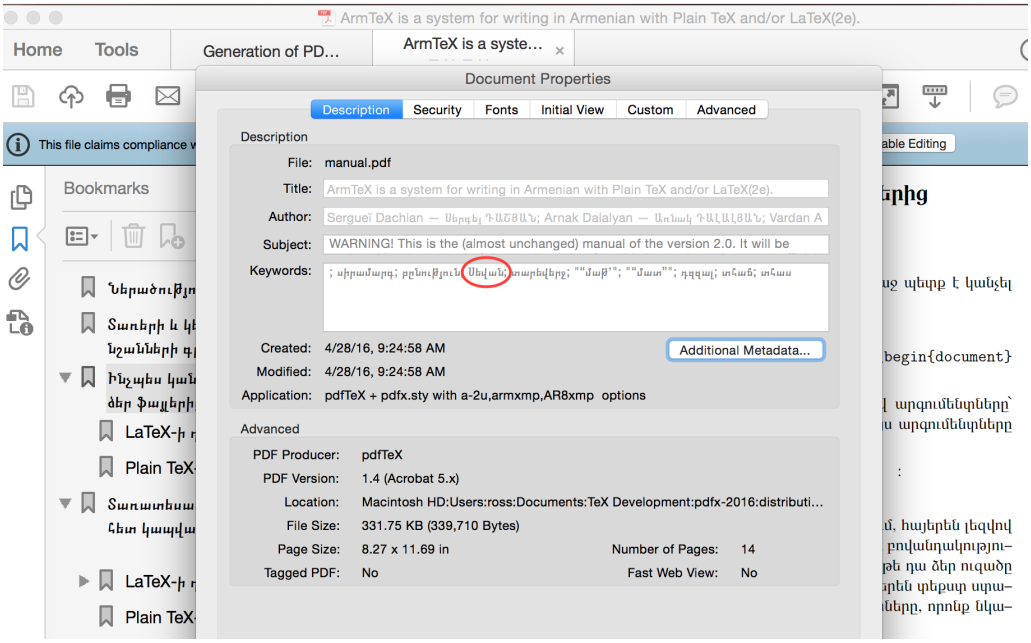

Figure 11: Metadata generated from the coding shown in Figure 12 using the Armenian language specified using ArmTEX transliteration. Bookmarks have been generated in Armenian. Figure 13 explains how the word indicated in red is obtained via parsing.

```
\pdfstringdefDisableCommands{\let\sectAtitle\pdfx@temp}
\def\sectAtitle{Nerac'uthyun}
\section{\sectAtitle}
```

so that the correct section heading is displayed on the page, but when `\sectAtitle` is processed to create a bookmark it is replaced by the pre-prepared contents of `\pdfx@temp`. There are some technicalities[11] to make this work cleanly, as just doing these commands would interfere with other uses of `\pdfstringdef`. In case a long sectioning command has an optional argument, or a ∗-variant is needed, then include it this way.

```
\pdfxBookmark[Ar'avot e'r]{\section*}{\sectAtitle}{Ar'avot e'r, Araratyan dashti ...}
```

4.1.5. Other Languages

There is support for Metadata using characters from other languages, with corresponding loading options, as follows.

- `arbxmp` : Arabic; via LICRs `\textarabicalef`, `\textarabicqaf`, `\textarabicaleflowerhamza`, etc.
- `devxmp` : Devanagari; via LICRs `\textdevanagaria`, `\textdevanagarivocalicr`, `\textdevanagaricandrabindu`, etc.
- `hebxmp` : Hebrew; via LICRs `\hebalef`, `\hebsamekh`, `\hebfinalpe` and accent marks `\segol`, `\qubuts`, etc.

[11] In fact a small change is made to how `\@@writetorep` is used.

```
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%
%% This is the `manual.tex' file (ArmTeX manual in Armenian).
 ...
%%
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
\providecommand{\pdfxopts}{a-2u,armxmp,AR8xmp}
\immediate\write18{rm \jobname.xmpdata}
\begin{filecontents*}{\jobname.xmpdata}
\Title{ArmTeX is a system for writing in Armenian with Plain TeX and/or LaTeX(2e).\textLF
 \textARM{\ArmTeX` {\aroff\TeX}-um ev {\aroff\LaTeX}-um Hayeren Lezvov Grelu Hamakarg}}
\Author{Sergue\"i Dachian \textARM{--- Sergey DASHYAN}\sep Arnak Dalalyan
 \textARM{--- Ar'nak DALALYAN}\sep Vardan Akopian \textARM{--- Vardan HAKOBYAN}}
\Copyright{\textcopyright 1997\textendash 2013  ArmTeX may be distributed and/or modified
 under the conditions of the LaTeX Project Public License, either version 1.3 of this
 license or (at your option) any later version.}
\CopyrightURL{http://www.latex-project.org/lppl.txt}
\Subject{WARNING! This is the (almost unchanged) manual of the version 2.0. It will be
 replaced by the manual of the version 3.0 before this beta release becomes official.
 A (temporary) brief description of the new features of \latArmTeX~3.0 can be found at
 the end of the ``readme.txt'' file. \textLF
 \textLF\textARM{OWSHADROWT'YO|WN: Sa tarberak 2.0-i (grethe anphophox) dzer'narkn e': Ayn
 kphoxarinvi tarberak 3.0-i dzer'narkov naxqan ays beta tho\-ghark\-man pashtonakanacowmu':
 \ArmTeX~3.0-i nor hnaravoruthyunneri (g'a\-ma\-na\-ka\-vor) hamar'ot nkaragrowmu' (angleren
 lezvov) karogh eq gu't\armuh nel~``}readme.txt\textARM{'' fayli verjum:}
 \textLF\textLF\textARM{Hamakargu' o'gtagorc'elu hamar bavakan e' karoghanal ayn kanchel dzer
 fayleric, tirapetel tar'qatesakneru' phoxogh hramannerin ev i\-ma\-nal the inchpes petq e'
 nermuc'el teqstu' steghnasharic: Ays gor\-c'o\-ghu\-thyun\-ne\-ru' nkaragrvac' en hajordogh
 ereq bag'innerum:}}
\Keywords{\textARM{si\-ra\-marg}\sep \textARM{bu'\armuh nuthyun}\sep \textARM{Se\armuh van}
 \sep \textARM{tare\*verj}\sep \textARM{``mat''}\sep \textARM{``mat"}\sep \textARM{d\*zzal}
 \sep \textARM{t\*haj'}\sep \textARM{t\*has}}
\CoverDisplayDate{1 June 1999 (\textARM{1-u' hunisi 1999 th.})}
\Creator{pdfTeX + pdfx.sty with \pdfxopts\space options}
\pdfxEnableCommands{\let\sl\empty%
 \xdef\sectAtitle{\textARM{Nerac'uthyun}}%
 \xdef\sectBtitle{\textARM{Tar'eri ev ketadrakan nshanneri greladzevu'}}%
 ...
 \xdef\sectFtitle{\textARM{Arm\TeX-i phophoxman patmuthyunu'}}%
}
\end{filecontents*}

\documentclass[12pt,a4paper]{article}
\usepackage[\pdfxopts]{pdfx}
\hypersetup{colorlinks,allcolors=blue}
 ...
\title{\ArmTeX$\,$` $\,${\aroff \TeX}-um ev {\aroff \LaTeX}-um Hayeren Lezvov
  Grelu Hamakarg\\ {\normalsize\aroff (\latArmTeX: a System for Writing in Armenian
  with \TeX\ and \LaTeX)}}
\author{ ... }%
\date{1-u' hunisi 1999 th.}
 ...
\begin{document}
\maketitle
 ...
%\section{\sectAtitle}%{Nerac'uthyun}}
\pdfxBookmark{\section}{\sectAtitle}{Nerac'uthyun}
```

Figure 12: Enriched LaTeX source for the Armenian version of the ArmTeX manual, with added metadata demonstrating the ArmTeX transliteration scheme for OT6 encoding. Also shown is coding used to produce bookmarks from the transliteration.

- ▶ vnmxmp : Vietnamese; via LICRs \ABREVE, \OCIRCUMFLEX, \uhorn etc. and the combinations of multiple accents applied as usual via \', \`, \^, etc.

The LICRs include support mapping accented letters to precomposed glyphs, falling back on 'combining characters' only in unusual situations. Special input conventions or methods, such as transliteration schemes, are *not yet* supported. Indeed, these options are largely untested, so any difficulties encountered should be reported to the package authors. Requests to support

extra input methods or other language blocks should also be directed to the authors, along with pointers to where the desired input methods are fully described. Sample 'real-world' documents would be greatly appreciated.

4.2. L8U pseudo-encoding

To understand how pdfx handles the translation into UTF-8 of input that is not already in that format, we'll briefly discuss LaTeX's font-encoding mechanism, which is the basis for LICR macros [22, § 7.11]. As an example, consider the macro \textgamma representing the lowercase Greek letter γ. Various LaTeX packages declare this as LICR in different ways, for different purposes.

```
greek-fontenc/lgrenc.def:\DeclareTextSymbol{\textgamma}{LGR}{103}
tipa/t3enc.def:\DeclareTextSymbol\textgamma{T3}{71}              % Gamma
greek-fontenc/greek-euenc.def:\DeclareTextCommand{\textgamma}{\LastDeclaredEncoding}{îł}
hyperref/puenc.def:\DeclareTextCommand{\textgamma}{PU}{\83\263}%* U+03B3
ucs/data/uni-2.def:\uc@dclc{611}{tipa}{\textgamma}%
ucs/data/uni-3.def:\uc@dclc{947}{default}{\textgamma}%
```

Here the \uc@dclc commands associate UTF-8 input of Ux0263 (IPA small letter gamma) and Ux03B3 (Greek small letter gamma) internally with \textgamma, whereas the others deal with output formats[12]. In four of these examples there is a number, which refers to a position in an 'encoding vector' for the particular font used to place the character onto the printable page. For example LGR refers to greek fonts, encoded as explained in Section 4.1.3. IPA phonetics use the T3 encoding, so \textgamma refers to a character from a different Unicode block.

With two of these cases there is no specific font. For example, PU is used to create bookmark strings, and other PDF string inclusions, using \pdfstringdef from the hyperref package. With greek-euenc.def designed for XeTeX and LuaTeX, the encoding can be variable, with the output bytes being those for the UTF-8 encoding of γ, namely ^^ce^^b3, shown here as the T1-encoded pair îł. The term 'pseudo-encoding' has been coined by the LaTeX team. Although there is no actual font to determine the encoding, to an author there is essentially no difference in how corresponding macros can be used to get a character placed into an appropriate structure within the PDF.

Thus there are 4 output forms for this character, and we've not even considered how γ is used in mathematics! To handle these concurrently, one has internally-defined control-sequence names

```
\LGR\textgamma=\char"67       where 6 × 16 + 7 = 103
\T3\textgamma=\char"47        where 4 × 16 + 7 = 71
\PU\textgamma=\long macro:->\83\263
\L8U\textgamma=\long macro:->îł
```

where the 2nd '\' is part of the name[13]. The latter macro is explained below. To use the specific version of the macro, LaTeX maintains a 'font-encoding' parameter, set using \fontencoding{...} local to the surrounding environment grouping.

To the above declarations of \textgamma, to deal with conversion to UTF-8, the pdfx package adds the following declarations when the LGRxmp option is used.

[12] Whereas ucs.sty handles UTF-8 input, mapping it to LICRs, with pdfx.sty we need the reverse mapping into UTF-8, not just from LICRs but also from legacy 8-bit encodings and transliteration schemes.

[13] obtained using \csname LGR\string\textgamma\endcsname.

```
pdfx/l8ugrk.def:\DeclareTextCommand{\textgamma}{L8U}{Î±}
pdfx/l8ugrk.def:\DeclareTextCompositeCommand{\textLGRenc}{L8U}{\textgamma}{Î±}
pdfx/l8ugrk.def:\DeclareTextCompositeCommand{\textLGRenc}{L8U}{g}{Î±}
pdfx/l8ugrk.def:\DeclareTextCompositeCommand{\textLGRenc}{L8U}{^^e3}{Î±}
```

The pseudo-encoding name L8U indicates **L**ocal conversion into UTF-**8** **U**nicode, as required for metadata, using pdfx.sty. Currently this pseudo-encoding is used in one place only; during the interpretation of information supplied through the \jobname.xmpdata file. This happens as part of the pdfx package, *before* it uses xmpincl.sty. Such specificity justifies being called a 'Local' encoding. However, other tasks may emerge requiring on-the-fly conversion to UTF-8. In this case all the functionality of this pseudo-encoding could be shifted into a separate package, and the name changed to reflect this more general usage. Bookmarks from transliterated input, as described in Section 4.1.4, is possibly a sufficient reason to have a separate package. Another possibility is to generate on-the-fly creation of UTF-8 strings, to be sent to XeTEX or LuaTEX running as a slave process to generate images of string using OTF fonts, which pdfTEX currently cannot handle. The result would then be imported back into the running job as an image. The authors invite suggestions of how this L8U pseudo-encoding functionality can be put to good use.

Accented letters normally use (e.g., from t1enc.def)

```
\DeclareTextComposite{\`}{T1}{A}{192}
```

to get the pre-composed 'À', rather than a composite built from ` and 'A'. The last parameter is an index into a font; however the \DeclareTextCompositeCommand variant allows arbitrary coding as that final parameter, so can be the bytes for the UTF-8 representation of a character. In the above code lines, macros are defined as follows

```
\\L8U\textLGRenc-\textgamma=macro:->Î±
\\L8U\textLGRenc-g=macro:->Î±
\\L8U\textLGRenc-ã=macro:->Î±
```

where now the 2nd and 3rd (and perhaps 4th) '\' are part of the name[14]. This shows how the ascii letter 'g' is associated with the UTF-8 bytes for γ, and how the upper 8-bit character from ^^e3 can be similarly associated, as in ISO-8859-7 encoding.

All these associations come together in the 'parser' macro \textLGR which works as follows. Firstly, \textLGR is declared for L8U pseudo-encoding only, where it expands as follows.

```
\L8U\textLGR #1->\textgreekLGRstring {#1}
\L8U\textgreekLGRstring #1->\textgreekLGR@ii #1\@empty \@empty
\textgreekLGR@ii #1#2\@empty -> ...  coding to test what is in #2
 ...  \textLGRenc{#1}\@empty     if #2 is \@empty
 ...  \textLGRenc{#1}\textgreekLGR@i #2\@empty     if #2 has more tokens
\textgreekLGR@i #1->\textgreekLGR@ii #1
```

Thus \textLGRenc is called on each token in the argument of \textLGR. Now \textLGRenc, which is applicable only when L8U pseudo-encoding is in effect, has a default expansion of just passing the character through unchanged; *viz.*

```
\DeclareTextCommand{\textLGRenc}{L8U}[1]{#1}
```

but by using \DeclareTextCompositeCommand{\textLGRenc}{L8U}{...}{...}, alternate expansions apply with specific arguments, as shown above. In particular, that final argument

[14] obtained using \csname\string\LGR\string\textLGRenc-\string\textgamma\endcsname.

can include coding that 'looks ahead' to find the next character. This is used, for example, with diacritics in Greek, multi-letter sequences for Armenian letters, and other special cases related to ligatures and punctuation symbols. To illustrate this Figure 13 (below) follows the conversion of a specific word, given in the transliteration for Armenian (see Section 4.1.4). This conversion occurs using only TEX's macro-expansion ability. Some details relevant to this example are explained there.

Note how in Figure 13 the ArmTEX user macro `\armuh` gets aliased to an LICR called `\textarmuh`. Since `\armuh` is already defined, not as an LICR, it cannot be declared to be one without creating problems. Instead, within the environment grouping where `L8U` pseudo-encoding is specified, one uses `\let\armuh\textarmuh` within a 'rebinding' macro command `\LIIXUmaparmenianletters`[15] to get LICR functionality from user-commands.

```
\def\LIIXUmaparmenianletters{%
  \let\ArmTeX\textArmTeX
  \let\Armayb\textArmayb
  ...
  \let\armuh\textarmuh
  ...
   \def\armbf{}%
  ... }
```

As well as rebinding each command for a letter, the font style-switching commands are aliased to do nothing, as these are not relevant to creating UTF-8 output. Being localised by the `L8U` grouping, this causes no problem elsewhere within the document. These are similar to macros `\psdaliasnames` and `\psdmapshortnames` from `hyperref.sty`, which rebind user macros to LICRs, so that `PU` encoded versions of LICRs can be used.

Several other 'rebinding' commands are defined, mostly with package-loading options.

- `\LIIXUmapTeXnames` always defined
- `\LIIXUscriptcommands` handles `\textsuperscript`, `\textsubscript`, `\t`
- `\LIIXUtipacommands` handles IPA letters and symbols
- `\LIIXUmaparabicletters` with `arbxmp`
- `\LIIXUmaparmenianletters` with `armxmp` and `AR8xmp`
- `\LIIXUmapdevaccents` with `devxmp`
- `\LIIXUmapgreekletters` with `grkxmp` and `LGRxmp`
- `\LIIXUmaphebrewletters` with `hebxmp` and `HEBxmp`
- `\LIIXUmaplatinchars` and `\LIIXUcancelfontswitches` with `LATxmp`
- `\LIIXUmapmathletterlikes` always defined
- `\LIIXUmapmathspaces` always defined
- `\LIIXUmapmath...` with `mathxmp` — see Section 4.3 below.

It may well be that more macro names can be added to some of these commands, to allow macro usage within the metadata. Suggestions for such additions should be sent to the `pdfx` package authors, along with example documents. Similarly support for more languages can be requested.

[15] The start of the macro name is derived from pseudo-Roman numerals: IX = 9, IIX = 8

```
\textARM{Se\armuh van}
\textarmenARMstring {Se\armuh van}
\textarmenARM@ii Se\armuh  van\@empty \@empty
\textARMenc {S}\textarmenARM@i e\armuh  van\@empty \@empty
\arm@en{S}{Ő?}{\arm@nc{h}{Ő?}{\arm@nc{H}{Ő?}{Ő?}}}\textarmenARM@i e\armuh  van\@empty ...
\arm@nc{h}{Ő?}{\arm@nc{H}{Ő?}{Ő?}}\textarmenARM@i e\armuh  van\@empty \@empty
\arm@nc{H}{Ő?}{Ő?}\textarmenARM@i e\armuh  van\@empty \@empty
Ő?\textarmenARM@i e\armuh  van\@empty \@empty
Ő?\textARMenc {e}\textarmenARM@i \armuh  van\@empty \@empty
Ő?\textARMenc {e}\textarmenARM@i \armuh  van\@empty \@empty
Ő?\arm@en{e}{Ő„}{\arm@nc{'}{Ő§}{\arm@nc{v}{Ö?}{Ő„}}}\textarmenARM@i \armuh  van\@empty ...
Ő?\arm@nc{'}{Ő§}{\arm@nc{v}{Ö?}{Ő„}}\textarmenARM@i \armuh  van\@empty \@empty
Ő?\arm@nc{v}{Ö?}{Ő„}\textarmenARM@i \armuh  van\@empty \@empty
Ő?Ő„\textarmenARM@i \armuh  van\@empty \@empty
Ő?Ő„\textARMenc {\armuh }\textarmenARM@i  van\@empty \@empty
Ő?Ő„\textarmuh\textarmenARM@i  van\@empty \@empty
Ő?Ő„\\L8U\textarmuh-\textarmenARM@i  van\@empty \@empty
Ő?Ő„\textarmgobblespace  van\@empty \@empty
Ő?Ő„\\L8U\textarmgobblespace- van\@empty \@empty
Ő?Ő„\textarmenARM@i van\@empty \@empty
Ő?Ő„\textARMenc {v}\textarmenARM@i an\@empty \@empty
Ő?Ő„\arm@en{v}{ŐŸ}{\arm@nc{n}{ïŹ?}{ŐŸ}}\textarmenARM@i an\@empty \@empty
Ő?Ő„\arm@nc{n}{ïŹ?}{ŐŸ}\textarmenARM@i an\@empty \@empty
Ő?Ő„ŐŸ\textarmenARM@i an\@empty \@empty
Ő?Ő„ŐŸ\textARMenc {a}\textarmenARM@i n\@empty \@empty
Ő?Ő„ŐŸŐą\textarmenARM@i n\@empty \@empty
Ő?Ő„ŐŸŐą\textARMenc {n}\@empty
Ő?Ő„ŐŸŐąŐ¶\@empty
Ő?Ő„ŐŸŐąŐ¶
```

The macro `\armen@en` (named for **e**mpty or **n**ext), looks ahead to see if the 5th-next argument token is `\@empty`, signifying that there is nothing left of the original input. (A closed bracing `{...}` counts as a single argument.) If `\@empty` the tokens in the 2nd bracing are substituted, otherwise those in the 3rd bracing. Similarly `\armen@nc` (named for **n**ext **c**haracter) looks to see whether that 5th argument token matches with the character in the 1st bracing. If so, the 2nd bracing's tokens are substituted, else those of the 3rd bracing. This is how to cope with 'Sh' or 'SH', implemented as ligatures in an `OT6` encoded font, denoting a different letter from a single 'S'. The macro `\armuh` is used here to *prevent* a ligature from `ev` that would otherwise occur. One writes `e\armuh v` to get the separate letters. As the space becomes an active token, we need `\textarmgobblespace` to restart parsing appropriately. Of course `\textarmenARM@i` behaves like `\textgreekLGR@i` as explained earlier, with a test for `\@empty` as the 2nd token. At the end, any remaining `\@empty` expand into nothing.

Figure 13: Partial tracing of the conversion of an Armenian word, indicated by the red oval in Figure 11, from `OT6` transliterated form into UTF-8 bytes. In each line, TEX expansion occurs at the position of the left-most '\'. The resulting bytes are shown here in `T1` encoding, as in previous examples, with `?` indicating an invisible character in the byte range `0x80–0x9f`. See Figure 14 for how this source appears with UTF-8 encoding.

4.3. Nested Parsing — Mathematics in Metadata

Macro commands for many mathematical symbols can be used directly in metadata without extra support; e.g., basic arithmetic operations, letter-like symbols, spacing commands. Super-

```
\begin{decl}[]
|\textARM{Se\armuh van}|\\
|\textarmenARMstring {Se\armuh van}|\\
|\textarmenARM@ii Se\armuh  van\@empty \@empty|\\
|\textARMenc {S}\textarmenARM@i e\armuh  van\@empty \@empty|\\
|\arm@en{S}{U}{\arm@nc{h}{Շ}{\arm@nc{H}{Շ}{U}}}\textarmenARM@i e\armuh  van\@empty ...|\\
|\arm@nc{h}{Շ}{\arm@nc{H}{Շ}{U}}\textarmenARM@i e\armuh  van\@empty \@empty|\\
|\arm@nc{H}{Շ}{U}\textarmenARM@i e\armuh  van\@empty \@empty|\\
|U\textarmenARM@i e\armuh  van\@empty \@empty|\\
|U\textARMenc {e}\textarmenARM@i \armuh  van\@empty \@empty|\\
|U\textARMenc {e}\textarmenARM@i \armuh  van\@empty \@empty|\\
|U\arm@en{e}{ե}{\arm@nc{'}{է}{\arm@nc{v}{և}{ե}}}\textarmenARM@i \armuh  van\@empty ...|\\
|U\arm@nc{'}{է}{\arm@nc{v}{և}{ե}}\textarmenARM@i \armuh  van\@empty \@empty|\\
|U\arm@nc{v}{և}{ե}\textarmenARM@i \armuh  van\@empty \@empty|\\
|Uե\textarmenARM@i \armuh  van\@empty \@empty|\\
|Uե\textARMenc {\armuh }\textarmenARM@i  van\@empty \@empty|\\
|Uե\textarmuh\textarmenARM@i  van\@empty \@empty|\\
|Uե\\L8U\textarmuh-\textarmenARM@i  van\@empty \@empty|\\
|Uե\textarmgobblespace  van\@empty \@empty|\\
|Uե\\L8U\textarmgobblespace- van\@empty \@empty|\\
|Uե\textarmenARM@i van\@empty \@empty|\\
|Uե\textARMenc {v}\textarmenARM@i an\@empty \@empty|\\
|Uե\arm@en{v}{վ}{\arm@nc{n}{փ}{վ}}\textarmenARM@i an\@empty \@empty|\\
|Uե\arm@nc{n}{փ}{վ}\textarmenARM@i an\@empty \@empty|\\
|Uեվ\textarmenARM@i an\@empty \@empty|\\
|Uեվ\textARMenc {a}\textarmenARM@i n\@empty \@empty|\\
|Uեվա\textarmenARM@i n\@empty \@empty|\\
|Uեվա\textARMenc {n}\@empty|\\
|Uեվան\@empty|\\
|Uեվան|
\end{decl}
```

Figure 14: Image of part of the source coding for Figure 13, viewed as UTF-8 encoded, within editing software.

and subscripted letters and numerals can use `\textsuperscript` and `\textsubscript` when there is an appropriate Unicode character (digits, comma, +/−/=, parentheses, many letters but not all).

When the `mathxmp` loading option is specified, many more symbols become available, using 'rebinding' macros. These are necessary, as the macros for mathematical symbols are generally *not* defined as LICRs, but use `\mathchar`. Thus new LICRs are needed, and existing names bound to these.

`\LIIXUmapmathaccents` using 'combining' characters from Unicode ranges at `Ux0300`, `Ux1DC0`, `Ux20D0`
`\LIIXUmapisomathgreek` using `Ux0391–Ux03F8` for greek symbols
`\LIIXUmapmatharrowsA` supporting symbols in the `Ux2190–Ux21FF` block
`\LIIXUmapmathoperatorsA` supporting symbols in the `Ux2200–Ux227F` block
`\LIIXUmapmathoperatorsB` supporting symbols in the `Ux2280–Ux22FF` block
`\LIIXUmapmiscmathsymbolsA` supporting some symbols in the `Ux27C0–Ux27EF` range
`\LIIXUmapsupparrowsA` supporting some symbols in the `Ux27F0–Ux27FF` block
`\LIIXUmapsupparrowsB` supporting some symbols in the `Ux2900`-â??`Ux297F` block
`\LIIXUmapmiscmathsymbolsB` supporting symbols in the `Ux2980–Ux29FF` block
`\LIIXUmapsuppmathoperators` supporting symbols in the `Ux2A00–Ux2AFF` block
`\LIIXUmapunimathgreek` using `Ux1D6E2–Ux1D71B` for greek symbols
`\LIIXUmapmathalphabets` allows access to symbols in the `Ux1D400–Ux1D755` block

The 'parser' macro idea can extends to handle a large class of mathematical expressions.

```
\let\(\textinlinemath
\DeclareTextCommand{\textinlinemath}{L8U}{\liixu@getinlinemath}
\def\liixu@getinlinemath#1\){\space\textmathnormalstring{#1}\space}
\DeclareTextCommand{\textmathnormalstring}{L8U}[1]{\textmathnormal@ii#1\@empty\@empty}
\textmathnormal@ii #1#2\@empty -> ...  coding to test what is in #2
 ...  \textmathnormal{#1}\@empty     if #2 is \@empty
 ...  \textmathnormal{#1}\textmathnormal@i #2\@empty     if #2 has more tokens
\let\[\textdisplaymath defined similarly to call \textmathnormalstring
```

This allows `\textmathnormal` to test each token, in particular mapping letters A–Za–z into the Unicode range `Ux1D44E–Ux1D467` (except for h). Mathematical styles, such as `\mathrm`, `\mathbf`, `\mathbb` etc. can now be handled using declarations such as:

```
\Dec...positeCommand{\textmathnormal}{L8U}{\mathrm}{\liixu@mathreorder\textmathrmstring}
\Dec...positeCommand{\textmathnormal}{L8U}{\mathbf}{\liixu@mathreorder\textmathbfstring}
```

where `\liixu@mathreorder` uses some TEX pattern-matching to allow the `\textmathrmstring` parser macro to work on the argument to `\mathrm` before allowing `\textmathnormal` parsing to continue afterwards. We refer to this as 'nested parsing'.

Similarly 'nested parsing' can be used with superscripts and subscripts using `^{...}` and `_{...}` and to specify linebreaks, and even super-/subscripts within styles; viz.

```
\Declar...CompositeCommand{\textmathnormal}{L8U}{^}{\liixu@mathreorder\textsuperstring}
\DeclareTextCompositeCommand{\textmathnormal}{L8U}{_}{\liixu@mathreorder\textsubstring}
\DeclareTextCompositeCommand{\textmathnormal}{L8U}{\\}{\textLF}
\DeclareTextCompositeCommand{\textmathnormal}{L8U}{\cr}{\textLF}
\DeclareTextCompositeCommand{\textmathrm}{L8U}{^}{\liixu@mathreorder\textsuperstring}
\DeclareTextCompositeCommand{\textmathrm}{L8U}{_}{\liixu@mathreorder\textsubstring}
```

Such 'nested parsing' seems to be quite robust[16], but a great deal more testing is required to uncover cases which may require special handling. An ultimate aim is to be able to just copy the LATEX source for the 'Abstract' of a technical paper into the `\Subject{...}` field of the `.xmpdata` file, with a large expectation that it will 'just work', or need only trivial edits to make it so.

4.4. Metadata in a Production Workflow

At Macquarie University, the Mathematics Department produces personalised topmatter or coversheets for student assignments and tutorial papers using LATEX, incorporating information that has been stored in a database. This is done by writing extra definitions at the top of a copy of the LATEX source as prepared by the lecturers. For example information analogous to the following

[16] ... so far, barring multi-line aligned environments.

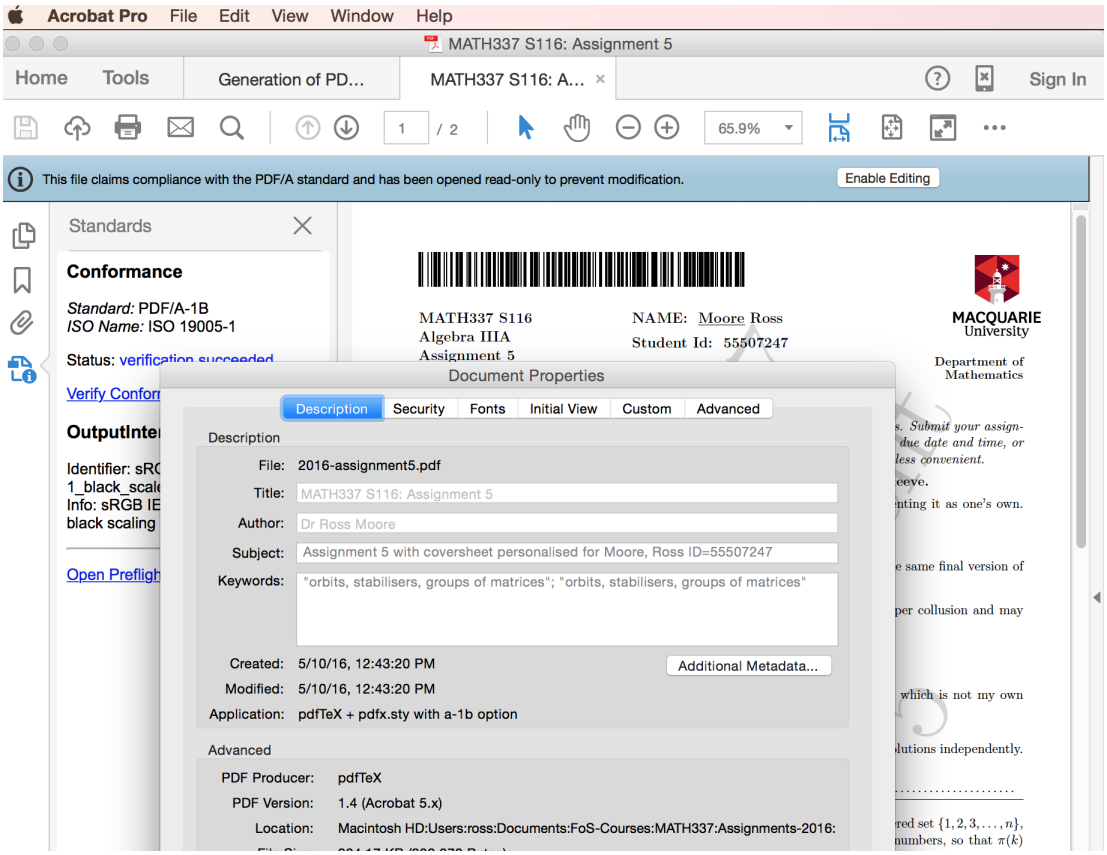

Figure 15: Metadata from student assignment papers, using information drawn from a database. The start of the LaTeX coding for this example is shown in Figure 16.

```
\def\thestudentname{\utext{Moore} Ross}
\def\thestudentid{55507247}
\def\theunitcode{MATH337}
\def\theoffering{S116}
\def\thetaskname{Assignment 5}
\def\theassignmentnumber{5}
\def\theduedate{09/05 2016}
...
```

is prepended to the file shown in Figure 16, for each student downloading their personalised assignment paper. The LaTeX source makes use of this information, including recording some of it within the Metadata. When preparing such documents LaTeX's `\providecommand` is used to supply default values, not drawn from the database; but when actually used, these are ignored as the required information has been supplied using TeX's `\def` command. The resulting metadata is as in Figure 15, showing also how the information is displayed at the top of the PDF file that is produced. Notice how a command `\utext` is included to obtain the underlining of the surname within the produced PDF. This is modified, using `\pdfxEnableCommands` in the `\jobname.xmpdata` file, to just place a comma after the surname in the metadata, as it precedes the given name.

```
\providecommand{\theassignmentnumber}{5}
\providecommand{\assignLecturer}{Dr Ross Moore}
\providecommand{\theunitcode}{MATH337}
\providecommand{\theunitname}{Algebra IIIA}
\providecommand{\theyear}{2016}
...
\def\assigntopics{orbits, stabilisers, groups of matrices}
\providecommand{\pdfxopts}{a-1b}
%% XMP metadata for PDF/A conformance
\begin{filecontents*}{\jobname.xmpdata}
\Title{\theunitcode\ \theoffering: Assignment \theassignmentnumber}
\Author{\assignLecturer}
\Copyright{Macquarie University, Mathematics Department}
\Subject{Assignment \theassignmentnumber, with coversheet personalised for \thestudentname,
    id = \thestudentid}
\Keywords{\assigntopics}
\Creator{pdfTeX + pdfx.sty with \pdfxopts\space option}
\pdfxEnableCommands{\def\utext#1{#1,}}
\end{filecontents*}

\documentclass[a4paper,11pt]{article}
\RequirePackage{assignments}
\usepackage[\pdfxopts]{pdfx}
```

Figure 16: Start of the LaTeX source for an assignment paper, using macro expansion values supplied via definitions prepended to this file.

Another way that jobs can be customised using essentially the same LaTeX source, is via the command used to initiate the job. For example the file `sample.tex`, accompanying the `pdfx` distribution, can be used to test the loading options to create PDFs conforming to the various flavours of PDF/A, PDF/E and PDF/X. Consider a shell script containing the following (Unix/Linux) commands.

```
pdflatex "\def\pdfxopt{a-2b}\input sample.tex"
pdflatex "\def\pdfxopt{a-2b}\input sample.tex"
mv sample.pdf sample-a2b.pdf

pdflatex "\def\pdfxopt{a-2u}\input sample.tex"
pdflatex "\def\pdfxopt{a-2u}\input sample.tex"
mv sample.pdf sample-a2u.pdf
...
```

With a 3-line block for each flavour, this produces a corresponding PDF from the same LaTeX source, named according to each particular variant. A default `\providecommand{\pdfxopt}{a-1b}` at the start of `sample.tex` catches the case of normal typesetting, doing nothing when `\pdfxopt` already has an expansion value.

4.5. Further Developments

Prospects for further development of the `pdfx` package are as follows, listed not necessarily in order of perceived importance.

- Support for the `dvips` driver with Ghostscript as PDF producer; possible since `gs v9.21`.
- Separate the `L8U` pseudo-encoding support into a separate package.

- Conformance to multiple PDF standards; e.g. both PDF/A and PDF/E, both PDF/A and PDF/X with RGB or CMYK color profile, other combinations.
- Explore delaying the processing of metadata until `\begin{document}`, thereby allowing some fields to be set automatically from other information supplied within the document preamble.
- Support for input using other legacy 8-bit encodings and transliterations.
- Support for more mathematical environments within the metadata.
- Support for more PRISM metadata fields, incl. PRISM 3.0 [26].
- Explore ways to overcome incompatibilities that may arise with other packages.
- Full support for PDF/VT; in particular, transparency groups and PDF/VT-2s.
- Support for more aspects of PDF/UA and 'Tagged PDF'.
- Develop ways to usefully use `L8U` apart from metadata and bookmarks.
- Support emerging standards based on PDF 2.0 [21].

5. Bibliography

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Revised as ISO 14289-1:2014 (December 2014): http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=64599.
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PDF/E: https://en.wikipedia.org/wiki/PDF/E
PDF/VT: https://en.wikipedia.org/wiki/PDF/VT
PDF/UA: https://en.wikipedia.org/wiki/PDF/UA
PDF/X: https://en.wikipedia.org/wiki/PDF/X

6. Implementation

```
\@ifpackageloaded{pdfxmult}{%
 \PackageError{pdfx}%
  {^^JThis package may not be used in conjunction with the \space
   pdfxmult \space package}%
  {Type \space x <return> \space to exit; or just \space <return> \space
```

```
   to continue without this package.}%
 \expandafter\let\csname opt@pdfx.sty\endcsname\@empty\endinput
}{}%
\NeedsTeXFormat{LaTeX2e}
\ProvidesPackage{pdfx}
  [2019/02/27 v1.6.3 PDF/X and PDF/A support (CVR/HTH/RRM/PS)]

\newif\ifpdfx@noBOM \pdfx@noBOMfalse   % use a BOM in the XMP packet
\newif\ifpdfx@x \pdfx@xfalse   % PDF/X mode
\newif\ifpdfx@e \pdfx@efalse   % PDF/E mode; not fully implemented yet
\newif\ifpdfx@ua\pdfx@uafalse   % PDF/UA mode; not fully implemented yet
\newif\ifpdfx@vt \pdfx@vtfalse   % PDF/VT mode, extension of  PDF/X
\newif\ifno@iccprofile   % used with PDF/X-4p and PDF/X-5pg
\newif\ifpdfx@noerr   % error messages become just warnings
\newif\ifpdfx@omitcharset % used with  pdfomitcharset  primitive

\DeclareOption{noerr}{\pdfx@noerrtrue}

%% Not all combinations of the following parameters are meaningful.
\def\xmp@Part{1}               % PDF/A part: 1, 2, or 3
\def\xmp@Conformance{B}        % Conformance level: A, B, or U
\def\xmp@ReleaseDate{2005}     % 2001 for PDF/X-1, 2005 for PDF/A-1,
                               % 2010 for PDF/A-2, 2012 for PDF/A-3.

\newcount\pdfx@minorversion
\expandafter\ifx\csname pdfminorversion\endcsname\relax
\else
 \global\pdfx@minorversion=\the\pdfminorversion
\fi

\def\pdfx@ErrorWarning#1#2#3#4{%
 \ifpdfx@noerr \PackageWarning{pdfx}{#1.^^J  #2#3.^^J}%
 \else \PackageError{pdfx}{#1}{#2#4.^^J
    Use option 'noerr' to avoid this message.^^J}%
 \fi}

\def\pdfx@Xvn@message{%
 \pdfx@ErrorWarning{PDF/X-5n has no default profile}%
   {Provide your own}{; continuing to build a non-valid document}%
   {, else continue to build a non-valid document}%
}

%%  support  pdfomitcharset  primitive, added to pdfTeX in 2019
\DeclareOption{nocharset}{\pdfx@omitcharsettrue}
\DeclareOption{usecharset}{\pdfx@omitcharsetfalse}

%% PDF/A options
%%  default is to create  PDF/A-1b
%%  options can change this for PDF/X or higher levels of PDF/A
\DeclareOption{a-1a}{\global\pdfx@xfalse\def\xmp@Part{1}%
 \def\xmp@Conformance{A}\def\xmp@ReleaseDate{2005}%
 \pdfx@omitcharsetfalse}
```

```
\DeclareOption{a-1b}{\global\pdfx@xfalse\def\xmp@Part{1}%
 \def\xmp@Conformance{B}\def\xmp@ReleaseDate{2005}%
 \pdfx@omitcharsetfalse}
\DeclareOption{a-2a}{\global\pdfx@xfalse\def\xmp@Part{2}%
 \def\xmp@Conformance{A}\def\xmp@ReleaseDate{2010}%
 \pdfx@omitcharsettrue}
\DeclareOption{a-2b}{\global\pdfx@xfalse\def\xmp@Part{2}%
 \def\xmp@Conformance{B}\def\xmp@ReleaseDate{2010}%
 \pdfx@omitcharsettrue}
\DeclareOption{a-2u}{\global\pdfx@xfalse\def\xmp@Part{2}%
 \def\xmp@Conformance{U}\def\xmp@ReleaseDate{2010}%
 \pdfx@omitcharsettrue}
\DeclareOption{a-3a}{\global\pdfx@xfalse\def\xmp@Part{3}%
 \def\xmp@Conformance{A}\def\xmp@ReleaseDate{2012}%
 \pdfx@omitcharsettrue}
\DeclareOption{a-3b}{\global\pdfx@xfalse\def\xmp@Part{3}%
 \def\xmp@Conformance{B}\def\xmp@ReleaseDate{2012}%
 \pdfx@omitcharsettrue}
\DeclareOption{a-3u}{\global\pdfx@xfalse\def\xmp@Part{3}%
 \def\xmp@Conformance{U}\def\xmp@ReleaseDate{2012}%
 \pdfx@omitcharsettrue}
%%
%% PDF/X options
%% comments added, using
%% https://www.eci.org/_media/downloads/pdfx/pdfx_faq_english_nov05.pdf
%% https://en.wikipedia.org/wiki/PDF/X#List_of_the_PDF.2FX_standards
%%
\DeclareOption{x-1}{\global\pdfx@xtrue\def\xmp@Part{1}%  obsolete
 \def\xmp@Conformance{a}\def\xmp@ReleaseDate{1999}% CMYK only
 \global\pdfx@minorversion=2\relax
 \pdfx@ErrorWarning{PDF/X-1:1999 is no longer an accepted standard}%
    {Use option  x-1a1 or  x-1a3 }{; continuing to build a non-valid document}%
    {, else continue to build a non-valid document.}%
 }%  effectively same as  x-1a1
\DeclareOption{x-1a}{\global\pdfx@xtrue\def\xmp@Part{1}% CMYK only
 \def\xmp@Conformance{a}\def\xmp@ReleaseDate{2003}%
 \global\pdfx@minorversion=3 }%  same as  x-1a3
\DeclareOption{x-1a1}{\global\pdfx@xtrue\def\xmp@Part{1}%
 \def\xmp@Conformance{a}\def\xmp@ReleaseDate{2001}%  ISO 15930-1:2001
 \global\pdfx@minorversion=3 }
\DeclareOption{x-1a3}{\global\pdfx@xtrue\def\xmp@Part{1}%
 \def\xmp@Conformance{a}\def\xmp@ReleaseDate{2003}%  ISO 15930-4:2003
 \global\pdfx@minorversion=3 }
\DeclareOption{x-2}{\global\pdfx@xtrue\def\xmp@Part{2}%  XMP Metadata
%% \def\xmp@Conformance{}\def\xmp@ReleaseDate{2002}%  ISO 15930-2:2003
 \def\xmp@Conformance{}\def\xmp@ReleaseDate{2003}%  ISO 15930-5, withdrawn 2011
 \global\pdfx@minorversion=4\relax
 \pdfx@ErrorWarning{PDF/X-2:2003 was never published as a standard}%
   {Use option  x-1a or  x-3 }{; continuing to build a non-valid document}%
   {, else continue to build a non-valid document}%
 }%  external OPI workflow, i.e. multiple files involved
\DeclareOption{x-3}{\global\pdfx@xtrue\def\xmp@Part{3}% RGB allowed, but rare!
```

```
\def\xmp@Conformance{}\def\xmp@ReleaseDate{2003}%
 \global\pdfx@minorversion=4 }%  same as x-303
\DeclareOption{x-302}{\global\pdfx@xtrue\def\xmp@Part{3}%
 \def\xmp@Conformance{}\def\xmp@ReleaseDate{2002}%   ISO 15930-3:2002
 \global\pdfx@minorversion=3 }
\DeclareOption{x-303}{\global\pdfx@xtrue\def\xmp@Part{3}%
 \def\xmp@Conformance{}\def\xmp@ReleaseDate{2003}%  ISO 15930-6:2003
 \global\pdfx@minorversion=4 }
%%%  Later versions, yet to be fully implemented
\DeclareOption{x-4}{\global\pdfx@xtrue\def\xmp@Part{4}%
 \def\xmp@Conformance{}\def\xmp@ReleaseDate{2010}%  ISO 15930-7:2010
 \global\pdfx@minorversion=6 }%  same as  x-410
\DeclareOption{x-4p}{\global\pdfx@xtrue\global\no@iccprofiletrue
  \def\xmp@Part{4}\def\xmp@Conformance{p}\def\xmp@ReleaseDate{2010}%
  \global\pdfx@minorversion=6 }%  same as  x-4p10
\DeclareOption{x-408}{\global\pdfx@xtrue\def\xmp@Part{4}%
 \def\xmp@Conformance{}\def\xmp@ReleaseDate{2008}%  ISO 15930-7:2008
 \global\pdfx@minorversion=6 }
\DeclareOption{x-410}{\global\pdfx@xtrue\def\xmp@Part{4}%
 \def\xmp@Conformance{}\def\xmp@ReleaseDate{2010}%  ISO 15930-7:2010
 \global\pdfx@minorversion=6 }
\DeclareOption{x-4p08}{\global\pdfx@xtrue\global\no@iccprofiletrue
  \def\xmp@Part{4}\def\xmp@Conformance{p}\def\xmp@ReleaseDate{2008}%
  \global\pdfx@minorversion=6 }%   ISO 15930-7:2010
\DeclareOption{x-4p10}{\global\pdfx@xtrue\global\no@iccprofiletrue
  \def\xmp@Part{4}\def\xmp@Conformance{p}\def\xmp@ReleaseDate{2010}%
  \global\pdfx@minorversion=6 }%   ISO 15930-7:2010
\DeclareOption{x-5}{\global\pdfx@xtrue\def\xmp@Part{5}%
 \def\xmp@Conformance{g}\def\xmp@ReleaseDate{2008}%
 \global\pdfx@minorversion=6 }%   ISO 15930-8:2010
\DeclareOption{x-5g}{\global\pdfx@xtrue\def\xmp@Part{5}%
 \def\xmp@Conformance{g}\def\xmp@ReleaseDate{2008}%
 \global\pdfx@minorversion=6 }%   ISO 15930-8:2010
\DeclareOption{x-5n}{\global\pdfx@xtrue %\global\no@iccprofiletrue
 \def\xmp@Part{5}\def\xmp@Conformance{n}\def\xmp@ReleaseDate{2010}%
 \global\pdfx@minorversion=6 \pdfx@Xvn@message}%   ISO 15930-8:2010
\DeclareOption{x-5pg}{\global\pdfx@xtrue\global\no@iccprofiletrue
  \def\xmp@Part{5}\def\xmp@Conformance{pg}\def\xmp@ReleaseDate{2010}%
  \global\pdfx@minorversion=6 }%  ISO 15930-8:2010
\DeclareOption{x-508}{\global\pdfx@xtrue\def\xmp@Part{5}%
 \def\xmp@Conformance{g}\def\xmp@ReleaseDate{2008}%
 \global\pdfx@minorversion=6 }%   ISO 15930-8:2008
\DeclareOption{x-5g08}{\global\pdfx@xtrue\def\xmp@Part{5}%
 \def\xmp@Conformance{g}\def\xmp@ReleaseDate{2008}%
 \global\pdfx@minorversion=6 }%   ISO 15930-8:2008
\DeclareOption{x-5n08}{\global\pdfx@xtrue %\global\no@iccprofiletrue
 \def\xmp@Part{5}\def\xmp@Conformance{n}\def\xmp@ReleaseDate{2008}%
 \global\pdfx@minorversion=6 \pdfx@Xvn@message}%   ISO 15930-8:2008
\DeclareOption{x-5pg08}{\global\pdfx@xtrue\global\no@iccprofiletrue
  \def\xmp@Part{5}\def\xmp@Conformance{pg}\def\xmp@ReleaseDate{2008}%
  \global\pdfx@minorversion=6 }%  ISO 15930-8:2008
\DeclareOption{x-510}{\global\pdfx@xtrue\def\xmp@Part{5}%
```

```
\def\xmp@Conformance{g}\def\xmp@ReleaseDate{2010}%
 \global\pdfx@minorversion=6 }%  ISO 15930-8:2010
\DeclareOption{x-5g10}{\global\pdfx@xtrue\def\xmp@Part{5}%
 \def\xmp@Conformance{g}\def\xmp@ReleaseDate{2010}%
 \global\pdfx@minorversion=6 }%  ISO 15930-8:2010
\DeclareOption{x-5n10}{\global\pdfx@xtrue %\global\no@iccprofiletrue
 \def\xmp@Part{5}\def\xmp@Conformance{n}\def\xmp@ReleaseDate{2010}%
 \global\pdfx@minorversion=6 \pdfx@Xvn@message}%  ISO 15930-8:2010
\DeclareOption{x-5pg10}{\global\pdfx@xtrue\global\no@iccprofiletrue
  \def\xmp@Part{5}\def\xmp@Conformance{pg}\def\xmp@ReleaseDate{2010}%
  \global\pdfx@minorversion=6 }%  ISO 15930-8:2010
%%
%% PDF/E options
%%
\DeclareOption{e}{\global\pdfx@xfalse\global\pdfx@etrue
  \def\xmp@Part{1}\def\xmp@Conformance{}\def\xmp@ReleaseDate{2008}%
  \gdef\thepdfminorversion{6}%   same as  e-1
  }
\DeclareOption{e-1}{\global\pdfx@xfalse\global\pdfx@etrue
  \def\xmp@Part{1}\def\xmp@Conformance{}\def\xmp@ReleaseDate{2008}%
  \gdef\thepdfminorversion{6}%  ISO 24517-1:2008
  }
%% PDF/UA options
%%
\let\xmp@PDFUA\@empty
\DeclareOption{ua}{\global\pdfx@uatrue % ISO 14289-1:2012, 2014
  \def\xmp@UAlevel{1}\let\xmp@PDFUA\relax}%   same as  ua-1
\DeclareOption{ua-1}{\global\pdfx@uatrue % ISO 14289-1:2012, 2014
  \def\xmp@UAlevel{1}\let\xmp@PDFUA\relax}
%%
%% PDF/VT options
%%
\DeclareOption{vt-1}{\global\pdfx@xtrue\global\pdfx@vttrue
  \def\xmp@Part{4}\def\xmp@vtPart{1}\def\xmp@Conformance{}%
  \def\xmp@vtConformance{}\def\xmp@ReleaseDate{2010}%
  \gdef\xmpMM@VersionID{1}%
  \global\pdfx@minorversion=6 }
\DeclareOption{vt-2}{\global\pdfx@xtrue\global\pdfx@vttrue
  \global\no@iccprofiletrue   \gdef\xmpMM@VersionID{1}%
  \def\xmp@Part{5}\def\xmp@vtPart{2}\def\xmp@Conformance{pg}%
  \def\xmp@vtConformance{}\def\xmp@ReleaseDate{2010}%
  \global\pdfx@minorversion=6 }
\DeclareOption{vt-2s}{\global\pdfx@xtrue\global\pdfx@vttrue
  \global\no@iccprofiletrue   \gdef\xmpMM@VersionID{1}%
  \def\xmp@Part{5}\def\xmp@vtPart{2}\def\xmp@Conformance{pg}%
  \def\xmp@vtConformance{s}\def\xmp@ReleaseDate{2010}%
  \global\pdfx@minorversion=6 }

%% options to alter PDF minor version, in case needed in special circumstances
\DeclareOption{pdf12}{\global\pdfx@minorversion=2 }%  1999
\DeclareOption{pdf13}{\global\pdfx@minorversion=3 }%  2001  Acrobat 4 (ISBN 0-201-61588-6)
\DeclareOption{pdf14}{\global\pdfx@minorversion=4 }%  2003  Acrobat 5 (ISBN 0-201-75839-3)
```

```
\DeclareOption{pdf15}{\global\pdfx@minorversion=5 }%  2005  Acrobat 6
\DeclareOption{pdf16}{\global\pdfx@minorversion=6 }%  2006  Acrobat 7 (ISBN 0-321-30474-8)
\DeclareOption{pdf17}{\global\pdfx@minorversion=7 }%  2008  ISO 32000-1:2008

%% inhibits writing the XMP byte-order marker
\DeclareOption{noBOM}{\pdfx@noBOMtrue}
\DeclareOption{useBOM}{\pdfx@noBOMfalse}

%% options for language character macros in XMP metadata
\newif\ifcyrxmp
\newif\ifcyrKOIxmp
\newif\ifgrkxmp
\newif\ifgrkLGRxmp
\newif\ifhebxmp
\newif\ifhebHEBxmp
\newif\ifarbxmp
\newif\ifarmxmp
\newif\ifarmSCIxmp
\newif\ifdevxmp
\newif\ifvnmxmp
\newif\iflatEXTxmp
\newif\iflatLATxmp
\newif\ifipaxmp
\newif\ifmathxmp

\DeclareOption{latxmp}{\global\latEXTxmptrue}
\DeclareOption{LATxmp}{\global\latLATxmptrue\global\latEXTxmptrue}
\DeclareOption{cyrxmp}{\global\cyrxmptrue}
\DeclareOption{KOIxmp}{\global\cyrKOIxmptrue\global\cyrxmptrue}
\DeclareOption{grkxmp}{\global\grkxmptrue}
\DeclareOption{LGRxmp}{\global\grkLGRxmptrue\global\grkxmptrue}
\DeclareOption{hebxmp}{\global\hebxmptrue}
\DeclareOption{HEBxmp}{\global\hebHEBxmptrue\global\hebxmptrue}
\DeclareOption{arbxmp}{\global\arbxmptrue}
\DeclareOption{armxmp}{\global\armxmptrue}
\DeclareOption{AR8xmp}{\global\armSCIxmptrue\global\armxmptrue}
\DeclareOption{devxmp}{\global\devxmptrue}
\DeclareOption{vnmxmp}{\global\vnmxmptrue}
\DeclareOption{ipaxmp}{\global\ipaxmptrue\global\latEXTxmptrue}
\DeclareOption{mathxmp}{\global\mathxmptrue\global\grkxmptrue}

%% all the above
\DeclareOption{allxmp}{%
 \global\cyrxmptrue
 \global\cyrKOIxmptrue
 \global\grkxmptrue
 \global\grkLGRxmptrue
 \global\hebxmptrue
 \global\hebHEBxmptrue
 \global\arbxmptrue
 \global\armxmptrue
 \global\armSCIxmptrue
```

```
\global\devxmptrue
\global\vnmxmptrue
\global\latEXTxmptrue
\global\latLATxmptrue
\global\vnmxmptrue
\global\ipaxmptrue
\global\mathxmptrue
\global\let\pdfx@useactivespacestrue\pdfx@useactivespacesfalse
}

\newif\ifpdfx@useactivespaces

\ExecuteOptions{noBOM,a-1b}
\ProcessOptions

\ifpdfx@ua\ifpdfx@x\else
 \expandafter\if\xmp@Conformance A\else
 \pdfx@ErrorWarning{PDF/UA requires 'Tagged PDF' for any structure.^^J
  Then PDF/A Conformance must be 'a'}%
  {Use option 'a-\xmp@Part a'}%
  {; continuing with a likely invalid document}%
  {, or continue for a likely invalid document}%
%%%  \gdef\xmp@Conformance{A}%   do we want this?
\fi\fi\fi

\expandafter\ifx\csname pdflastobj\endcsname\relax
\else
 \ifnum\pdflastobj >\z@ % pdftex  has already written objects
  \ifnum\pdfx@minorversion=\pdfminorversion\else
   \PackageError{pdfx}%
    {^^J(pdfx)    Cannot change the \string\pdfminorversion^^J%
     (pdfx)   PDF version remains at 1.\the\pdfminorversion.^^J%
     (pdfx)   Use \string\pdfminorversion=\the\pdfx@minorversion\space
      before \string\documentclass}%
   {(pdfx)  Another package or document-class has written objects into the PDF.^^J%
     (pdfx)   Hit return to continue with PDF version 1.\the\pdfminorversion.%
    }%
   \global\pdfx@minorversion=\the\pdfminorversion
  \fi
 \else
  \global\pdfminorversion\pdfx@minorversion
 \fi
\fi

\expandafter\ifx\csname thepdfminorversion\endcsname\relax
 \expandafter\ifx\csname pdfminorversion\endcsname\relax
 \else
  \xdef\thepdfminorversion{\the\pdfminorversion}
\fi\fi

\expandafter\ifx\csname pdfminorversion\endcsname\relax
 \gdef\thepdfminorversion{4}% assumed with XeTeX
```

```
\def\pdf@minorversion@xetex=#1{\gdef\thepdfminorversion{#1}}%
\let\pdfminorversion\pdf@minorversion@xetex
\else
 \ifnum\pdfminorversion < 4\relax
  \ifpdfx@x
    % more testing needed with PDF/X
  \else
   \pdfminorversion=4\relax %  assumed for PDF/A ;  options may change this for  PDF/X
   \gdef\thepdfminorversion{4}%
  \fi
 \else
  \ifnum\pdfminorversion<\thepdfminorversion\relax
   \global\pdfminorversion=\thepdfminorversion\relax
  \fi
 \fi
\fi
\expandafter\ifx\csname pdfresetpageorigin\endcsname\relax\else
 \pdfresetpageorigin=0
\fi

\expandafter\ifx\csname pdfomitcharset\endcsname\relax\else
 \ifpdfx@omitcharset
  \pdfomitcharset = 1 %
  %%  do not create /Charset listings of font glyphs;
  %%  optional for PDF/A-2,3 and PDF 2.x
 \else
  \pdfomitcharset = 0 %
  %%  create the /Charset listings of font glyphs, required with PDF/A-1
 \fi
\fi

\newif\ifpdfx@nopdfinfo
\ifmathxmp\pdfx@nopdfinfotrue
\else
 \iflatLATxmp\pdfx@nopdfinfotrue
\else
 \ifgrkLGRxmp\pdfx@nopdfinfotrue
\else
 \ifhebHEBxmp\pdfx@nopdfinfotrue
\else
 \ifcyrKOIxmp\pdfx@nopdfinfotrue
\else
 \ifarmSCIxmp\pdfx@nopdfinfotrue
\fi\fi\fi\fi\fi\fi

\iflatLATxmp\pdfx@useactivespacestrue\fi
\ifgrkLGRxmp\pdfx@useactivespacestrue\fi
\ifhebHEBxmp\pdfx@useactivespacestrue\fi
\ifcyrKOIxmp\pdfx@useactivespacestrue\fi
\ifarmSCIxmp\pdfx@useactivespacestrue\fi

\newif\ifpdfx@transliterated
```

```
\ifgrkLGRxmp\pdfx@transliteratedtrue\fi
\ifhebHEBxmp\pdfx@transliteratedtrue\fi
\ifarmSCIxmp\pdfx@transliteratedtrue\fi

\RequirePackage{iftex}
\RequirePackage{ifpdf}
%% Support for pdfTeX primitives when using XeTeX:
\RequirePackage{ifxetex}
\ifxetex
 \def\pdfx@pages@xetex#1{\special{pdf:put @pages <<#1>>}}
 \def\pdfx@pageattr@xetex#1{\special{pdf:put @thispage <<#1>>}}
 \def\pdfx@docinfo@xetex#1{\special{pdf:put @docinfo <<#1>>}}
 \def\pdfx@catalog@xetex#1{\special{pdf:put @catalog <<#1>>}}
 \def\pdfx@mapline@xetex#1{\special{pdf:mapline #1}}%% does this work ??
%% \def\pdfx@mapline@xetex#1{}
 \def\pdf@compress@xetex=#1{}
%%
 \let\pdfpagesattr\pdfx@pages@xetex
 \let\pdfinfo\pdfx@docinfo@xetex
 \let\pdfcatalog\pdfx@catalog@xetex
 \let\pdfmapline\pdfx@mapline@xetex
 \let\pdfcompresslevel\pdf@compress@xetex
 \let\pdfobjcompresslevel\pdf@compress@xetex
\fi

%%\newif\ifpdfx@pdfmark  %  control future support for  dvips

\RequirePackage{everyshi}
\RequirePackage{ifluatex}
\ifluatex
 \IfFileExists{luatex85.sty}{% 2016+
  \RequirePackage{luatex85}%
  \edef\pdfcreationdate{\pdfcreationdate}%
 }{%  earlier versions
 }%
 \RequirePackage{pdftexcmds}%
 \let\pdfx@mdfivesum\pdf@mdfivesum
 \let\pdfescapestring\pdf@escapestring
\else
 \ifxetex
  \expandafter\ifx\csname mdfivesum\endcsname\relax
   %  too early a version of  XeTeX
   \let\pdfx@mdfivesum\relax
  \else
   %  since mid-2015
   \let\pdfx@mdfivesum\mdfivesum
  \fi
 \else
  \let\pdfx@mdfivesum\pdfmdfivesum
 \fi
\fi
\def\pdfx@encodingfile{l8u-penc.def}
```

```
422
423 \expandafter\ifx\csname pdftexbanner\endcsname\relax
424  \expandafter\ifx\csname luatexbanner\endcsname\relax
425  \else %  luatex85
426   \let\pdftexbanner\luatexbanner
427  \fi
428 \else %  pdfTeX, but which version ???
429  {\endlinechar=-1
430   \everyeof{\noexpand}%
431   \xdef\pdfx@bannerstring{\expandafter\scantokens\expandafter{\pdftexbanner}}
432  }%
433  \def\pdfx@testbannerstr{%
434   This is pdfTeX, Version 3.14159265-2.6-1.40.15 (TeX Live 2014/dev)
435   kpathsea version 6.2.0dev}%
436  \ifx\pdfx@bannerstring\pdfx@testbannerstr
437   \typeout{This version of pdfTeX cannot write out upper-range character bytes,
438    128-255.}%
439   \typeout{Any UTF-8 Unicode characters in the Metadata will not be written
440    correctly.}%
441   \typeout{Please update to a more stable version of pdfTeX.^^J}%
442  \fi
443 \fi
444
445 %% How to support XeTeX here ?
446 \ifpdfx@x
447  \pdfobjcompresslevel=0 \relax
448  \expandafter\ifx\csname pdfinterwordspaceoff\endcsname\relax\else
449   \pdfinterwordspaceoff
450   \let\pdfinterwordspaceon\pdfinterwordspaceoff
451   \let\pdfinterwordspace\relax
452  \fi
453  \expandafter\ifx\csname pdfgeninterwordspace\endcsname\relax\else
454   \pdfgeninterwordspace=0 \relax
455  \fi
456  \begingroup
457   \dimen0=0.996264009963\paperwidth\relax
458   \edef\pdfx@mwidth{\strip@pt\dimen0}%
459   \advance\dimen0 -25\p@
460   \edef\pdfx@twidth{\strip@pt\dimen0}%
461   \dimen0=0.996264009963\paperheight\relax
462   \edef\pdfx@mheight{\strip@pt\dimen0}%
463   \advance\dimen0 -20\p@
464   \edef\pdfx@theight{\strip@pt\dimen0}%
465   \ifxetex
466    \xdef\pdfx@everypage@xetex{%
467      /MediaBox[0 0 \pdfx@mwidth\space \pdfx@mheight]^^J
468      /BleedBox[0 0 \pdfx@mwidth\space \pdfx@mheight]^^J
469      /CropBox[0 0 \pdfx@mwidth\space \pdfx@mheight]^^J
470      /TrimBox[25 20 \pdfx@twidth\space \pdfx@theight]%
471    }%
472   \fi
473   \edef\next{\endgroup\pdfpagesattr{%
```

```
474     /MediaBox[0 0 \pdfx@mwidth\space \pdfx@mheight]^^J
475 %%    /ArtBox[0 0 \pdfx@mwidth\space \pdfx@mheight]^^J
476     /BleedBox[0 0 \pdfx@mwidth\space \pdfx@mheight]^^J
477     /CropBox[0 0 \pdfx@mwidth\space \pdfx@mheight]^^J
478     /TrimBox[25 20 \pdfx@twidth\space \pdfx@theight]}
479   }\next
480  \ifxetex
481   \AtBeginDvi{%
482    \expandafter\immediate\pdfx@pageattr@xetex{\pdfx@everypage@xetex}}%
483   \EveryShipout{%
484    \expandafter\immediate\pdfx@pageattr@xetex{\pdfx@everypage@xetex}}%
485  \else
486    \EveryShipout{%
487     \expandafter\ifx\expandafter\relax\the\pdfpageattr\relax
488      \immediate\pdfpageattr\expandafter{\the\pdfpagesattr}%
489     \fi }%
490  \fi
491 \else
492 %%  PDF/A-1b  doesn't allow object compression
493  \ifnum\xmp@ReleaseDate=2005\relax
494   \expandafter\ifx\csname pdfobjcompresslevel\endcsname\relax
495   \else
496    \pdfobjcompresslevel=0\relax
497  \fi \fi
498 \fi
499 \ifxetex
500 %% How to support XeTeX here ?
501 \else
502  \ifnum\thepdfminorversion >3 \relax
503   \expandafter\ifx\csname pdfsuppresswarningdupmap\endcsname\relax
504    \expandafter\ifx\csname pdfmapline\endcsname\relax\else
505     \pdfmapline{+dummy-space <dummy-space.pfb}
506    \fi
507   \else
508    \advance\pdfsuppresswarningdupmap 1
509    \pdfmapline{+dummy-space <dummy-space.pfb}
510    \advance\pdfsuppresswarningdupmap -1
511   \fi
512   \expandafter\ifx\csname pdfgeninterwordspace\endcsname\relax\else
513    \pdfgeninterwordspace=1 \relax
514   \fi
515  \fi
516 \fi
517
518 \ifluatex\else\ifxetex\else
519  \@ifpackageloaded{inputenc}{%
520  }{%
521   \RequirePackage{inputenc}
522  % allow this to be loaded again cleanly
523  \expandafter\let\csname ver@inputenc.sty\endcsname\relax
524  }
525 \fi\fi
```

```
526
527 %% pseudo-declare the L8U encoding
528 \expandafter\let\csname L8U-cmd\expandafter\endcsname\csname OT1-cmd\endcsname
529 \@namedef{T@L8U}{}%
530 \@namedef{D@L8U}{}%
531 \@namedef{M@L8U}{}%
532
533 %% adjust to LaTeX's 2018 change to the default encoding
534 \expandafter\ifx\csname inputencodingname\endcsname\relax
535 \else
536  \def\pdfx@restoreencoding#1{%
537    \@tempcnta=128
538    \loop
539     \catcode\@tempcnta=13
540     \advance\@tempcnta\@ne
541    \ifnum\@tempcnta<256
542    \repeat
543   \inputencoding{#1}%
544   \let\LastDeclaredEncoding\pdfx@LastDeclaredEncoding
545   \let\DeclareFontEncoding@\pdfx@DeclareFontEncoding@
546   \let\DeclareUnicodeCharacter\pdfx@DeclareUnicodeCharacter
547   }%
548   \AtEndOfPackage{\pdfx@restoreencoding\pdfx@inputencodingname}%
549   \let\pdfx@inputencodingname\inputencodingname
550   \global\let\pdfx@DeclareUnicodeCharacter\DeclareUnicodeCharacter
551   \global\let\pdfx@DeclareFontEncoding@\DeclareFontEncoding@
552   \UseRawInputEncoding
553 \fi
554 \InputIfFileExists{\pdfx@encodingfile}{}{}
555 \expandafter\ifx\csname pdfx@inputencodingname\endcsname\relax
556 \else
557   \let\inputencodingname\pdfx@inputencodingname
558 %%  \global\let\DeclareUnicodeCharacter\pdfx@DeclareUnicodeCharacter
559 %%  \global\let\DeclareFontEncoding@\DeclareFontEncoding@saved
560   \global\let\pdfx@LastDeclaredEncoding\LastDeclaredEncoding
561   \expandafter\inputencoding\expandafter{\inputencodingname}%
562 \fi
563
564 %%-----------------------------------------------------------------------
565 %% Macros for reading XMP data with special catcodes. Usage:
566 %%
567 %% \xmp@parse{continuation}{data}
568 %%
569 %% The effect is to read the data with special catcodes: '<', '>', and
570 %% '&' are "active", and '^', '_', '#', '$', '~' are "other". The data
571 %% is then bound to the locally scoped name \@this, and the
572 %% continuation is called.
573 \def\xmp@parse#1{%
574  \begingroup
575  \catcode`\<=13\catcode`\>=13\catcode`\&=13\catcode`\^=12
576  \catcode`\_=12\catcode`\#=12\catcode`\$=12\catcode`\~=12
577  \ifpdfx@useactivespaces\obeyspaces\fi % capture spaces as active characters
```

```
\xmp@doparse{#1}%
}
\def\afterxmp@parse{}% methods may change this
\def\xmp@doparse#1#2{%
 \def\@this{#2}#1
 \endgroup
 % do any post-processing
 \afterxmp@parse
 \def\afterxmp@parse{}%
}

%%-----------------------------------------------------------------------
%% Local commands. They are only brought into scope during the reading
%% of xmpdata. Some fields can have a 'xml:lang' attribute; others must have.
%%  LANG values as in:  (BCP 47)  https://tools.ietf.org/html/rfc5646#appendix-A
%%
\def\xmp@lang@Default{x-default}
\let\xmp@lang@Title\xmp@lang@Default
\let\xmp@lang@Author\xmp@lang@Default
\let\xmp@lang@Keywords\xmp@lang@Default
\let\xmp@lang@Subject\xmp@lang@Default
%%\def\xmp@lang@CreatorTool{\xmp@lang@Default}
\let\xmp@lang@Producer\xmp@lang@Default
%%\def\xmp@lang@Volume{\xmp@lang@Default}
%%\def\xmp@lang@Issue{\xmp@lang@Default}
\let\xmp@lang@Copyright\xmp@lang@Default
\let\xmp@lang@PublicationType\xmp@lang@Default
\let\xmp@lang@Publisher\xmp@lang@Default
\let\xmp@lang@Coverage\xmp@lang@Default
\let\xmp@lang@Contributor\xmp@lang@Default
\let\xmp@lang@Relation\xmp@lang@Default
%%%  PRISM fields
\let\xmp@lang@CoverDisplayDate\xmp@lang@Default
\let\xmp@lang@JournalTitle\xmp@lang@Default
%%\def\xmp@lang@JournalNumber{\xmp@lang@Default}
%%%  xmp:  &  xmpRights:  fields
\let\xmp@lang@Advisory\xmp@lang@Default
\let\xmp@lang@Identifier\xmp@lang@Default
\let\xmp@lang@Nickname\xmp@lang@Default
\let\xmp@lang@Owner\xmp@lang@Default

%% some validators require a language attribute for
%%   dc:title                set via  \Title
%%   dc:description   set via  \Subject
%%   dc:rights              set via  \Copyright
%%   xmpRights:UsageTerms   set via \Copyright
%%
{\catcode `\" 12 \catcode`\: 12 \catcode`\= 12
 \gdef\pdfx@xmp@checklang#1{%
  \ifx #1\xmp@lang@Default\else\space xml:lang="#1"\fi}
 \gdef\pdfx@xmp@strictlang#1{\space xml:lang="#1"}
}%  end of  \catcodes
```

```
\let\xmp@checklang\pdfx@xmp@checklang
\let\xmp@strictlang\pdfx@xmp@strictlang

\newcommand{\pdfx@Title}[1][]{%
 \ifx\relax#1\relax\else\gdef\xmp@lang@Title{#1}\fi
 \xmp@parse{\global\let\xmp@Title\@this}}

%% allow for multiple authors, keywords and languages
%%  also:  contributor, date, relation, type, thumbnails
%%  and  AuthoritativeDomain, Advisory, Identifier, Owner
\newcommand{\pdfx@Author}[1][]{%
 \ifx\relax#1\relax\else\gdef\xmp@lang@Author{#1}\fi
 \def\afterxmp@parse{\let\Author\pdfx@extraAuthor}%
 \xmp@parse{\global\let\xmp@Author\@this}}
\newcommand{\pdfx@Keywords}[1][]{%
 \ifx\relax#1\relax\else\gdef\xmp@lang@Keywords{#1}\fi
 \def\afterxmp@parse{\let\Keywords\pdfx@extraKeywords}%
 \xmp@parse{\global\let\xmp@Keywords\@this}}
\newcommand{\pdfx@Language}{%
 \def\afterxmp@parse{\let\Language\pdfx@extraLanguages}%
 \xmp@parse{\global\let\xmp@Language\@this}}

\newcommand{\pdfx@AuthoritativeDomain}{%
 \def\afterxmp@parse{\let\AuthoritativeDomain\pdfx@extraAuthoritativeDomain}%
 \xmp@parse{\global\let\xmp@AuthoritativeDomain\@this}}
\newcommand{\pdfx@Date}{%
 \def\afterxmp@parse{\let\Date\pdfx@extraDate}%
 \xmp@parse{\global\let\xmp@Date\@this}}
\newcommand{\pdfx@Contributor}[1][]{%
 \ifx\relax#1\relax\else\gdef\xmp@lang@Contributor{#1}\fi
 \def\afterxmp@parse{\let\Contributor\pdfx@extraContributor}%
 \xmp@parse{\global\let\xmp@Contributor\@this}}
\newcommand{\pdfx@Relation}[1][]{%
 \ifx\relax#1\relax\else\gdef\xmp@lang@Relation{#1}\fi
 \def\afterxmp@parse{\let\Relation\pdfx@extraRelation}%
 \xmp@parse{\global\let\xmp@Relation\@this}}
%%\newcommand{\pdfx@Type}[1][]{%
%% \ifx\relax#1\relax\else\gdef\xmp@lang@Type{#1}\fi
%% \def\afterxmp@parse{\let\Type\pdfx@extraType}%
%% \xmp@parse{\global\let\xmp@Type\@this}}

\newcommand{\pdfx@Advisory}[1][]{%
 \ifx\relax#1\relax\else\gdef\xmp@lang@Advisory{#1}\fi
 \def\afterxmp@parse{\let\Advisory\pdfx@extraAdvisory}%
 \xmp@parse{\global\let\xmp@Advisory\@this}}
\newcommand{\pdfx@Identifier}[1][]{%
 \ifx\relax#1\relax\else\gdef\xmp@lang@Identifier{#1}\fi
 \def\afterxmp@parse{\let\Identifier\pdfx@extraIdentifier}%
 \xmp@parse{\global\let\xmp@Identifier\@this}}
\newcommand{\pdfx@Thumbnails}{%
 \def\afterxmp@parse{\let\Thumbnails\pdfx@extraThumbnails}%
 \xmp@parse{\global\let\xmp@Thumbnails\@this}}
```

```
682
683 \newcommand{\pdfx@Owner}[1][]{%
684  \ifx\relax#1\relax\else\gdef\xmp@lang@Owner{#1}\fi
685  \def\afterxmp@parse{\let\Owner\pdfx@extraOwner}%
686  \xmp@parse{\global\let\xmp@Owner\@this}}
687
688 {\obeyspaces%
689  \ifpdfx@useactivespaces\gdef\pdfx@insert@sep{\sep }%
690  \else\gdef\pdfx@insert@sep{\sep}\fi%
691 }
692 \newcommand{\pdfx@extraAuthor}[1][]{%
693  \ifx\relax#1\relax
694   \expandafter\expandafter\expandafter\gdef
695    \expandafter\expandafter\expandafter\xmp@Author
696     \expandafter\expandafter\expandafter{%
697      \expandafter\xmp@Author\pdfx@insert@sep}%
698  \else
699   \expandafter\expandafter\expandafter\gdef
700    \expandafter\expandafter\expandafter\xmp@Author
701     \expandafter\expandafter\expandafter{%
702      \expandafter\xmp@Author\pdfx@insert@sep[#1]}%
703  \fi
704  \def\afterxmp@parse{%
705   \expandafter\expandafter\expandafter\gdef
706    \expandafter\expandafter\expandafter\xmp@Author
707    \expandafter\expandafter\expandafter{%
708     \expandafter\xmp@Author\xmp@extraAuthor}%
709    }%
710  \xmp@parse{\global\let\xmp@extraAuthor\@this}%
711  }%
712 \newcommand{\pdfx@extraKeywords}[1][]{%
713  \ifx\relax#1\relax
714   \expandafter\expandafter\expandafter\gdef
715    \expandafter\expandafter\expandafter\xmp@Keywords
716     \expandafter\expandafter\expandafter{%
717      \expandafter\xmp@Keywords\pdfx@insert@sep}%
718  \else%
719   \expandafter\expandafter\expandafter\gdef
720    \expandafter\expandafter\expandafter\xmp@Keywords
721     \expandafter\expandafter\expandafter{%
722      \expandafter\xmp@Keywords\pdfx@insert@sep[#1]}%
723  \fi%
724  \def\afterxmp@parse{%
725   \expandafter\expandafter\expandafter\gdef
726    \expandafter\expandafter\expandafter\xmp@Keywords
727    \expandafter\expandafter\expandafter{%
728     \expandafter\xmp@Keywords\xmp@extraKeywords}}%
729  \xmp@parse{\global\let\xmp@extraKeywords\@this}%
730  }%
731 \newcommand{\pdfx@extraLanguages}{%
732   \expandafter\expandafter\expandafter\gdef
733    \expandafter\expandafter\expandafter\xmp@Language
```

```
    \expandafter\expandafter\expandafter{%
     \expandafter\xmp@Language\pdfx@insert@sep}%
\def\afterxmp@parse{%
 \expandafter\expandafter\expandafter\gdef
  \expandafter\expandafter\expandafter\xmp@Language
  \expandafter\expandafter\expandafter{%
   \expandafter\xmp@Language\xmp@extraLanguages}}%
\xmp@parse{\global\let\xmp@extraLanguages\@this}%
}%

\newcommand{\pdfx@extraContributor}[1][]{%
\ifx\relax#1\relax
 \expandafter\expandafter\expandafter\gdef
  \expandafter\expandafter\expandafter\xmp@Contributor
   \expandafter\expandafter\expandafter{%
    \expandafter\xmp@Contributor\pdfx@insert@sep}%
\else
 \expandafter\expandafter\expandafter\gdef
  \expandafter\expandafter\expandafter\xmp@Contributor
   \expandafter\expandafter\expandafter{%
    \expandafter\xmp@Contributor\pdfx@insert@sep[#1]}%
\fi
\def\afterxmp@parse{%
 \expandafter\expandafter\expandafter\gdef
  \expandafter\expandafter\expandafter\xmp@Contributor
  \expandafter\expandafter\expandafter{%
   \expandafter\xmp@Contributor\xmp@extraContributor}%
  }%
\xmp@parse{\global\let\xmp@extraContributor\@this}%
}%

\newcommand{\pdfx@extraAuthoritativeDomain}{%
 \expandafter\expandafter\expandafter\gdef
  \expandafter\expandafter\expandafter\xmp@AuthoritativeDomain
   \expandafter\expandafter\expandafter{%
    \expandafter\xmp@AuthoritativeDomain\pdfx@insert@sep}%
\def\afterxmp@parse{%
 \expandafter\expandafter\expandafter\gdef
  \expandafter\expandafter\expandafter\xmp@AuthoritativeDomain
  \expandafter\expandafter\expandafter{%
   \expandafter\xmp@AuthoritativeDomain\xmp@extraAuthoritativeDomain}%
  }%
\xmp@parse{\global\let\xmp@extraAuthoritativeDomain\@this}%
}%

\newcommand{\pdfx@extraDate}{%
 \expandafter\expandafter\expandafter\gdef
  \expandafter\expandafter\expandafter\xmp@Date
   \expandafter\expandafter\expandafter{%
    \expandafter\xmp@Date\pdfx@insert@sep}%
\def\afterxmp@parse{%
 \expandafter\expandafter\expandafter\gdef
```

```
   \expandafter\expandafter\expandafter\xmp@Date
   \expandafter\expandafter\expandafter{%
    \expandafter\xmp@Date\xmp@extraDate}%
   }%
 \xmp@parse{\global\let\xmp@extraDate\@this}%
 }%

\newcommand{\pdfx@extraRelation}[1][]{%
 \ifx\relax#1\relax
  \expandafter\expandafter\expandafter\gdef
   \expandafter\expandafter\expandafter\xmp@Relation
    \expandafter\expandafter\expandafter{%
     \expandafter\xmp@Relation\pdfx@insert@sep}%
 \else
  \expandafter\expandafter\expandafter\gdef
   \expandafter\expandafter\expandafter\xmp@Relation
    \expandafter\expandafter\expandafter{%
     \expandafter\xmp@Relation\pdfx@insert@sep[#1]}%
 \fi
 \def\afterxmp@parse{%
  \expandafter\expandafter\expandafter\gdef
   \expandafter\expandafter\expandafter\xmp@Relation
   \expandafter\expandafter\expandafter{%
    \expandafter\xmp@Relation\xmp@extraRelation}%
   }%
 \xmp@parse{\global\let\xmp@extraRelation\@this}%
 }%

%%\newcommand{\pdfx@extraType}[1][]{%
%%% \show\xmp@Type
%% \ifx\relax#1\relax
%%  \expandafter\expandafter\expandafter\gdef
%%   \expandafter\expandafter\expandafter\xmp@Type
%%    \expandafter\expandafter\expandafter{%
%%     \expandafter\xmp@Type\pdfx@insert@sep}%
%% \else
%%  \expandafter\expandafter\expandafter\gdef
%%   \expandafter\expandafter\expandafter\xmp@Type
%%    \expandafter\expandafter\expandafter{%
%%     \expandafter\xmp@Type\pdfx@insert@sep[#1]}%
%% \fi
%% \def\afterxmp@parse{%
%%  \expandafter\expandafter\expandafter\gdef
%%   \expandafter\expandafter\expandafter\xmp@Type
%%   \expandafter\expandafter\expandafter{%
%%    \expandafter\xmp@Type\xmp@extraType}%
%%   %\show\xmp@Type
%%   }%
%% \xmp@parse{\global\let\xmp@extraType\@this}%
%% }%

\newcommand{\pdfx@extraAdvisory}[1][]{%
```

```
\ifx\relax#1\relax
 \expandafter\expandafter\expandafter\gdef
  \expandafter\expandafter\expandafter\xmp@Advisory
   \expandafter\expandafter\expandafter{%
    \expandafter\xmp@Advisory\pdfx@insert@sep}%
\else
 \expandafter\expandafter\expandafter\gdef
  \expandafter\expandafter\expandafter\xmp@Advisory
   \expandafter\expandafter\expandafter{%
    \expandafter\xmp@Advisory\pdfx@insert@sep[#1]}%
\fi
\def\afterxmp@parse{%
 \expandafter\expandafter\expandafter\gdef
  \expandafter\expandafter\expandafter\xmp@Advisory
  \expandafter\expandafter\expandafter{%
   \expandafter\xmp@Advisory\xmp@extraAdvisory}%
  }%
\xmp@parse{\global\let\xmp@extraAdvisory\@this}%
}%

\newcommand{\pdfx@extraIdentifier}[1][]{%
\ifx\relax#1\relax
 \expandafter\expandafter\expandafter\gdef
  \expandafter\expandafter\expandafter\xmp@Identifier
   \expandafter\expandafter\expandafter{%
    \expandafter\xmp@Identifier\pdfx@insert@sep}%
\else
 \expandafter\expandafter\expandafter\gdef
  \expandafter\expandafter\expandafter\xmp@Identifier
   \expandafter\expandafter\expandafter{%
    \expandafter\xmp@Identifier\pdfx@insert@sep[#1]}%
\fi
\def\afterxmp@parse{%
 \expandafter\expandafter\expandafter\gdef
  \expandafter\expandafter\expandafter\xmp@Identifier
  \expandafter\expandafter\expandafter{%
   \expandafter\xmp@Identifier\xmp@extraIdentifier}%
  }%
\xmp@parse{\global\let\xmp@extraIdentifier\@this}%
}%

\newcommand{\pdfx@extraThumbnails}[1][]{%
\ifx\relax#1\relax
 \expandafter\expandafter\expandafter\gdef
  \expandafter\expandafter\expandafter\xmp@Thumbnails
   \expandafter\expandafter\expandafter{%
    \expandafter\xmp@Thumbnails\pdfx@insert@sep}%
\else
 \expandafter\expandafter\expandafter\gdef
  \expandafter\expandafter\expandafter\xmp@Thumbnails
   \expandafter\expandafter\expandafter{%
    \expandafter\xmp@Thumbnails\pdfx@insert@sep[#1]}%
```

```
\fi
\def\afterxmp@parse{%
 \expandafter\expandafter\expandafter\gdef
  \expandafter\expandafter\expandafter\xmp@Thumbnails
  \expandafter\expandafter\expandafter{%
   \expandafter\xmp@Thumbnails\xmp@extraThumbnails}%
  }%
\xmp@parse{\global\let\xmp@extraThumbnails\@this}%
}%

\newcommand{\pdfx@extraOwner}[1][]{%
 \ifx\relax#1\relax
  \expandafter\expandafter\expandafter\gdef
   \expandafter\expandafter\expandafter\xmp@Owner
    \expandafter\expandafter\expandafter{%
     \expandafter\xmp@Owner\pdfx@insert@sep}%
 \else
  \expandafter\expandafter\expandafter\gdef
   \expandafter\expandafter\expandafter\xmp@Owner
    \expandafter\expandafter\expandafter{%
     \expandafter\xmp@Owner\pdfx@insert@sep[#1]}%
 \fi
 \def\afterxmp@parse{%
  \expandafter\expandafter\expandafter\gdef
   \expandafter\expandafter\expandafter\xmp@Owner
   \expandafter\expandafter\expandafter{%
    \expandafter\xmp@Owner\xmp@extraOwner}%
   }%
 \xmp@parse{\global\let\xmp@extraOwner\@this}%
 }%

\newcommand{\pdfx@Subject}[1][]{%
 \ifx\relax#1\relax\else\gdef\xmp@lang@Subject{#1}\fi
 \xmp@parse{\global\let\xmp@Subject\@this}}
\newcommand{\pdfx@Producer}[1][]{%
 \ifx\relax#1\relax\else\gdef\xmp@lang@Producer{#1}\fi
 \xmp@parse{\global\let\xmp@Producer\@this}}
\newcommand{\pdfx@Publisher}[1][]{%
 \ifx\relax#1\relax\else\gdef\xmp@lang@Publisher{#1}\fi
 \xmp@parse{\global\let\xmp@Publisher\@this}}
\newcommand{\pdfx@Copyright}[1][]{%
 \ifx\relax#1\relax\else\gdef\xmp@lang@Copyright{#1}\fi
 \xmp@parse{\global\let\xmp@Copyright\@this%
  \ifx\xmp@Copyrighted\@empty\gdef\xmp@Copyrighted{True}\fi}}

\newcommand{\pdfx@Coverage}[1][]{%
 \ifx\relax#1\relax\else\gdef\xmp@lang@Coverage{#1}\fi
 \xmp@parse{\global\let\xmp@Coverage\@this}}

%%  PRISM Text fields
\newcommand{\pdfx@CoverDisplayDate}[1][]{%
 \ifx\relax#1\relax\else\gdef\xmp@lang@CoverDisplayDate{#1}\fi
```


Contacts: [cvr,thanh]@river-valley.org, ross.moore@mq.edu.au, selinger@mathstat.dal.ca

```
\xmp@parse{\global\let\xmp@CoverDisplayDate\@this}}
\newcommand{\pdfx@JournalTitle}[1][]{%
 \ifx\relax#1\relax\else\gdef\xmp@lang@JournalTitle{#1}\fi
 \ifx\xmp@PublicationType\@empty\gdef\xmp@PublicationType{journal}\fi
 \xmp@parse{\global\let\xmp@JournalTitle\@this}}

%%  Uses PRISM Controlled Vocabulary:
%%    http://prismstandard.org/vocabularies/3.0/aggregationtype.xml
%%  blog, book, bookazine, catalog, feed, journal, magazine, manual
%%  newsletter, newspaper, other, report, pamphlet, vook, whitepaper
%%
\newcommand{\pdfx@PublicationType}[1][]{%
 \ifx\relax#1\relax\else\gdef\xmp@lang@PublicationType{#1}\fi
 \xmp@parse{\global\let\xmp@PublicationType\@this}}

\def\pdfx@localcommands{
 \let\Title\pdfx@Title
 \let\Author\pdfx@Author
 \let\Keywords\pdfx@Keywords
 \let\Subject\pdfx@Subject
 \let\Language\pdfx@Language
 \def\CreatorTool{\xmp@parse{\global\let\xmp@CreatorTool\@this}}
 \let\Producer\pdfx@Producer
 \def\Volume{\xmp@parse{\global\let\xmp@Volume\@this}}
 \def\Issue{\xmp@parse{\global\let\xmp@Issue\@this}}
 \let\CoverDisplayDate\pdfx@CoverDisplayDate
 \def\CoverDate{\xmp@parse{\global\let\xmp@CoverDate\@this}}
 \let\Copyright\pdfx@Copyright
 \def\CopyrightURL{\xmp@parse{\global\let\xmp@CopyrightURL\@this%
   \ifx\xmp@Copyrighted\@empty\gdef\xmp@Copyrighted{True}\fi}}
 \def\Copyrighted{\xmp@parse{\global\let\xmp@Copyrighted\@this}}
 \def\Doi{\xmp@parse{\global\let\xmp@Doi\@this}}
 \def\ISBN{\xmp@parse{\global\let\xmp@ISBN\@this}}
 \def\URLlink{\xmp@parse{\global\let\xmp@URL\@this}}
 \def\Lastpage{\xmp@parse{\global\let\xmp@Lastpage\@this}}
 \def\Firstpage{\xmp@parse{\global\let\xmp@Firstpage\@this}}
 \let\PublicationType\pdfx@PublicationType
 \let\Journaltitle\pdfx@JournalTitle
 \def\Journalnumber{\xmp@parse{\global\let\xmp@Journalnumber\@this}}
 \let\Publisher\pdfx@Publisher
 \let\Coverage\pdfx@Coverage
 \def\Source{\xmp@parse{\global\let\xmp@Source\@this}}
 \let\Contributor\pdfx@Contributor
 \let\Date\pdfx@Date
 \let\Relation\pdfx@Relation
 \let\Advisory\pdfx@Advisory
 \def\BaseURL{\xmp@parse{\global\let\xmp@BaseURL\@this}}
 \let\Identifier\pdfx@Identifier
 \let\Nickname\pdfx@Nickname
 \let\Thumbnails\pdfx@Thumbnails
 \let\Owner\pdfx@Owner
 \def\CertificateURL{\xmp@parse{\global\let\xmp@CertificateURL\@this}}
```

```
\def\MMversionID{\xmp@parse{\global\let\xmpMM@versionID\@this}}
%% \let\Type\pdfx@Type
%%
%% currently unused; for backward compatibility only
 \let\AuthoritativeDomain\pdfx@AuthoritativeDomain
 \let\Creator\CreatorTool  % for backward compatibility
 \let\Org\Publisher        % for backward compatibility
 \let\WebStatement\CopyrightURL  % for backward compatibility
}

%%-------------------------------------------------------------------------
%% The following characters and markup can be used within the XMP data
%% defined by \Author, \Title, and so on.
%%
%% * All printable non-whitespace ASCII characters except
%%   '%', '{', '}', '\' can be used as themselves.
%%
%% * All printable non-whitespace UTF-8 encoded Unicode characters
%%   from the basic multilingual plane can be used as themselves.
%%
%% * As usual, consecutive whitespace characters are contracted to a
%%   single space. Whitespace after a macro such as \copyright is
%%   ignored. Blank lines are not permitted.
%%
%% * The following markup can be used:
%%   '\ '        - a literal space  (for example after a macro)
%%   \%          - a literal '%'
%%   \{          - a literal '{'
%%   \}          - a literal '}'
%%   \backslash  - a literal '\'
%%   \copyright  - the (c) copyright symbol
%%
%%   \sep        - only permitted within \Author, \Keywords, \Publisher.
%%
%% * For backward compatibility, \& and \TextCopyright are also
%%   provided. Their use is deprecated.

%%-------------------------------------------------------------------------
%% The macro \pdfx@actives binds the active characters
%% '&', '<', and '>' to \pdfx@amp, \pdfx@lt, and \pdfx@gt,
%% respectively, without actually making them active.
\begingroup
 \catcode`\<=13
 \catcode`\>=13
 \catcode`\&=13
 \gdef\pdfx@actives{
  \def&{\pdfx@amp}
  \def<{\pdfx@lt}
  \def>{\pdfx@gt}
 }
\endgroup

```

```
%%-------------------------------------------------------------------------
%% Markup bindings to be used during XMP generation.

{%
 \catcode`\<=12 \catcode`\>=12 \catcode`\/=12 \catcode`\:=12 \catcode`\"=12
\obeyspaces\ifpdfx@useactivespaces%
 \gdef\pdfx@sep {\pdfx@check@lang}%
\else%
 \gdef\pdfx@sep{\pdfx@check@lang}%
\fi%
 \xdef\pdfx@sep@nolang{</rdf:li>^^J     <rdf:li>}%
 \xdef\pdfx@sep@lang[#1]{</rdf:li>^^J     <rdf:li xml:lang="#1">}%
}% end of \obeyspaces and \catcode ....

\def\pdfx@check@lang#1{%
 \ifx[#1\expandafter\@firstoftwo
 \else\expandafter\@secondoftwo\fi
 {\pdfx@sep@lang#1}{\pdfx@sep@nolang#1}}

\def\pdfx@xmpmarkup{%
 \pdfx@actives
 \edef\@amp{\expandafter\@gobble\string\&}%
 \edef\@hash{\expandafter\@gobble\string\#}%
 \edef\ {\expandafter\@gobble\string\ }%
 \edef\%{\expandafter\@gobble\string\%}%
 \edef\{{\expandafter\@gobble\string\{}%
 \edef\}{\expandafter\@gobble\string\}}%
 \edef\backslash{\expandafter\@gobble\string\\}%
 \def\@unicode##1{\@amp\@hash x##1;}%
 \def\pdfx@amp{\@unicode{0026}}%
 \def\pdfx@lt{\@unicode{003c}}%
 \def\pdfx@gt{\@unicode{003e}}%
 \def\copyright{\@unicode{00A9}}%
 \let\&\pdfx@amp               % for backward compatibility
 \let\TextCopyright\copyright  % for backward compatibility
 \let\sep\pdfx@sep
 \pdfx@xmpunimarkup   % only need this when writing XMP
 \the\pdfxsafeforxmp@toks
}

%% cope with active spaces with LGR encoding
%% and the spaces written out with \IeC in KOI8-r
%% It's possible to have both together.
\def\liixu@IeC#1#{\liixu@IeCi}
\def\liixu@IeCi#1{\liixu@IeCii#1}
\def\liixu@IeCii#1#2{#1}
\def\liixu@enableIeC{\ifpdfx@useactivespaces
 \let\IeC\liixu@IeC\else\def\IeC##1{##1}\fi}
\def\liixu@numberline#1#{\liixu@numberlinei}
\def\liixu@numberlinei#1{\liixu@numberlineii#1}
\def\liixu@numberlineii#1{\textLF #1. }
\def\liixu@enablenumberline{\ifpdfx@useactivespaces
```

```
\let\numberline\liixu@numberline
\else\def\numberline##1{\textLF ##1. }\fi}

\def\pdfx@xmpunimarkup{%
 \liixu@enableIeC
 \liixu@enablenumberline
 \def\empty{}% used in LICR patterns
 \LIIXUscriptcommands
 \LIIXUtipacommands
 \LIIXUmapTeXnames
%%  from Hyperref's  psdextra.def
 \csname psdmapshortnames\endcsname
 \csname psdaliasnames\endcsname
%% from  lu8enc.def
 \csname LIIXUmapmathletterlikes\endcsname
 \csname LIIXUmapmathspaces\endcsname
 \iflatLATxmp
  \LIIXUmaplatinchars
  \LIIXUcancelfontswitches
 \fi
 \ifmathxmp
  \let\(\textinlinemath
  \let\[\textdisplaymath
  \LIIXUmapmathaccents
  \LIIXUmapisomathgreek
  \LIIXUmapmatharrowsA
  \LIIXUmapmathoperatorsA
  \LIIXUmapmathoperatorsB
  \LIIXUmapmiscmathsymbolsA
  \LIIXUmapsupparrowsA
  \LIIXUmapsupparrowsB
  \LIIXUmapmiscmathsymbolsB
  \LIIXUmapsuppmathoperators
  \LIIXUmapunimathgreek
  \LIIXUmapmathalphabets
 \fi
 \ifarbxmp \LIIXUmaparabicletters\fi
 \ifarmxmp \LIIXUmaparmenianletters\fi
 \ifdevxmp\LIIXUmapdevaccents\fi
 \ifgrkxmp \LIIXUmapgreekletters\fi
 \ifhebxmp \LIIXUmaphebrewletters\fi
}

%% In case macros are used in XMP Metadata, need a way to map these
%% to simple text, rather than specific font characters, or whatever:
\newtoks\pdfxsafeforxmp@toks
\def\pdfxEnableCommands{%   user command
 \begingroup
  \ifpdfx@useactivespaces\obeyspaces\fi
  \pdfx@EnableCommands
}
\def\pdfx@EnableCommands#1{%   internal command
```

```
\expandafter\global\expandafter\pdfxsafeforxmp@toks
 \expandafter{\the\pdfxsafeforxmp@toks#1}%
\endgroup
}

%%-------------------------------------------------------------------------
%% Markup bindings to be used during PDF string generation.

\def\pdfx@pdfmarkup{%
 \pdfx@actives
 \edef\%{\expandafter\@gobble\string\%}%
 \edef\{{\expandafter\@gobble\string\{}%
 \edef\}{\expandafter\@gobble\string\}}%
 \edef\pdfx@backslash{\expandafter\@gobble\string\\}%
 \def\backslash{\pdfx@backslash000\pdfx@backslash134}%
 \edef\pdfx@amp{\expandafter\@gobble\string\&}%
 \edef\pdfx@lt{\expandafter\@gobble\string\<}%
 \edef\pdfx@gt{\expandafter\@gobble\string\>}%
 \let\TextCopyright\copyright  % for backward compatibility
 \def\sep{; }%
 %\let\sep\pdfx@sep
%% Note: '\ ', \&, \copyright are already predefined by hyperref.
%% allow LICRs to expand into PDF strings
 \def\cf@encoding{PU}%
 \def\9##1{\ifcase##1\string\0\or\string\1\or\string\2\or\string\3\fi}%
 \def\8{\string\00}%
 \def\0{\string\0}\def\1{\string\1}\def\2{\string\2}\def\3{\string\3}%
 \pdfx@xmpunimarkup
 \the\pdfxsafeforxmp@toks
}

%%-------------------------------------------------------------------------
%% Defaults
\ifxetex
 \def\xmp@Producer{XeTeX}
\else\ifluatex
 \def\xmp@Producer{LuaTeX}
\else
 \def\xmp@Producer{pdfTeX}
\fi\fi
\global\let\pdfxProducer\xmp@Producer

\global\let\xmp@CreatorTool\@empty
\global\let\xmp@Title\@empty
\global\let\xmp@Author\@empty
\global\let\xmp@Keywords\@empty
\global\let\xmp@Subject\@empty
\global\let\xmp@Language\@empty
\global\let\xmp@Volume\@empty
\global\let\xmp@Issue\@empty
\global\let\xmp@CoverDisplayDate\@empty
\global\let\xmp@CoverDate\@empty
```

```
\global\let\xmp@Copyright\@empty
\global\let\xmp@Copyrighted\@empty
\global\let\xmp@CopyrightURL\@empty
\gdef\xmp@WebStatement{\xmp@CopyrightURL}
\global\let\xmp@Doi\@empty
\global\let\xmp@ISBN\@empty
\global\let\xmp@URL\@empty
\global\let\xmp@Lastpage\@empty
\global\let\xmp@Firstpage\@empty
\global\let\xmp@PublicationType\@empty
\global\let\xmp@Journaltitle\@empty
\global\let\xmp@Journalnumber\@empty
%%\global\let\xmp@Type\@empty
\global\let\xmp@Contributor\@empty
\global\let\xmp@Coverage\@empty
\global\let\xmp@Date\@empty
\global\let\xmp@Relation\@empty
\global\let\xmp@Source\@empty
\global\let\xmp@Publisher\@empty
\gdef\xmp@Org{\xmp@Publisher}
\global\let\xmp@AuthoritativeDomain\@empty
\global\let\xmp@Advisory\@empty
\global\let\xmp@BaseURL\@empty
\global\let\xmp@Identifier\@empty
\global\let\xmp@Nickname\@empty
\global\let\xmp@Thumbnails\@empty
\global\let\xmp@Owner\@empty
\global\let\xmp@CertificateURL\@empty

%%-------------------------------------------------------------------------
%%  Alternative way to get the CreationDate using Lua  for XeTeX
\ifdefined\pdfcreationdate\else
 \begingroup  %% ensure correct catcodes, not done by \dospecials
 \catcode`\:=12 \catcode`\.=12
\begin{filecontents*}{creationdate.lua}
 os.remove("creationdate.timestamp")
 io.output("creationdate.timestamp"):write(os.date("\\edef\\tempa{\\string D:%Y%m%d%H%M%S}\n\\
\end{filecontents*}
 \endgroup
 \ifnum\shellescape=1
  \begingroup  %% ensure correct catcodes when file is read in
   \catcode`\'=12 \catcode`\.=12 \catcode`\:=12 \catcode`\+=12
   \immediate\write18{texlua creationdate.lua}
   \input{creationdate.timestamp}
   \def\tempc#1#2#3#4#5{#1#2#3'#4#5'}
   \edef\tempb{\expandafter\tempc\tempb}
   \edef\x{\endgroup\def\noexpand\pdfcreationdate{\tempa\tempb}}\x
 \else
  \begingroup  %% ensure correct catcodes in the error/warning messages
  \catcode`\<=12 \catcode`\>=12 \catcode`\"=12 \catcode`\-=12
  \catcode`\: 12 \catcode`\' 12 \catcode`\= 12
  \ifpdfx@noerr
```

```
    \PackageWarning{pdfx}{%
     CreationDate is not properly supported;^^J
     PDF validation may fail. To avoid this problem use:^^J
      xelatex -shell-escape  -output-driver="xdvipdfmx -z 0" <filename>^^J}
  \else
   \PackageError{pdfx}{%
    CreationDate is not properly supported;^^J
    PDF validation may fail.}{To avoid this problem use:^^J
     xelatex -shell-escape  -output-driver="xdvipdfmx -z 0" <filename> }
  \fi
  %% Using a constant date, to allow processing to finish smoothly.
  \edef\x{\endgroup
   \def\noexpand\pdfcreationdate{\string D:20181028075445+10'00'}}%
   \x
 \fi
\fi

%%-----------------------------------------------------------------------
\def\pdfx@findUUID#1{\edef\pdfx@tmpstring{\pdfx@mdfivesum{#1}}
     \expandafter\pdfx@eightofnine\pdfx@tmpstring\end}
\def\pdfx@eightofnine#1#2#3#4#5#6#7#8#9\end{%
     \xdef\pdfx@eightchars{#1#2#3#4#5#6#7#8}
     \pdfx@fouroffive#9\end}
\def\pdfx@fouroffive#1#2#3#4#5\end{\xdef\pdfx@ffourchars{#1#2#3#4}
     \pdfx@sfouroffive#5\end}
\def\pdfx@sfouroffive#1#2#3#4#5\end{\xdef\pdfx@sfourchars{#1#2#3#4}
     \pdfx@tfouroffive#5\end}
\def\pdfx@tfouroffive#1#2#3#4#5\end{\xdef\pdfx@tfourchars{#1#2#3#4}
     \xdef\pdfx@laststring{#5}}

\def\pdfx@uuid{\pdfx@eightchars-%
          \pdfx@ffourchars-%
          \pdfx@sfourchars-%
          \pdfx@tfourchars-%
          \pdfx@laststring}

\expandafter\ifx\csname pdfx@mdfivesum\endcsname\relax
  \PackageError{pdfx}{%
    No implementation for \string\pdfx@mdfivesum.^^J
    \ifxetex XeTeX needs to be 2015 or later\fi
   }{%
    Continue without, but the PDF will not validate.
   }%
 \def\xmp@docid{}%
 \def\pdfx@findUUID#1{}%
 \def\pdfx@uuid{}%
\else
 \pdfx@findUUID{\jobname.pdf}
 \edef\xmp@docid{\pdfx@uuid}
\fi

\expandafter\ifx\csname pdfcreationdate\endcsname\relax\relax
```

```
1306  \PackageWarning{pdfx}{%
1307   No implementation for \string\pdfxcreation .
1308  }%
1309 \def\xmp@instid{}%
1310 %%
1311 \else   %% use the MD5 sum methods
1312 %%
1313  \pdfx@findUUID{\pdfcreationdate}%
1314  \edef\xmp@instid{\pdfx@uuid}
1315 \fi
1316
1317 %%--------------------------------------------------------------------
1318 %% load  xcolor  before  hyperref  to get the link colors correct
1319 %%
1320 \PassOptionsToPackage{nosetpagesize}{color}
1321 \PassOptionsToPackage{nosetpagesize}{graphics}
1322 \@ifpackageloaded{xcolor}{%
1323  % Beamer will have already loaded  xcolor
1324  % need to understand what options it used
1325 }{
1326 \ifpdfx@x
1327  \RequirePackage[cmyk,hyperref]{xcolor}
1328 \else
1329  \RequirePackage[rgb,hyperref]{xcolor}
1330 \fi
1331 }%
1332
1333 %%  loading  puenc.def  will kill a lot of what  mathtext.sty  established
1334 \@ifpackageloaded{mathtext}{%
1335  \PackageWarningNoLine{pdfx}{pdfx.sty  and hyperref.sty should be loaded^^J
1336   before mathtext.sty , otherwise text symbols may not show in math mode.}%
1337 }{}
1338
1339 \newif\ifpdfx@hluatex
1340 \IfFileExists{hluatex.def}{\pdfx@hluatextrue}{\pdfx@hluatexfalse}
1341
1342 %% the "pdftex" option seems to work fine with LuaTeX
1343 \def\pdfx@luatest{\ifpdfx@hluatex luatex\else pdftex \fi}
1344
1345 %% Hyperref options for PDF/X
1346 \edef\pdfx@pdfX@opts@pdftex{%
1347    draft,pdftex,pdfpagemode=UseNone,bookmarks=false,%
1348    pdfversion=1.\thepdfminorversion,pdfstartview=}
1349 \edef\pdfx@pdfX@opts@xetex{%
1350    draft,xetex,pdfpagemode=UseNone,bookmarks=false,%
1351    pdfversion=1.\thepdfminorversion,pdfstartview=}
1352 \edef\pdfx@pdfX@opts@luatex{%
1353    draft,\pdfx@luatest,pdfpagemode=UseNone,bookmarks=false,%
1354    pdfversion=1.\thepdfminorversion,pdfstartview=}%
1355
1356 \newif\ifpdfx@hyperrefloaded
1357 \expandafter\ifx\csname ifHy@pdfa\endcsname\relax\else\pdfx@hyperrefloadedtrue\fi
```

```
%% Hyperref options for PDF/A and PDF/E
\newtoks\pdfx@tmptoks
\pdfx@tmptoks{%
\ifHy@pdfa
   \edef\pdfx@pdfAE@opts@pdftex{pdftex}%
   \edef\pdfx@pdfAE@opts@xetex{xetex,pdfversion=1.\thepdfminorversion}%
  \edef\pdfx@pdfAE@opts@luatex{\pdfx@luatest,pdfversion=1.\thepdfminorversion}%
   \edef\pdfx@pdfAE@opts@pdfmark{pdfmark,pdfversion=1.\thepdfminorversion}%
  \else
   \edef\pdfx@pdfAE@opts@pdftex{pdftex,pdfa}%
   \edef\pdfx@pdfAE@opts@xetex{xetex,pdfa,pdfversion=1.\thepdfminorversion}%
  \edef\pdfx@pdfAE@opts@luatex{\pdfx@luatest,pdfa,pdfversion=1.\thepdfminorversion}%
   \edef\pdfx@pdfAE@opts@pdfmark{pdfmark,pdfa,pdfversion=1.\thepdfminorversion}%
  \fi
}
\ifpdfx@hyperrefloaded
 \the\pdfx@tmptoks\relax
\else
 \edef\pdfx@pdfAE@opts@pdftex{pdftex,pdfa}%
 \edef\pdfx@pdfAE@opts@xetex{xetex,pdfa,pdfversion=1.\thepdfminorversion}%
\edef\pdfx@pdfAE@opts@luatex{\pdfx@luatest,pdfa,pdfversion=1.\thepdfminorversion}%
 \edef\pdfx@pdfAE@opts@pdfmark{pdfmark,pdfa,pdfversion=1.\thepdfminorversion}%
\fi
\pdfx@tmptoks{}%

\ifpdfx@x
 \@ifpackageloaded{hyperref}{%
  \ifxetex
   \expandafter\hypersetup\expandafter{\pdfx@pdfX@opts@xetex}
  \else\ifluatex
   \expandafter\hypersetup\expandafter{\pdfx@pdfX@opts@luatex}
  \else
   \expandafter\hypersetup\expandafter{\pdfx@pdfX@opts@pdftex}
  \fi\fi
 }{%
  \ifxetex
   \expandafter\RequirePackage\expandafter[\pdfx@pdfX@opts@xetex]{hyperref}
  \else\ifluatex
   \expandafter\RequirePackage\expandafter[\pdfx@pdfX@opts@luatex]{hyperref}
  \else
   \expandafter\RequirePackage\expandafter[\pdfx@pdfX@opts@pdftex]{hyperref}
  \fi\fi
 }%
\else
 \ifpdfx@e
  \@ifpackageloaded{hyperref}{%
   \ifxetex
    \expandafter\hypersetup\expandafter{\pdfx@pdfAE@opts@xetex}
   \else\ifluatex
    \expandafter\hypersetup\expandafter{\pdfx@pdfAE@opts@luatex}
   \else
```

```
    \expandafter\hypersetup\expandafter{\pdfx@pdfAE@opts@pdftex}
   \fi\fi
  }{%
   \ifxetex
    \expandafter\RequirePackage\expandafter[\pdfx@pdfAE@opts@xetex]{hyperref}
   \else\ifluatex
    \expandafter\RequirePackage\expandafter[\pdfx@pdfAE@opts@luatex]{hyperref}
   \else
    \expandafter\RequirePackage\expandafter[\pdfx@pdfAE@opts@pdftex]{hyperref}
   \fi\fi
  }%
 \else % generating PDF/A or ...
  \@ifpackageloaded{hyperref}{%
   \ifxetex
    \expandafter\hypersetup\expandafter{\pdfx@pdfAE@opts@xetex}%
   \else\ifluatex
    \expandafter\hypersetup\expandafter{\pdfx@pdfAE@opts@luatex}%
   \else
    \expandafter\hypersetup\expandafter{\pdfx@pdfAE@opts@pdftex}%
   \fi\fi
  }{%
   \ifxetex
    \expandafter\RequirePackage\expandafter[\pdfx@pdfAE@opts@xetex]{hyperref}
   \else\ifluatex
    \expandafter\RequirePackage\expandafter[\pdfx@pdfAE@opts@luatex]{hyperref}
   \else
    \expandafter\RequirePackage\expandafter[\pdfx@pdfAE@opts@pdftex]{hyperref}
   \fi\fi
  }%
\fi\fi
\hypersetup{pdfencoding=auto}%  unicode
\expandafter\ifx\csname KV@Hyp@psdextra\endcsname\relax\else
 \hypersetup{psdextra}
\fi

%% hyperref doesn't set the minor version for XeTeX
\ifxetex
 \special{pdf:minorversion \thepdfminorversion}
\fi

\ifx\xmp@CreatorTool\@empty
 \edef\xmp@CreatorTool{\@pdfcreator}
\fi

\newif\ifpdfx@cmyk
\newif\ifpdfx@custom
\ifpdfx@x   %  PDF/X  normally needs a CMYK color profile for printing
 \global\pdfx@cmyktrue
\fi
%%-------------------------------------------------------------------------
%% -----   Color Profiles  -------
%% Define how to specify the profile, so the default
```

```
%% can be over-ridden in the  .xmpdata  file.
%%
%%   --- user-command ---   RGB profile needed with  PDF/A-??
%% \setRGBcolorprofile{<filename>}{<identifier>}
%%    {<info string>}{<registry URL>}
\def\setRGBcolorprofile{%
 \begingroup
  \catcode`\_ 11\relax\catcode`\& 11\relax\catcode`\~ 11\relax
  \catcode`\% 11\relax
  \edef\({\string\(}\edef\){\string\)}%
  \pdfx@setrgbprofile}
%%
%%  --- user-command ---   CMYK profile needed with  PDF/X-??
%% \setCMYKcolorprofile{<filename>}{<output intent>}
%%    {<identifier>}{<registry URL>}
\def\setCMYKcolorprofile{%
 \begingroup
  \catcode`\_ 11\relax\catcode`\& 11\relax\catcode`\~ 11\relax
  \catcode`\% 11\relax
  \edef\({\string\(}\edef\){\string\)}%
  \pdfx@setcmykprofile}
%%
%%  --- user-command ---   DeviceGray profile needed with  PDF/E-1
%% \setGRAYcolorprofile{<filename>}{<output intent>}
%%    {<identifier>}{<registry URL>}
\def\setGRAYcolorprofile{%
 \begingroup
  \catcode`\_ 11\relax\catcode`\& 11\relax\catcode`\~ 11\relax
  \catcode`\% 11\relax
  \edef\({\string\(}\edef\){\string\)}%
  \pdfx@setgrayprofile}
%%
%%  --- user-command ---  External profile with  PDF/X-4p and PDF/X-5pg
%% \setEXTERNALprofile{<profilename>}{<output intent>}
%%    {<identifier>}{<registry URL>}{<color-space>}%
%%    {<ICC Version>}{<provider URL>}{<extra info>}{<Check Sum>}
\def\setEXTERNALprofile{%
 \begingroup
  \catcode`\_ 11\relax\catcode`\& 11\relax\catcode`\~ 11\relax
  \catcode`\% 11\relax
  \edef\({\string\(}\edef\){\string\)}%
  \ifno@iccprofile
   \expandafter\pdfx@externalprofile
   \else
    \expandafter\pdfx@externalprofile@gobble
   \fi
  }
%%
%%
\def\pdfx@setRGBcolorprofiledir#1{%
 \xdef\pdfx@RGBcolorprofiledir{#1}%
}
```

```
\def\pdfx@setCMYKcolorprofiledir#1{%
 \xdef\pdfx@CMYKcolorprofiledir{#1}%
}
\pdfx@setRGBcolorprofiledir{}
\pdfx@setCMYKcolorprofiledir{}

%% This does indeed work!  Use it in  .xmpdata  files
\providecommand{\MacOSColordir}{/System/Library/ColorSync/Profiles/}
\providecommand{\MacOSLibraryColordir}{/Library/ColorSync/Profiles/}
\providecommand{\AdobeMacOSdir}%
  {/Library/Application Support/Adobe/Color/Profiles/Recommended/}
\edef\pdfx@tmp{C:\string\Windows\string\System32\string\Spool%
  \string\Drivers\string\Color\string/}
\expandafter\providecommand\expandafter
  {\expandafter\WindowsColordir\expandafter}\expandafter{\pdfx@tmp}
%%\pdfx@setcolorprofiledir{\AdobeMacOSdir}

%% overide that value using the following commands:
\let\pdfxSetCMYKcolorProfileDir\pdfx@setCMYKcolorprofiledir
\let\pdfxSetRGBcolorProfileDir\pdfx@setRGBcolorprofiledir
%%  for back-compatibility
\let\pdfxSetColorProfileDir\pdfxSetCMYKcolorProfileDir
%%
\def\pdfx@setrgbprofile#1#2#3#4{%
 \xdef\pdfx@rgb@profile{\pdfx@RGBcolorprofiledir#1}%  valid file path/name
 \xdef\pdfx@rgb@profilename{#1}%  valid file name
 \gdef\pdfx@rgb@identifier{#2}%
 \gdef\pdfx@rgb@info{#3}%
 \pdfstringdef\pdfx@rgb@registry{#4}%  valid URL
 \endgroup
 \global\pdfx@cmykfalse
 }%  closes-off  \setRGBcolorprofile
%%
\def\pdfx@setcmykprofile#1#2#3#4{%
 \xdef\pdfx@cmyk@profile{\pdfx@CMYKcolorprofiledir#1}%  valid file path/name
 \xdef\pdfx@cmyk@profilename{#1}%  valid file name
%% \expandafter\gdef\expandafter\pdfx@cmyk@profile\expandafter
%%    {\pdfx@colorprofiledir#1}%  valid file name
 \gdef\pdfx@cmyk@intent{#2}%
%% \pdfstringdef\pdfx@cmyk@intent{#2}%  color intent
 \gdef\pdfx@cmyk@identifier{#3}%
%% \pdfstringdef\pdfx@cmyk@identifier{#3}%  text string identifier
 \gdef\pdfx@cmyk@registry{#4}%
%% \pdfstringdef\pdfx@cmyk@registry{#4}%  valid URL
 \endgroup
 \global\pdfx@cmyktrue
 }%  closes-off  \setcmykcolorprofile
%%
\def\setCUSTOMcolorprofile{%
 \begingroup
  \catcode`\_ 11\relax\catcode`\& 11\relax\catcode`\~ 11\relax
  \catcode`\% 11\relax
```

```
  \edef\({\string\(}\edef\){\string\)}%
  \pdfx@setcustomprofile
}
\def\pdfx@setcustomprofile#1#2#3#4#5#6#7#8{%
 \xdef\pdfx@customcolorprofiledir{#2}% valid directory location
 \xdef\pdfx@custom@profile{#1}%  valid file name
 \gdef\pdfx@custom@identifier{#3}%
 \gdef\pdfx@custom@registry{#4}%
 \gdef\pdfx@custom@numcolors{#5}% num-colors specifier
 \gdef\pdfx@iccversion{#6}%  Hex string for /ICCVersion < ... >
 \gdef\pdfx@custom@colornames{#7}%
 \gdef\pdfx@profile@checksum{#8}%  Hex string for /CheckSum < ... >
\endgroup
 \global\pdfx@cmykfalse
 \global\pdfx@customtrue
 }%  closes-off  \pdfx@setcustomprofile
%%
\def\pdfx@setgrayprofile#1#2#3#4{%
 \gdef\pdfx@gray@profile{#1}%  valid file name
 \gdef\pdfx@gray@intent{#2}%
 \gdef\pdfx@gray@identifier{#3}%
 \pdfstringdef\pdfx@gray@registry{#4}%  valid URL
 \endgroup}%  closes-off  \setGRAYcolorprofile
%%
\def\pdfx@externalprofile#1#2#3#4#5#6#7#8#9{%
 \gdef\pdfx@extprofile{#1}% PDF string for /ProfileName
 \gdef\pdfx@cmyk@intent{#2}% PDF string for /OutputCondition
 \gdef\pdfx@cmyk@identifier{#3}% PDF string for /OutputConditionIdentifier
 \gdef\pdfx@cmyk@registry{#4}% {http://www.color.org}%
 \gdef\pdfx@profileCS{#5}%  4 bytes for /ProfileCS
 \gdef\pdfx@iccversion{#6}%  Hex string for /ICCVersion < ... >
 \gdef\pdfx@colorURL{#7}%  URL
 \gdef\pdfx@cmyk@info{#8}%  for /Info
 \gdef\pdfx@profile@checksum{#9}%  Hex string for /CheckSum < ... >
 \endgroup}%  closes-off  \setEXTERNALprofile
\def\pdfx@externalprofile@gobble#1#2#3#4#5#6#7#8#9{%
  \PackageError{pdfx}{Wrong option for using an External Color profile}%
   {Use one of the options: x-4p , x-4p08 , x-4p10 or  x-5pg .}%
 \endgroup}
%%
%% default color profiles

{\catcode`\_ 12 \catcode`\& 12 \catcode`\~ 12
 \gdef\pdfx@xprofile@cmykdefault{coated_FOGRA39L_argl.icc}
 \gdef\pdfx@aprofile@rgbdefault{sRGB_IEC61966-2-1_black_scaled.icc}
 \gdef\pdfx@eprofile@graydefault{Gray_linear.icc}
 \gdef\pdfx@pprofile@externaldefault{FOGRA39}
}% end of \catcode
\xdef\pdfx@rgb@profile{\pdfx@aprofile@rgbdefault}
\xdef\pdfx@cmyk@profile{\pdfx@xprofile@cmykdefault}
\xdef\pdfx@gray@profile{\pdfx@eprofile@graydefault}
\xdef\pdfx@external@profile{\pdfx@pprofile@externaldefault}
```

```
%%-------------------------------------------------------------------------
%% License for the file  sRGB_IEC61966-2-1_black_scaled.icc :
%%
%% Copyright International Color Consortium, 2009  -- http://www.color.org/
%%
%% It is hereby acknowledged that the file "sRGB_IEC61966-2-1_black_scaled.icc"
%% is provided "AS IS" WITH NO EXPRESS OR IMPLIED WARRANTY.
%%
%% Licensing
%%
%% This profile is made available by the International Color Consortium,
%% and may be copied, distributed, embedded, made, used, and sold without
%% restriction. Altered versions of this profile shall have the original
%% identification and copyright information removed and shall not be
%% misrepresented as the original profile.
%%
%% Terms of use
%%
%% To anyone who acknowledges that the file "sRGB_IEC61966-2-1_black_scaled.icc"
%% is provided "AS IS" WITH NO EXPRESS OR IMPLIED WARRANTY, permission to use,
%% copy and distribute these file for any purpose is hereby granted without fee,
%% provided that the file is not changed including the ICC copyright notice tag,
%% and that the name of ICC shall not be used in advertising or publicity
%% pertaining to distribution of the software without specific, written prior
%% permission. ICC makes no representations about the suitability of this
%% software for any purpose.
%%
%%-------------------------------------------------------------------------

\newif\ifpdfx@tryoldprofiles

%%  The  colorprofiles package was added to  TeXLive  in October 2018.
%%  It allows the default Color Profiles to be maintained independent
%%  of the  pdfx  package.
%%  In particular  sRGB_IEC61966-2-1_black_scaled.icc  is no longer
%%  distributed with TeXLive 2018 and later.
%%  Older versions still have this file.
%%
\IfFileExists{colorprofiles.tex}{%
  \RequirePackage{colorprofiles}[2018/11/01]%
  \ifx\colorpro@rgb@profile\relax
    \expandafter\pdfx@tryoldprofilestrue
   \else
    \begingroup %%  \endgroup occurs within the macro expansion
     \pdfx@setrgbprofile{\colorpro@rgb@profile
     }{\colorpro@rgb@identifier
     }{\colorpro@rgb@info
     }{\colorpro@rgb@registry
     }%
    \begingroup %%  \endgroup occurs within the macro expansion
    \pdfx@setcmykprofile{\colorpro@cmyk@profile
```

```
      }{\colorpro@cmyk@intent
      }{\colorpro@cmyk@identifier
      }{\colorpro@cmyk@registry
      }%
     \expandafter\pdfx@tryoldprofilesfalse
    \fi
}{%
 \PackageWarning{pdfx}{%
   The 'colorprofiles' package is not installed correctly.^^J
   File  'colorprofiles.tex'  is missing. Proceeding without it.
 }%
 \pdfx@tryoldprofilestrue
}

{\catcode`\| 14 \catcode`\% 12 \catcode`\_ 12 \catcode`\: 12
 \catcode`\. 12 \catcode`\- 12 \catcode`\/ 12
 \edef\@bchar{\expandafter\@gobble\string\\}|
 \edef\({\string\(}\edef\){\string\)}|
\ifpdfx@tryoldprofiles
 || this will be used by TeXLive installations up to 2017.
 \begingroup | \endgroup occurs within the macro expansion
\expandafter\pdfx@setrgbprofile\expandafter
 {sRGB_IEC61966-2-1_black_scaled.icc}|
 {sRGB_IEC61966-2-1_black_scaled}|
 {sRGB IEC61966 v2.1 with black scaling}|
 {http://www.color.org}|
 \begingroup | \endgroup occurs within the macro expansion
\pdfx@setcmykprofile{coated_FOGRA39L_argl.icc}| coated_FOGRA39L_argl.icc
 {Coated FOGRA39}|
 {FOGRA39 \string\(ISO Coated v2 300%\space \string\(ECI\string\)\string\)}|
 {http://www.argyllcms.com/}|{http://www.color.org}|
\fi  ||  end of   \ifpdfx@tryoldprofiles
 \begingroup | \endgroup occurs within the macro expansion
\pdfx@setgrayprofile{Gray_linear.icc}|
 {}|
 {Custom}|
 {http://www.freedesktop.org/wiki/OpenIcc}|
\ifno@iccprofile
 \begingroup | \endgroup occurs within the macro expansion
  \pdfx@externalprofile{Coated FOGRA39 \(ISO 12647-2:2004\)}|
   {Offset commercial and specialty printing according to ISO 12647-2:2004 |
    / Amd 1, paper type 1 or 2 \(gloss or matte coated offset, 115 g/m2\), |
    screen frequency 60/cm.}|
   {FOGRA39}{http://www.color.org}{CMYK}{02100000}{http://www.adobe.com}|
   {Coated FOGRA39 \(ISO 12647-2:2004\)}{74FF62F330BF0DBE4495B5720542D511}|
\fi
}% end of \catcode

%%
%%-----------------------------------------------------------------------
%% License for the file  coated_FOGRA39L_argl.icc :
%%
```

```
%% The zlib/libpng License
%%
%% Copyright (c) 2008 Kai-Uwe Behrmann
%%
%% This software is provided 'as-is', without any express or implied
%% warranty. In no event will the authors be held liable for any damages
%% arising from the use of this software.
%%
%% Permission is granted to anyone to use this software for any purpose,
%% including commercial applications, and to alter it and redistribute
%% it freely, subject to the following restrictions:
%%
%%    1. The origin of this software must not be misrepresented; you
%%    must not claim that you wrote the original software. If you use
%%    this software in a product, an acknowledgment in the product
%%    documentation would be appreciated but is not required.
%%
%%    2. Altered source versions must be plainly marked as such, and
%%    must not be misrepresented as being the original software.
%%
%%    3. This notice may not be removed or altered from any source
%%    distribution.
%%-----------------------------------------------------------------------

\newif\ifexternalICCprofiles
\newif\ifpdfx@noXMPdata

\begingroup
%% override unneeded color-profile specifier
 \ifpdfx@x
  \ifno@iccprofile %  PDF/X-4p and PDF/X-5pg  PDF/VT-2
   \begingroup
    \def\pdfx@extprofiles@store{AdobeExternalProfiles.tex}%
    \InputIfFileExists{\pdfx@extprofiles@store}%
     {\global\externalICCprofilestrue \catcode `\# 12\relax}%
     {\typeout{** pdfx: No file \pdfx@extprofiles@store\space
       found for PDF/X-4p or PDF/X-5pg}}%
   \endgroup
  \else
   \begingroup
    \def\pdfx@profiles@store{AdobeColorProfiles.tex}%
    \InputIfFileExists{\pdfx@profiles@store}%
     {\global\externalICCprofilesfalse \catcode `\# 12\relax}%
     {\typeout{** pdfx: No file \pdfx@profiles@store\space
       found for PDF/X variants}}%
   \endgroup
%%   \def\setRGBcolorprofile#1#2#3#4{%
%%    \PackageError{pdfx}{PDF/X requires a CMYK color profile}%
%%     {Just continue using the default CMYK profile.^^J}}%
  \fi
 \else
%% load it, in case the macros are used in .xmpdata
```

```
\InputIfFileExists{AdobeColorProfiles.tex}{}{}%
\ifpdfx@e
\else
 \def\setCMYKcolorprofile#1#2#3#4{}%
 \def\setGRAYcolorprofile#1#2#3#4{}%
\fi\fi
%%
\ifluatex\else\ifxetex\else
 \inputencoding{8bit}%
\fi\fi
\makeatletter
\pdfx@localcommands
%% Do this in a box, so any stray characters don't get into TeX's lists.
\setbox0\hbox{%
 \InputIfFileExists{\jobname.xmpdata}%
  {\typeout{** pdfx: Metadata file \jobname.xmpdata  read successfully.}}%
  {\typeout{** pdfx: No file  \jobname.xmpdata .
    Metadata will be incomplete!}\aftergroup\pdfx@noXMPdatatrue}}
\endgroup
%% ------------------------------------------------------------------------

\def\pdfx@LanguageSpec{}
\def\pdfx@mainLanguage{en-US}%  absolute default
\def\pdfx@checkfor@sep#1#2\sep#3\pdfx@endparse{\def#1{#2}}
\ifx\@empty\xmp@Language\else
 \expandafter\pdfx@checkfor@sep\expandafter\pdfx@mainLanguage\xmp@Language
  \sep\pdfx@endparse
\fi
\edef\pdfx@LanguageSpec{/Lang (\pdfx@mainLanguage)}

%% ------------------------------------------------------------------------
\begingroup
 \catcode`\_ 12 \catcode`\" 12 \catcode`\' 12
 \catcode`\< 12 \catcode`\> 12 \catcode`\/ 12 \catcode`\[ 12 \catcode`\] 12
 \edef\@pctchar{\expandafter\@gobble\string\%}
 \edef\@bchar{\expandafter\@gobble\string\\}
 \edef\0{\string\0}
 \edef\({\string\(}
 \edef\){\string\)}
%%
 \def\pdfx@outcatalog@dict{%
  \pdfx@LanguageSpec
  /ViewerPreferences <</DisplayDocTitle true >>
  /OutputIntents \pdfx@outintents % needs appropriate expansion
 }%
\ifpdfx@x   %  PDF/X  needs a CMYK or RGB color profile for printing
 \ifno@iccprofile %  PDF/X-4p and PDF/X-5pg
%%
%% URL and metadata for the desired external Color Profile
%%
  \edef\pdfx@colorURL@dict{<</FS/URL/F(\pdfx@colorURL)>>}
  \def\pdfx@colorprofile@dict{<< %
```

```
1826      /CheckSum <\pdfx@profile@checksum>^^J%
1827      /ICCVersion <\pdfx@iccversion>%
1828      /ProfileCS (\pdfx@profileCS)^^J%
1829      /ProfileName (\pdfx@extprofile)^^J%
1830      /URLs [\OBJ@URLs] >>
1831    }
1832 %% How to specify the PDF objects with different drivers
1833    \ifxetex
1834     \def\OBJ@URLs{ @colorURL }%
1835     \def\OBJ@ICC{ @colorprofile }%
1836     \immediate\special{pdf:obj \OBJ@URLs \pdfx@colorURL@dict }%
1837     \immediate\special{pdf:obj \OBJ@ICC \pdfx@colorprofile@dict }%
1838    \else %  pdfTeX & LuaTeX
1839     \immediate\pdfobj{\pdfx@colorURL@dict}%
1840     \edef\OBJ@URLs{\the\pdflastobj\space 0 R}%
1841     \immediate\pdfobj{\pdfx@colorprofile@dict}%
1842     \edef\OBJ@ICC{\the\pdflastobj\space 0 R}%
1843    \fi
1844 %%  Output Intent dictionary, with object reference
1845    \edef\pdfx@outintent@dict{%
1846      /Type/OutputIntent
1847      /S/GTS_PDFX^^J
1848      /OutputCondition (\pdfx@cmyk@intent)^^J
1849      /OutputConditionIdentifier (\pdfx@cmyk@identifier)^^J
1850      /Info(\pdfx@cmyk@intent)^^J
1851      /RegistryName(\pdfx@cmyk@registry)^^J
1852 %% extra dictionary required for  PDF/X-4p and PDF/X-5pg
1853      /DestOutputProfileRef \OBJ@ICC
1854    }%
1855 %%
1856  \else  %  PDF/X-1 , PDF/X-1a , PDF/X-3 , PDF/X-4 , PDF/X-5g
1857 %%
1858    \ifpdfx@cmyk
1859     \IfFileExists{"\pdfx@cmyk@profile"}{%
1860    %  embedded CMYK color profile
1861    %%
1862    %%  Output Intent dictionary, with object reference
1863    \def\pdfx@outintent@dict{%
1864      /Type/OutputIntent
1865      /S/GTS_PDFX^^J
1866      /OutputCondition (\pdfx@cmyk@intent)^^J
1867      /OutputConditionIdentifier (\pdfx@cmyk@identifier)^^J
1868      /Info(\pdfx@cmyk@intent)^^J
1869      /RegistryName(\pdfx@cmyk@registry)
1870      /DestOutputProfile \OBJ@CMYK
1871     }%
1872    \def\pdfx@numcoords{/N 4}%
1873 %%
1874    \ifxetex
1875     \def\OBJ@CMYK{@colorprofile}%
1876     \immediate\special{%
1877       pdf:fstream \OBJ@CMYK (\pdfx@cmyk@profile) <<\pdfx@numcoords >>}%
```

```
1878  \else % pdfTeX
1879   \immediate\pdfobj stream attr{\pdfx@numcoords} file {\pdfx@cmyk@profile}%
1880   \edef\OBJ@CMYK{\the\pdflastobj\space 0 R}%
1881  \fi
1882  \pdfcatalog{%
1883   \pdfx@LanguageSpec
1884   /OutputIntents [ <<
1885   /Type/OutputIntent
1886   /S/GTS_PDFX
1887   /OutputCondition (\pdfx@cmyk@intent)%
1888   /OutputConditionIdentifier (\pdfx@cmyk@identifier)%
1889   /Info(\pdfx@cmyk@intent)%
1890   /RegistryName(\pdfx@cmyk@registry)
1891   /DestOutputProfile \OBJ@CMYK
1892   >> ]}%
1893  }{%
1894   \PackageError{pdfx}{No color profile \pdfx@cmyk@profilename\space found
1895     to use for CMYK printing colors.}%
1896     {Is this the correct directory: \pdfx@CMYKcolorprofiledir\space  ?}%
1897  }% end of \IfFileExists for CMYK
1898  \else\ifpdfx@custom
1899 %%  allow Custom profile with PDF/X-5n
1900   \IfFileExists{"\pdfx@customcolorprofiledir\pdfx@custom@profile"}{%
1901 %%  embedded Custom color profile
1902 %%
1903  %%  Output Intent dictionary, with object reference
1904  \def\pdfx@outintent@dict{%
1905    /Type/OutputIntent
1906    /S/GTS_PDFX^^J
1907    /OutputConditionIdentifier (Custom)^^J
1908    /OutputCondition (\pdfx@custom@identifier)^^J
1909    /Info(\pdfx@custom@profile)^^J
1910    /RegistryName(\pdfx@custom@registry)
1911    /Registry(\pdfx@custom@registry)
1912    /DestOutputProfileRef \OBJ@CustomDir
1913   }%
1914 \def\OBJ@CustomDir{<<
1915   \pdfx@numcoords^^J
1916    /URLs [ << /Type /Filespec ^^J/EF \OBJ@CustomFile^^J
1917     /F (\pdfx@custom@profile) /UF (\pdfx@custom@profile)  >>]^^J
1918    >>}
1919 %% need more attributes:
1920  \def\pdfx@numcoords{%
1921    /CheckSum <\pdfx@profile@checksum>^^J%
1922    /ICCVersion <\pdfx@iccversion>%
1923    /ProfileName (\pdfx@custom@profile)^^J%
1924    /ProfileCS (\pdfx@custom@numcolors)^^J%
1925    /ColorantTable [\pdfx@custom@colornames]
1926   }%
1927  \def\pdfx@custom@filespec{%
1928      /Type /EmbeddedFile >>^^J
1929      /Subtype (application/vnd.iccprofile )
```

```
1930  }%
1931 %%
1932  \ifxetex
1933   \def\OBJ@CustomFile{@colorprofile}%
1934   \immediate\special{pdf:fstream \OBJ@CustomFile
1935    (\pdfx@customcolorprofiledir\pdfx@custom@profile) <<\pdfx@custom@filespec >>}%
1936  \else % pdfTeX
1937   \immediate\pdfobj stream attr{\pdfx@custom@filespec} file %
1938     {\pdfx@customcolorprofiledir\pdfx@custom@profile}%
1939   \edef\OBJ@CustomFile{\the\pdflastobj\space 0 R}%
1940  \fi
1941  \pdfcatalog{%
1942   \pdfx@LanguageSpec
1943   /OutputIntents [ << \pdfx@outintent@dict >>]}%
1944  }{%
1945    \PackageError{pdfx}%
1946    {No color profile \pdfx@custom@profile\space found to use for Custom printing colors.}%
1947     {Is this the correct directory: \pdfx@customcolorprofiledir\space  ?}%
1948  }% end of \IfFileExists for Custom
1949  \global\pdfx@cmyktrue  % for TeX coloring
1950 %%
1951  \else  % allow RGB profile with PDF/X   ???
1952   \ifpdfx@noerr
1953    \PackageWarning{pdfx}{PDF/X normally requires a CMYK color profile.^^J
1954      Assuming RGB profile is of type 'prtr' not 'mntr'.^^J^^J}%
1955   \else
1956    \PackageError{pdfx}{PDF/X normally requires a CMYK color profile.}%
1957      {To use RGB ensure profile is of type 'prtr' not 'mntr'.^^J^^J}%
1958   \fi
1959   %  embedded RGB color profile
1960   %%
1961   %%  Output Intent dictionary, with object reference
1962   \def\pdfx@outintent@dict{%
1963     /Type /OutputIntent
1964     /S/GTS_PDFX^^J
1965     /OutputConditionIdentifier (\pdfx@rgb@identifier)^^J
1966     /DestOutputProfile \OBJ@RGB^^J
1967     /Info(\pdfx@rgb@info)^^J
1968     /RegistryName(\pdfx@rgb@registry)
1969   }%
1970   \IfFileExists{"\pdfx@rgb@profile"}{%
1971    \def\pdfx@numcoords{/N 3 /Alternate/DeviceRGB}
1972    \ifxetex
1973     \immediate\special{%
1974      pdf:fstream @colorprofile (\pdfx@rgb@profile) << \pdfx@numcoords >>}
1975     \def\OBJ@RGB{@colorprofile}%
1976    \else
1977     \immediate\pdfobj stream attr{\pdfx@numcoords} file{\pdfx@rgb@profile}%
1978     \edef\OBJ@RGB{\the\pdflastobj\space 0 R}%
1979    \fi
1980    \edef\pdfx@outintent@dict{%
1981      /Type /OutputIntent
```

```
      /S/GTS_PDFX
      /OutputConditionIdentifier (\pdfx@rgb@identifier)%
      /DestOutputProfile \OBJ@RGB
      /Info(\pdfx@rgb@info)
      /RegistryName(\pdfx@rgb@registry)
    }%
    \ifxetex
     \def\OBJ@RGB{ @colorprofile }%
     \immediate\special{%
       pdf:fstream @colorprofile (\pdfx@rgb@profile) <<\pdfx@numcoords >>}
    \else  %%     pdfTeX or LuaTeX
      \immediate\pdfobj stream attr{\pdfx@numcoords} file{\pdfx@rgb@profile}%
      \edef\OBJ@RGB{\the\pdflastobj\space 0 R}%
     \fi
   }{%
    \PackageError{pdfx}%
    {No color profile \pdfx@rgb@profilename\space found to use for RGB screen colors.}%
     {Is this the correct directory: \pdfx@RGBcolorprofiledir\space  ?}%
   }% end of \IfFileExists for RGB
   \fi % end of \ifpdfx@custom
  \fi % end of \ifpdfx@cmyk
 \fi % end of  \ifno@iccprofile
%%  end of PDF/X
\else
%%  PDF/A and PDF/E  can specify a CMYK profile
 \expandafter\ifx\expandafter\relax\pdfx@rgb@profile\relax
  \global\pdfx@cmyktrue
  \IfFileExists{"\pdfx@cmyk@profile"}{%
   \def\pdfx@numcoords{/N 4}
  %  embedded CMYK color profile
   \ifxetex
    \def\OBJ@CMYK{@colorprofile}%
   \special{pdf:fstream @colorprofile (\pdfx@cmyk@profile) <<\pdfx@numcoords >>}
   \else  %% pdfTeX or LuaTeX
    \immediate\pdfobj stream attr{\pdfx@numcoords} file{\pdfx@cmyk@profile}%
    \edef\OBJ@CMYK{\the\pdflastobj\space 0 R}%
   \fi
   \edef\pdfx@outintent@dict{%
     /Type /OutputIntent
    \ifpdfx@e
     /S/ISO_PDFE1
    \else
     /S/GTS_PDFA1
    \fi
    /OutputCondition (\pdfx@cmyk@intent)%  use this or  /Info ?
    /OutputConditionIdentifier (\pdfx@cmyk@identifier)%
    /DestOutputProfile \OBJ@CMYK
    /Info(\pdfx@cmyk@intent)%
    /RegistryName(\pdfx@cmyk@registry)
  }%
 }{%
   \PackageError{pdfx}{No color profile \pdfx@cmyk@profilename\space found
```

```
2034      to use for CMYK printing colors.}%
2035      {Is this the correct directory: \pdfx@CMYKcolorprofiledir\space  ?}%
2036  }% end of \IfFileExists for CMYK
2037  \else
2038 %%  PDF/A and PDF/E  usually need an RGB color profile for on-screen rendering
2039  \global\pdfx@cmykfalse
2040   \expandafter\IfFileExists\expandafter{\pdfx@rgb@profile}{%
2041    \def\pdfx@numcoords{/N 3 /Alternate/DeviceRGB}
2042   \ifxetex
2043     \def\OBJ@RGB{ @colorprofile }%
2044    \immediate\special{pdf:fstream @colorprofile (\pdfx@rgb@profile) <<\pdfx@numcoords >>}
2045   \else
2046     \immediate\pdfobj stream attr{\pdfx@numcoords} file{\pdfx@rgb@profile}%
2047     \edef\OBJ@RGB{\the\pdflastobj\space 0 R}%
2048   \fi
2049   \edef\pdfx@outintent@dict{%
2050     /Type /OutputIntent
2051    \ifpdfx@e
2052     /S/ISO_PDFE1
2053    \else
2054     /S/GTS_PDFA1
2055    \fi
2056     /OutputConditionIdentifier (\pdfx@rgb@identifier)%
2057     /DestOutputProfile \OBJ@RGB
2058     /Info(\pdfx@rgb@info)
2059     /RegistryName(\pdfx@rgb@registry)
2060   }%
2061  }{%
2062    \PackageError{pdfx}%
2063    {No color profile \pdfx@rgb@profilename\space found to use for RGB screen colors.}%
2064     {Is this the correct directory: \pdfx@RGBcolorprofiledir\space  ?}%
2065  }% end of \IfFileExists for RGB
2066  \fi % end of ifx  for PDF/A or PDF/E
2067 \fi % end of  ifpdfx@x
2068 %%
2069  \expandafter\ifx\csname pdfx@outintent@dict\endcsname\relax
2070  \else
2071 %%
2072 %% build the OutputIntent array
2073 %%
2074   \ifxetex
2075    \def\pdfx@outintents{ @outintentsarray }%
2076    \def\pdfx@outintentref{ @outintent@dict }%
2077    \immediate\special{pdf:obj \pdfx@outintentref << \pdfx@outintent@dict >>}
2078    \immediate\special{pdf:obj \pdfx@outintents [ ]}%
2079    \immediate\special{pdf:put \pdfx@outintents \pdfx@outintentref }%
2080   \else
2081    \immediate\pdfobj{<<\pdfx@outintent@dict>>}%
2082    \edef\pdfx@outintents{[\the\pdflastobj\space 0 R]}%
2083   \fi
2084 %%
2085 %% make the Catalog entry, if not already done
```

```
%%
  \ifx\pdfx@outcatalog@dict\relax
  \else
   \pdfcatalog{\pdfx@outcatalog@dict}%
  \fi
\fi  % end of  OutputIntent array and Catalog entry
\endgroup

%% ------------------------------------------------------------------------
%% Make a version of \xmp@Keywords and \xmp@Author where \sep has been
%% replaced by a comma. The first is for the pdf:Keywords property,
%% which accepts a comma-separated string of keywords, and seems to be
%% mandatory for PDF/A-1 compliance. The second is for the dc:creator
%% property. Although it is defined to be a sequence of authors, Adobe
%% Acrobat will in fact ignore and delete all except the first author.
%% Therefore, it's safer to always separate authors by commas.

\begingroup
 \let\pdfx@xmpunimarkup\relax
 \pdfx@xmpmarkup
 \ifluatex\else\ifxetex\else
  \inputencoding{8bit}%
 \fi\fi
 \makeatletter
 \IfFileExists{\pdfx@encodingfile}{%
  \def\cf@encoding{L8U}\fontencoding{L8U}%
 }{}%
 \let\protect\@typeset@protect
 \pdfx@xmpmarkup %%  !!!!! no longer needed
%% \xdef\xmp@@Author{\xmp@Author}% no need to expand
 \global\let\xmp@@Author\xmp@Author
 \def\sep{; }%  expand to replace \sep   !!!  no longer needed
%% \xdef\xmp@@Copyright{\xmp@Copyright}%
 \global\let\xmp@@Copyright\xmp@Copyright
%% \xdef\xmp@@Keywords{\xmp@Keywords}%
%% \global\let\xmp@@Keywords\xmp@Keywords
%% \global\let\xmp@Keywords\@empty %
 \global\let\xmp@@Keywords\@empty % don't use  pdf:Keywords
\endgroup

%% ------------------------------------------------------------------------
\def\xmp@convertDate{\pdfx@getYear}
{\catcode`\D=12 \catcode`\:=12
 \gdef\pdfx@getYear D:#1#2#3#4{\edef\pdfx@xYear{#1#2#3#4}\pdfx@getMonth}
}
\def\pdfx@getMonth#1#2{\edef\pdfx@xMonth{#1#2}\pdfx@getDay}
\def\pdfx@getDay#1#2{\edef\pdfx@xDay{#1#2}\pdfx@getHour}
\def\pdfx@getHour#1#2{\edef\pdfx@xHour{#1#2}\pdfx@getMin}
\def\pdfx@getMin#1#2{\edef\pdfx@xMin{#1#2}\pdfx@getSec}
\def\pdfx@getSec#1#2{\edef\pdfx@xSec{#1#2}\pdfx@getTZh}
\def\pdfx@getTZh{\futurelet\pdfx@next\pdfx@getTzh@branches}

```

```
{\catcode`\@=11 \catcode`\Z=12 \catcode`\+=12 \catcode`\-=12
\gdef\pdfx@getTzh@branches{%
 \ifx\pdfx@next Z\let\pdfx@getTzbranch\pdfx@getTznozone
 \else\ifx\pdfx@next +\let\pdfx@getTzbranch\pdfx@getTzplus
 \else\ifx\pdfx@next -\let\pdfx@getTzbranch\pdfx@getTzminus
 \else\let\pdfx@getTzbranch\pdfx@getTzerror
 \fi\fi\fi \pdfx@getTzbranch }

\catcode`\0=12
\gdef\pdfx@getTznozone Z#1\pdfx@getTzend{%
 \edef\pdfx@xTzh{+00}\edef\pdfx@xTzm{00}}
\gdef\pdfx@getTzplus +#1'#2'#3\pdfx@getTzend{%
 \edef\pdfx@xTzh{+#1}\edef\pdfx@xTzm{#2}%
 \ifx\relax#2\relax\def\pdfx@xTzm{00}\fi}
\gdef\pdfx@getTzminus -#1'#2'#3\pdfx@getTzend{%
 \edef\pdfx@xTzh{-#1}\edef\pdfx@xTzm{#2}%
 \ifx\relax#2\relax\def\pdfx@xTzm{00}\fi}
%%
%% How to support XeTeX here ?
\expandafter\ifx\csname pdfcreationdate\endcsname\relax
%% \xdef\pdfx@convDate{2016-04-01}%  April fool!
%% \xdef\xmp@convDate{2016-04-01}%  April fool!
\else
 \expandafter\expandafter\expandafter\xmp@convertDate\pdfcreationdate''\pdfx@getTzend
 \xdef\pdfx@convDate{\pdfx@xYear\pdfx@xMonth\pdfx@xDay\pdfx@xHour
  \pdfx@xMin\pdfx@xSec\pdfx@xTzh'\pdfx@xTzm'}%
 \xdef\xmp@convDate{\pdfx@xYear-\pdfx@xMonth-\pdfx@xDay
  T\pdfx@xHour:\pdfx@xMin:\pdfx@xSec\pdfx@xTzh:\pdfx@xTzm}%
\fi
}% end of \catcode

%% ------------------------------------------------------------------------
%% \pdfx@topdfstring\toka\tokb: Convert the string in \tokb to a format
%% appropriate for PDF /Info strings, i.e., PDFDoc encoding or UTF-16
%% encoding, and store the result in \toka As a special case, if \tokb
%% is \@empty, set \toka to \@empty.

\def\pdfx@topdfstring#1#2{%
 \ifx#2\@empty
  \global\let#1\empty
 \else
  \begingroup
   \ifluatex\else\ifxetex\else
    \inputencoding{utf8}%
   \fi\fi
   \hypersetup{pdfencoding=auto}%
   \pdfstringdef#1{#2}%
  \endgroup
 \fi
}

%% ------------------------------------------------------------------------
```

```
%% if high-bit characters are already encoded as active
%% then  \pdfstringdef  probably changes their meaning
%% so save these for later reversion.
%%
\newif\ifpdf@activechars
{\ifnum\catcode`^^c0 = 13\relax \aftergroup\pdf@activecharstrue\fi}%
%%
%% normally not used with XeTeX or LuaTeX
%%

\ifpdf@activechars
 \global\let\pdfx@save@co ^^c0\relax
 \global\let\pdfx@save@ci ^^c1\relax
 \global\let\pdfx@save@cii ^^c2\relax
 \global\let\pdfx@save@ciii ^^c3\relax
 \global\let\pdfx@save@civ ^^c4\relax
 \global\let\pdfx@save@cv ^^c5\relax
 \global\let\pdfx@save@cvi ^^c6\relax
 \global\let\pdfx@save@cvii ^^c7\relax
 \global\let\pdfx@save@cviii ^^c8\relax
 \global\let\pdfx@save@cix ^^c9\relax
 \global\let\pdfx@save@ca ^^ca\relax
 \global\let\pdfx@save@cb ^^cb\relax
 \global\let\pdfx@save@cc ^^cc\relax
 \global\let\pdfx@save@cd ^^cd\relax
 \global\let\pdfx@save@ce ^^ce\relax
 \global\let\pdfx@save@cf ^^cf\relax
 \global\let\pdfx@save@do ^^d0\relax
 \global\let\pdfx@save@di ^^d1\relax
 \global\let\pdfx@save@dii ^^d2\relax
 \global\let\pdfx@save@diii ^^d3\relax
 \global\let\pdfx@save@div ^^d4\relax
 \global\let\pdfx@save@dv ^^d5\relax
 \global\let\pdfx@save@dvi ^^d6\relax
 \global\let\pdfx@save@dvii ^^d7\relax
 \global\let\pdfx@save@dviii ^^d8\relax
 \global\let\pdfx@save@dix ^^d9\relax
 \global\let\pdfx@save@da ^^da\relax
 \global\let\pdfx@save@db ^^db\relax
 \global\let\pdfx@save@dc ^^dc\relax
 \global\let\pdfx@save@dd ^^dd\relax
 \global\let\pdfx@save@de ^^de\relax
 \global\let\pdfx@save@df ^^df\relax
 \global\let\pdfx@save@eo ^^e0\relax
 \global\let\pdfx@save@ei ^^e1\relax
 \global\let\pdfx@save@eii ^^e2\relax
 \global\let\pdfx@save@eiii ^^e3\relax
 \global\let\pdfx@save@eiv ^^e4\relax
 \global\let\pdfx@save@ev ^^e5\relax
 \global\let\pdfx@save@evi ^^e6\relax
 \global\let\pdfx@save@evii ^^e7\relax
 \global\let\pdfx@save@eviii ^^e8\relax
```

```
\global\let\pdfx@save@eix ^^e9\relax
\global\let\pdfx@save@ea ^^ea\relax
\global\let\pdfx@save@eb ^^eb\relax
\global\let\pdfx@save@ec ^^ec\relax
\global\let\pdfx@save@ed ^^ed\relax
\global\let\pdfx@save@ee ^^ee\relax
\global\let\pdfx@save@ef ^^ef\relax
\global\let\pdfx@save@fo ^^f0\relax
\global\let\pdfx@save@fi ^^f1\relax
\global\let\pdfx@save@fii ^^f2\relax
\global\let\pdfx@save@fiii ^^f3\relax
\fi

%% ----------------------------------------------------------------------
%% detect when \sep is used for multiple authors
%% then suppress the /Author field in PDF /Info
\newif\ifpdfx@sep@infield@
\let\pdfx@endparse\relax
\def\pdfx@parseforsep#1\sep#2\pdfx@endparse{%
 \pdfx@sep@infield@false
 \ifx\relax#2\relax\else\pdfx@sep@infield@true\fi
}

\begingroup
 \let\CATCODE\catcode
 \let\ENDGROUP\endgroup
 \let\GDEF\gdef
 \CATCODE`\m 12 \CATCODE`\a 12 \CATCODE`\c 12 \CATCODE`\r 12 \CATCODE`\o 12
 \CATCODE`\: 12 \CATCODE`\- 12 \CATCODE`\> 12
 \GDEF\pdfx@DOSTRIP@MACRO macro:->#1\@{#1}%
\ENDGROUP
\def\pdfx@strip@macro#1{%
  \expandafter\edef\expandafter#1\expandafter{%
    \expandafter\pdfx@DOSTRIP@MACRO\meaning#1\@}%
}

%% Convert the relevant XMP properties to PDF strings, expanding markup
%% (such as \sep, \&, \copyright, etc) in an appropriate way.
%% These PDF strings are actually not always necessary, but if supplied they
%% must match exactly what is in the XMP version. This may be impossible
%% if math symbols are used; e.g. Plane-1 alphanumerics.
%% Generally, it is better to *not* provide PDF-info strings;
%% instead just providing metadata through XMP.
%% This is not always enough â?? a driver may add it by default!
%%
%% But some PDF readers don't support XMP, so it is nice to have
%%  /Info fields, when this can be done reliably.
%%
%%  2018-12-16:   load package outside the grouping
\RequirePackage{stringenc}%
\begingroup
 \catcode`\| 0
```

```
\catcode `\\ 12
|gdef |pdfx@parsebackslash#1{%
 |begingroup
  |def |pdfx@parsemacro{#1}%
  |def |pdfx@parseout{}%
  |expandafter |pdfx@doparsebackslash#1\|pdfx@endparse
}
|gdef |pdfx@doparsebackslash#1\#2|pdfx@endparse{%
 |edef |pdfx@parseout{|pdfx@parseout#1}%
 |ifx |relax#2|relax
  |let |next |pdfx@parseend
 |else
  |edef |pdfx@parseout{|pdfx@parseout \\}%
  |def |next{|pdfx@doparsebackslash#2|pdfx@endparse}%
 |fi |next
 }
|endgroup
\def\pdfx@parseend{%
 \edef\next{\endgroup\def\expandafter\noexpand\pdfx@parsemacro{\pdfx@parseout}}%
 \next
}%
\begingroup
%% \expandafter\ifx\csname pdf@escapehex\endcsname\relax
%%  \PackageWarning{pdfx}{%
%%   Missing an implementation of \string\pdf@escapehex ^^J
%%   Translated Metadata cannot be generated as PDF strings.^^J}%
%%  \def\pdfx@GeneratePdfString#1#2{}%
%%  \def\pdfx@ConvertUTFtoBE#1#2{}%
%% \fi %%\else
 \gdef\pdfx@GeneratePdfString#1#2{%
  % converts a UTF-8 string to UTF-16be
  \StringEncodingConvert{#1}{#2}{utf8}{utf16be}%
  \edef\pdfx@tempii{#1}\relax
  \xdef#1{\string\376\string\377\pdfescapestring{\pdfx@tempii}}%
 }%
 \gdef\pdfx@ConvertUTFtoBE#1#2{%
  \setbox0=\hbox{% catch any rubbish escaping to the MVL
   \def\cf@encoding{L8U}\fontencoding{L8U}%
   \ifluatex
%%    \let\pdfescapestring\luaescapestring
   \else\ifxetex\else
    \inputencoding{8bit}%
   \fi\fi
%%   \pdfx@xmpmarkup %% don't want some things
   \pdfx@xmpunimarkup
   \let\backslash\textbackslash
   \edef\pdfx@temp{#2}% ensure XMP expands to UTF8
   \ifluatex
    \pdfx@parsebackslash\pdfx@temp
    \pdfstringdef{#1}{\pdfx@temp}%
   \else\ifxetex
     \pdfx@parsebackslash\pdfx@temp
```

```
      \pdfstringdef{#1}{\pdfx@temp}%
     \else
      \pdfx@GeneratePdfString{#1}{\pdfx@temp}%
    \fi\fi
   }% end of  \setbox
  }%
%% \fi
 \pdfx@pdfmarkup
 \global\let\pdfx@pdfAuthor\@empty
 \global\let\pdfx@pdfTitle\@empty
 \global\let\pdfx@pdfSubject\@empty
 \global\let\pdfx@pdfKeywords\@empty
 \ifpdfx@nopdfinfo  %  transliterated strings present
%% RRM: this may still work with parser macros   ???
  \expandafter\ifx\expandafter\relax\xmp@Title\relax\else
   \pdfx@ConvertUTFtoBE{\pdfx@pdfTitle}{\xmp@Title}%
  \fi
  \expandafter\ifx\expandafter\relax\xmp@Subject\relax\else
   \pdfx@ConvertUTFtoBE{\pdfx@pdfSubject}{\xmp@Subject}%
  \fi
\else %%  pdfx@nopdfinfofalse
  \expandafter\ifx\expandafter\relax\xmp@Title\relax\else
   \ifluatex
    \pdfx@ConvertUTFtoBE\pdfx@pdfTitle\xmp@Title
   \else\ifxetex
    \pdfx@ConvertUTFtoBE\pdfx@pdfTitle\xmp@Title
   \else
%%    \pdfx@GeneratePdfString\pdfx@pdfTitle\xmp@Title %  why does this fail ???
    \pdfx@ConvertUTFtoBE{\pdfx@pdfTitle}{\xmp@Title}%  ???  RRM 2019-02-17
   \fi\fi
  \fi
  \expandafter\ifx\expandafter\relax\xmp@Subject\relax\else
   \ifluatex
    \pdfx@ConvertUTFtoBE\pdfx@pdfSubject\xmp@Subject
   \else\ifxetex
    \pdfx@ConvertUTFtoBE\pdfx@pdfSubject\xmp@Subject
   \else
%%   \pdfx@GeneratePdfString\pdfx@pdfSubject\xmp@Subject %  why does this fail ???
    \pdfx@ConvertUTFtoBE{\pdfx@pdfSubject}{\xmp@Subject}% 2019-02-17
   \fi\fi
  \fi
 \fi  % end of  \ifpdfx@nopdfinfo
 \pdfx@topdfstring\pdfx@CreatorTool\xmp@CreatorTool
 \pdfx@topdfstring\pdfx@Producer\xmp@Producer
%%  \pdfescapestring  needed
%% \expandafter\ifx\csname pdfescapestring\endcsname\relax
%%  \else
    \expandafter\ifx\expandafter\relax\xmp@Author\relax
    \else
%%  check for multiple authors with parser macro
     \expandafter\pdfx@parseforsep\xmp@Author\sep\pdfx@endparse
     \ifpdfx@sep@infield@
```

```
2398      \else
2399        \pdfx@ConvertUTFtoBE{\pdfx@pdfAuthor}{\xmp@Author}%
2400      \fi %% end of  \ifpdfx@sep@infield@
2401     \fi  %%  end of  \xmp@Author  test
2402     \expandafter\ifx\expandafter\relax\xmp@Keywords\relax
2403     \else
2404 %%  check for multiple keywords with parser macro
2405      \expandafter\pdfx@parseforsep\xmp@Keywords\sep\pdfx@endparse
2406      \ifpdfx@sep@infield@
2407      \else
2408        \pdfx@ConvertUTFtoBE{\pdfx@pdfKeywords}{\xmp@Keywords}%
2409      \fi %% end of  \ifpdfx@sep@infield@
2410     \fi  %%  end of  \xmp@Keywords  test
2411 %%
2412 %%  \fi  %%  end of \pdfescapestring  test
2413 \endgroup
2414
2415 %% Affects CMap creation for certain fonts, according to glyph names
2416 %%  How to support XeTeX here ?
2417 %%  Maybe it's best to be using an updated  mmap.sty  ?
2418 \ifxetex
2419 \else
2420  \input glyphtounicode.tex
2421  \input glyphtounicode-cmr.tex
2422  \input glyphtounicode-ntx.tex
2423  \pdfgentounicode=1
2424 \fi
2425 \ifgrkLGRxmp
2426  \ifxetex\else
2427   \pdfglyphtounicode{internalchar2}{200D}%
2428 \fi \fi
2429
2430 %% patch to place accents *after* the base character, rather than before
2431 %%  based on coding from  mmap.sty  by RRM
2432 \newif\ifPDFX@inaccent
2433 \let\LTX@add@accent\add@accent
2434 \def\PDFX@add@accent#1#2{%
2435  \hmode@bgroup
2436   \let \hmode@start@before@group \@firstofone
2437   \setbox\@tempboxa\hbox{\PDFX@inaccenttrue
2438    #2\global\mathchardef\accent@spacefactor\spacefactor}%
2439   #2\kern-\wd\@tempboxa
2440 %%  \ifdim\ht\@tempboxa>1ex\relax
2441    \dimen@=\ht\@tempboxa\advance\dimen@-1ex\relax
2442 %%% reduce how much a nested accent is raised
2443    \ifPDFX@inaccent\advance\dimen@-.2ex\relax\fi
2444    \raise\dimen@\hbox to\wd\@tempboxa{\hss
2445     \accent#1{\vphantom{#2}}\hss}%
2446 %%  \else
2447 %%  \accent#1{%\vphantom{#2}
2448 %%   \vrule width\z@ height\ht\@tempboxa depth\dp\@tempboxa}%
2449 %% \fi
```

```
\egroup
\spacefactor\accent@spacefactor
}
%% same for named accents in math-mode
\def\pdfx@mathaccentV#1#2#3#4#5{%
 #5{\mathsurround=\z@\relax
  \everymath{}%
  \mathchoice
   {\setbox\z@\hbox{$\displaystyle #5$}\kern-\wd\z@}%
   {\setbox\z@\hbox{$\textstyle #5$}\kern-\wd\z@}%
   {\setbox\z@\hbox{$\scriptstyle #5$}\kern-\wd\z@}%
   {\setbox\z@\hbox{$\scriptscriptstyle #5$}\kern-\wd\z@}%
 }%
 \AMS@mathaccentV{#1}{#2}{#3}{#4}{\phantom{#5}}%
}
\AtBeginDocument{%
 \@ifpackageloaded{amsmath}{%
  \let\AMS@mathaccentV\mathaccentV
  \let\mathaccentV\pdfx@mathaccentV}%
}%

%% How to support XeTeX here ?
%%%%%  adjust accent characters to the Unicode Combining variant  %%%%
\def\PDFX@combiningchars@unicode{%
 \pdfglyphtounicode{grave}{0300}%
 \pdfglyphtounicode{acute}{0301}%
 \pdfglyphtounicode{circumflex}{0302}%
 \pdfglyphtounicode{tilde}{0303}%
 \pdfglyphtounicode{macron}{0304}%
 \pdfglyphtounicode{Macronsmall}{0304}%
 \pdfglyphtounicode{breve}{0306}%
 \pdfglyphtounicode{dotaccent}{0307}%
 \pdfglyphtounicode{Dotaccent}{0307}%
 \pdfglyphtounicode{Dotaccentsmall}{0307}%
 \pdfglyphtounicode{dieresis}{0308}%
 \pdfglyphtounicode{ogonek}{0309}%
 \pdfglyphtounicode{ring}{030A}%
 \pdfglyphtounicode{hungarumlaut}{030B}%
 \pdfglyphtounicode{caron}{030C}%
 \pdfglyphtounicode{cedilla}{0327}%
 \pdfglyphtounicode{commaaccent}{0326}%   droid
 %  tie accents in  berenisadf  lm  stix  and others
 \pdfglyphtounicode{tieaccentlowercase}{0311}%
 \pdfglyphtounicode{tieaccentcapital}{0361}%
 \pdfglyphtounicode{newtieaccentlowercase}{0311}%
 \pdfglyphtounicode{newtieaccentcapital}{0361}%
 % cm-unicode
 \pdfglyphtounicode{space_uni030D}{030D}%
 \pdfglyphtounicode{space_uni030E}{030E}%
 \pdfglyphtounicode{space_uni030F}{030F}%
 \pdfglyphtounicode{space_uni0311}{0311}%
 \pdfglyphtounicode{space_uni0321}{0321}%
```

```
\pdfglyphtounicode{space_uni0322}{0322}%
\pdfglyphtounicode{space_uni032A}{032A}%
\pdfglyphtounicode{space_uni032B}{032B}%
\pdfglyphtounicode{space_uni0335}{0335}%
\pdfglyphtounicode{space_uni0337}{0337}%
\pdfglyphtounicode{space_uni033A}{033A}%
\pdfglyphtounicode{space_uni033B}{033B}%
\pdfglyphtounicode{space_uni033C}{033C}%
\pdfglyphtounicode{space_uni034D}{034D}%
}

\def\pdfx@check@accents{%
 \ifx\add@accent\LTX@add@accent
  \let\add@accent\PDFX@add@accent
 \else
  \expandafter\ifx\csname MT@orig@add@accent\endcsname\relax
  \@ifpackageloaded{mmap}{}{%
  \pdfx@ErrorWarning{another package has patched \string\add@accent }%
   {Hit <return> to continue}{}{}}%
   \else
   \expandafter\let\csname MT@orig@add@accent\endcsname\PDFX@add@accent
 \fi\fi
 \ifxetex
 \else
  \PDFX@combiningchars@unicode
%%  this is now handled by  glyphtounicode-ntx.tex
%%  \@ifpackageloaded{newtxmath}{%
%%   \pdfglyphtounicode{vec}{20D7}%
%%    \pdfglyphtounicode{rvec}{20D6}%
%%    \pdfglyphtounicode{lrvec}{20E1}%
%%   }{}%
  \fi %  end of   \ifxetex
  \let\pdfx@check@accents\unDefiNeD
}
\AtBeginDocument{\pdfx@check@accents}

%%  suppress hyperlinks when generating  PDF/X
\def\pdfx@linkfile@pdfX#1#2#3{%
 \Hy@colorlink\@filecolor#1\Hy@xspace@end}
\def\pdfx@linkstart@pdfX#1#2#3{%
 \Hy@colorlink\@linkcolor#3\endgroup\Hy@xspace@end}
\def\pdfx@linkurl@pdfX#1#2{%
 \Hy@colorlink\@urlcolor#1\endgroup\Hy@xspace@end}
\def\pdfx@StartlinkName@pdfX#1#2{}
\def\pdfx@close@pdflink{\Hy@VerboseLinkStop\Hy@endcolorlink}%
\def\pdfx@Acrobatmenu@noaction#1#2{#2}

\ifpdfx@x
 \let\hyper@linkfile\pdfx@linkfile@pdfX
 \let\hyper@linkurl\pdfx@linkurl@pdfX
 \let\hyper@linkstart\pdfx@linkstart@pdfX
 \let\hyper@linkend\relax
```

```
\let\Hy@StartlinkName\pdfx@StartlinkName@pdfX
\let\close@pdflink\pdfx@close@pdflink
\let\AcrobatMenu\pdfx@Acrobatmenu@noaction
\Hy@bookmarksfalse
%% {\def\sep{;}% should not be needed, but just in case
 \AtBeginDocument{%
  % cancel annotations and links
  %
  \def\PDF@FinishDoc{%  ??? What uses this ???
   \begingroup
    \def\sep{; }% should not be needed, but just in case
    \pdfinfo{%
     \ifx\pdfx@pdfTitle\@empty\else /Title(\pdfx@pdfTitle)^^J\fi
     \ifx\pdfx@pdfAuthor\@empty\else /Author(\pdfx@pdfAuthor)^^J\fi
     \ifx\pdfx@pdfSubject\@empty\else /Subject(\pdfx@pdfSubject)^^J\fi
     \ifx\pdfx@pdfKeywords\@empty\else /Keywords(\pdfx@pdfKeywords)^^J\fi
      /Creator(\pdfx@CreatorTool)^^J%
     \ifx\@pdfcreationdate\@empty
      /CreationDate(D:\pdfx@convDate)%
     \else
      \ifxetex\else
       /CreationDate(\@pdfcreationdate)%
     \fi\fi
     \ifx\@pdfmoddate\@empty
      /ModDate(D:\pdfx@convDate)%
     \else
      /ModDate(\@pdfmoddate)%
     \fi
     ^^J/Producer(\pdfx@Producer)%
     /Trapped/False^^J%
     \ifnum\xmp@Part=1
      /GTS_PDFXVersion(PDF/X-1\ifnum\xmp@ReleaseDate>2001
       \xmp@Conformance\fi:\xmp@ReleaseDate)%
     \else
      /GTS_PDFXVersion(PDF/X-\xmp@Part\xmp@Conformance
       \ifnum\xmp@Part< 4 :\xmp@ReleaseDate\fi)%
     \fi
     \ifnum\xmp@Part < 3
       /GTS_PDFXConformance(PDF/X-\xmp@Part\xmp@Conformance
         :\xmp@ReleaseDate)%
     \fi
     \ifpdfx@vt
%%   support for PDF/VT extensions of  PDF/X-4 and PDF/X-5
      /GTS_PDFVTVersion(PDF/VT-\xmp@vtPart\xmp@vtConformance)%
     \fi
    }%%  end of  PDF/X  info
   \endgroup   %%  end of scope for  \sep
  }%% end of  \PDF@FinishDoc
 }% end of  \AtBeginDocument
%%  \pdfinfo{%   order of these dictionary keys should not matter
%%   \ifx\pdfx@Author\@empty\else /Author(\pdfx@Author)\fi
%%   /CreationDate(D:\pdfx@convDate)%
```

```
%%   /Creator(\pdfx@CreatorTool)%
%%   \ifnum\xmp@Part=1
%%     /GTS_PDFXVersion(PDF/X-1\ifnum\xmp@ReleaseDate>2001
%%      \xmp@Conformance\fi:\xmp@ReleaseDate)%
%%   \else
%%    /GTS_PDFXVersion(PDF/X-\xmp@Part\xmp@Conformance
%%     \ifnum\xmp@Part< 4 :\xmp@ReleaseDate\fi)%
%%   \fi
%%   \ifnum\xmp@Part < 3
%%      /GTS_PDFXConformance(PDF/X-\xmp@Part\xmp@Conformance
%%        :\xmp@ReleaseDate)%
%%   \fi
%%
%%   \ifpdfx@vt
%%%   support for PDF/VT extensions of  PDF/X-4 and PDF/X-5
%%     /GTS_PDFVTVersion(PDF/VT-\xmp@vtPart\xmp@vtConformance)%
%%   \fi
%%   \ifx\pdfx@Keywords\@empty\else /Keywords(\pdfx@Keywords)\fi
%%   /ModDate(D:\pdfx@convDate)%
%%   /Producer(\pdfx@Producer)%
%%   \ifx\pdfx@Subject\@empty\else /Subject(\pdfx@Subject)\fi
%%   \ifx\pdfx@Title\@empty\else /Title(\pdfx@Title)\fi
%%   /Trapped/False%
%%  }%  end of  PDF/X  info
%% }% end of scope for  \sep
\else
 \ifpdfx@e   %% PDF/E
  \AtBeginDocument{%
   \def\PDF@FinishDoc{%  ??? What uses this ???
    \begingroup
     \def\sep{; }% should not be needed, but just in case
     \pdfinfo{%
      \ifx\pdfx@pdfTitle\@empty\else /Title(\pdfx@pdfTitle)^^J\fi
      \ifx\pdfx@pdfAuthor\@empty\else /Author(\pdfx@pdfAuthor)^^J\fi
      \ifx\pdfx@pdfSubject\@empty\else /Subject(\pdfx@pdfSubject)^^J\fi
      \ifx\pdfx@pdfKeywords\@empty\else /Keywords(\pdfx@pdfKeywords)^^J\fi
       /Creator(\pdfx@CreatorTool)^^J%
      \ifx\@pdfcreationdate\@empty
       /CreationDate(D:\pdfx@convDate)%
      \else
       \ifxetex\else
        /CreationDate(\@pdfcreationdate)%
      \fi\fi
      \ifx\@pdfmoddate\@empty
       /ModDate(D:\pdfx@convDate)%
      \else
       /ModDate(\@pdfmoddate)%
      \fi
      ^^J/Producer(\pdfx@Producer)%
      /Trapped/False^^J%
      /GTS_PDFEVersion(PDF/E-1\xmp@Conformance:\xmp@ReleaseDate)%
     }%  end of  PDF/E  info
```

```
2658     \endgroup  %% end of scope for  \sep
2659    }% end of  \PDF@FinishDoc
2660   }% end of  \AtBeginDocument
2661 %% {\def\sep{;}% should not be needed, but just in case
2662 %%  \pdfinfo{%   order of these dictionary keys should not matter
2663 %%     \ifx\pdfx@Title\@empty\else /Title(\pdfx@Title)\fi
2664 %%     \ifx\pdfx@Author\@empty\else /Author(\pdfx@Author)\fi
2665 %%     \ifx\pdfx@Subject\@empty\else /Subject(\pdfx@Subject)\fi
2666 %%     \ifx\pdfx@Keywords\@empty\else /Keywords(\pdfx@Keywords)\fi
2667 %%   \ifx\pdfx@Author\@empty\else /Author(\pdfx@Author)\fi
2668 %%   /CreationDate(\pdfx@convDate)%
2669 %%   /Creator(\pdfx@CreatorTool)%
2670 %%   /GTS_PDFEVersion(PDF/E-1\xmp@Conformance:\xmp@ReleaseDate)%
2671 %%   \ifx\pdfx@Keywords\@empty\else /Keywords(\pdfx@Keywords)\fi
2672 %%   /ModDate(D:\pdfx@convDate)%
2673 %%   /Producer(\pdfx@Producer)%
2674 %%   \ifx\pdfx@Subject\@empty\else /Subject(\pdfx@Subject)\fi
2675 %%   \ifx\pdfx@Title\@empty\else /Title(\pdfx@Title)\fi
2676 %%   /Trapped/False%
2677 %%  }%  end of  PDF/E  info
2678 %% }% end of scope for  \sep
2679  \else  %%  PDF/A
2680   \def\pdfx@confA{a}%
2681   \def\pdfx@confB{b}%
2682   \def\pdfx@confU{u}%
2683   \expandafter\def\expandafter\xmp@conf\expandafter
2684    {\csname pdfx@conf\xmp@Conformance\endcsname}%
2685   \AtBeginDocument{%
2686    \def\PDF@FinishDoc{%  ??? What uses this ???
2687    \begingroup
2688     \def\sep{; }% should not be needed, but just in case
2689     \pdfinfo{%
2690      \ifx\pdfx@pdfTitle\@empty\else /Title(\pdfx@pdfTitle)^^J\fi
2691      \ifx\pdfx@pdfAuthor\@empty\else /Author(\pdfx@pdfAuthor)^^J\fi
2692      \ifx\pdfx@pdfSubject\@empty\else /Subject(\pdfx@pdfSubject)^^J\fi
2693      \ifx\pdfx@pdfKeywords\@empty\else /Keywords(\pdfx@pdfKeywords)^^J\fi
2694       /Creator(\pdfx@CreatorTool)^^J%
2695      \ifx\@pdfcreationdate\@empty
2696       /CreationDate(D:\pdfx@convDate)%
2697      \else
2698       \ifxetex\else
2699        /CreationDate(\@pdfcreationdate)%
2700      \fi\fi
2701      \ifx\@pdfmoddate\@empty
2702       /ModDate(D:\pdfx@convDate)%
2703      \else
2704       /ModDate(\@pdfmoddate)%
2705      \fi
2706      ^^J/Producer(\pdfx@Producer)%
2707      /Trapped/False^^J%
2708      /GTS_PDFA1Version (PDF/A-\xmp@Part\xmp@conf:\xmp@ReleaseDate)%
2709     }%  end of  PDF/A  info
```

```
2710   \endgroup  %%  end of scope for  \sep
2711  }% end of  \PDF@FinishDoc
2712 }% end of  \AtBeginDocument
2713 \fi\fi
2714
2715 %%--------------------------------------------------------------------------
2716 %%  2018-12-16:   xmpincl  needs the  ifthen  package
2717 %%  it should be loaded outside the grouping, else  biblatex  may barf
2718 %%
2719 \RequirePackage{ifthen}
2720 \begingroup
2721 %% override the \ifpdf  check of  xmpincl  package, inside the grouping
2722  \pdftrue
2723  \RequirePackage{xmpincl}
2724 %% combine coding from  xmpincl  and  hyperxml to support XeTeX
2725 \def\pdfx@xmpincl@xetex#1{%
2726  \IfFileExists{#1.xmp}{%
2727   \mcs@xmpincl@patchFile{#1}%
2728   \begingroup
2729    \special{pdf:fstream @pdfx@Metadata (#1.xmpi)
2730     <<
2731       /Type /Metadata
2732       /Subtype /XML
2733     >>
2734    }%
2735    \special{pdf:put @catalog
2736     <<
2737       /Metadata @pdfx@Metadata
2738     >>
2739    }%
2740   \endgroup
2741  }{%
2742   \newcommand{\mcs@xmpincl@filename}{#1.xmp}%
2743     \PackageError{xmpincl}%
2744     {The file \mcs@xmpincl@filename\space was not found}%
2745     {The file \mcs@xmpincl@filename\space The metadata file
2746      wasn't found.\MessageBreak Oops.}%
2747  }
2748 }
2749 \ifxetex
2750  \let\includexmp\pdfx@xmpincl@xetex
2751 \fi
2752
2753 %% macro provided by Leonardo E. Segovia on 2017-05-15
2754 %% <leonardo.segovia@cs.uns.edu.ar>
2755 \def\pdfx@xmpincl@luatex#1{%
2756  \IfFileExists{#1.xmp}{%
2757    \mcs@xmpincl@patchFile{#1}%
2758    \begingroup
2759    \pdfcompresslevel=0
2760    \immediate\pdfobj uncompressed stream attr {/Type /Metadata /Subtype /XML}
2761    file{#1.xmpi}%
```

```
2762   \pdfcatalog{%\pdfx@LanguageSpec
2763    /Metadata \the\pdflastobj\space 0 R}%
2764   \endgroup
2765 }{%
2766  \newcommand{\mcs@xmpincl@filename}{#1.xmp}%
2767   \PackageError{xmpincl}%
2768   {The file \mcs@xmpincl@filename\space was not found}%
2769   {The file \mcs@xmpincl@filename\space The metadata file
2770     wasn't found.\MessageBreak Oops.}%
2771 }
2772}
2773\ifluatex
2774 \let\includexmp\pdfx@xmpincl@luatex
2775\fi
2776
2777%%-------------------------------------------------------------------------
2778\begingroup
2779 \ifpdfx@x
2780  \ifpdfx@vt
2781   \def\xmp@template{pdfvt}%
2782  \else
2783   \def\xmp@template{pdfx}%    formerly  pdfx-1a
2784  \fi
2785 \else
2786  \ifpdfx@e
2787   \def\xmp@template{pdfe}%
2788  \else
2789   \def\xmp@template{pdfa}%
2790 \fi\fi
2791 \catcode`\'=12 \catcode`\<=12 \catcode`\>=12 \catcode`\?=12
2792 \catcode`\"=12 \catcode`\= 12 %% used within the template file
2793%% patch commands from  xmpincl.sty  ...
2794 \def\pdfx@xmpinclStart{% supply byte-order marker
2795  <?xpacket begin='^^ef^^bb^^be' id='W5M0MpCehiHzreSzNTczkc9d' ?> %
2796 }%
2797 \def\pdfx@xmpinclStartAlt{% no byte-order marker
2798  <?xpacket begin='' id='W5M0MpCehiHzreSzNTczkc9d' ?> %
2799 }%
2800 \def\pdfx@xmpinclEnd{%  allow XMP packet to be writable
2801  <?xpacket end='w'?> %
2802 }%
2803 \let\mcs@xmpinclStart\pdfx@xmpinclStart
2804 \let\mcs@xmpinclStartAlt\pdfx@xmpinclStartAlt
2805 \ifpdfx@noBOM  % don't use the byte-order marker
2806  \let\mcs@xmpinclStart\pdfx@xmpinclStartAlt
2807 \fi
2808 \let\mcs@xmpinclEnd\pdfx@xmpinclEnd
2809%% ... preventing their redefinition
2810 \def\newcommand#1#2{}%
2811%%
2812%% \def\pdfx@endeval{%
2813%%  \noexpand \TE@setvaltrue \noexpand \else
```

```
%%  \noexpand \TE@setvalfalse \noexpand \fi
%%   \noexpand \TE@negatefalse \noexpand \fi}%
%% \let\TE@endeval\pdfx@endeval
 \ifluatex\else\ifxetex\else
  \inputencoding{8bit}%
 \fi\fi
 \makeatletter
 \def\cf@encoding{L8U}\fontencoding{L8U}%
 \providecommand{\ifnot@empty}[2]{\ifx#1\@empty\relax\else#2\fi}%
 \pdfx@xmpmarkup
\expandafter\global\expandafter
  \let\csname L8U-cmd\expandafter\endcsname\csname U-cmd\endcsname
 \def\cf@encoding{L8U}\fontencoding{L8U}%
 \providecommand{\ifnot@empty}[2]{\ifx#1\@empty\relax\else#2\fi}%
 \obeyspaces%
%% beware 128 space characters -- for padding end of XMP packet
 \gdef\paddingline{
 \typeout{Using XMP template file: \xmp@template.xmp}%
 \includexmp{\xmp@template}%
\endgroup

%%
%% revert active characters to previous encoding
%%
\ifpdf@activechars
 \global\let ^^c0\pdfx@save@co
 \global\let ^^c1\pdfx@save@ci
 \global\let ^^c2\pdfx@save@cii
 \global\let ^^c3\pdfx@save@ciii
 \global\let ^^c4\pdfx@save@civ
 \global\let ^^c5\pdfx@save@cv
 \global\let ^^c6\pdfx@save@cvi
 \global\let ^^c7\pdfx@save@cvii
 \global\let ^^c8\pdfx@save@cviii
 \global\let ^^c9\pdfx@save@cix
 \global\let ^^ca\pdfx@save@ca
 \global\let ^^cb\pdfx@save@cb
 \global\let ^^cc\pdfx@save@cc
 \global\let ^^cd\pdfx@save@cd
 \global\let ^^ce\pdfx@save@ce
 \global\let ^^cf\pdfx@save@cf
 \global\let ^^d0\pdfx@save@do
 \global\let ^^d1\pdfx@save@di
 \global\let ^^d2\pdfx@save@dii
 \global\let ^^d3\pdfx@save@diii
 \global\let ^^d4\pdfx@save@div
 \global\let ^^d5\pdfx@save@dv
 \global\let ^^d6\pdfx@save@dvi
 \global\let ^^d7\pdfx@save@dvii
 \global\let ^^d8\pdfx@save@dviii
 \global\let ^^d9\pdfx@save@dix
 \global\let ^^da\pdfx@save@da
```

```
\global\let ^^db\pdfx@save@db
\global\let ^^dc\pdfx@save@dc
\global\let ^^dd\pdfx@save@dd
\global\let ^^de\pdfx@save@de
\global\let ^^df\pdfx@save@df
\global\let ^^e0\pdfx@save@eo
\global\let ^^e1\pdfx@save@ei
\global\let ^^e2\pdfx@save@eii
\global\let ^^e3\pdfx@save@eiii
\global\let ^^e4\pdfx@save@eiv
\global\let ^^e5\pdfx@save@ev
\global\let ^^e6\pdfx@save@evi
\global\let ^^e7\pdfx@save@evii
\global\let ^^e8\pdfx@save@eviii
\global\let ^^e9\pdfx@save@eix
\global\let ^^ea\pdfx@save@ea
\global\let ^^eb\pdfx@save@eb
\global\let ^^ec\pdfx@save@ec
\global\let ^^ed\pdfx@save@ed
\global\let ^^ee\pdfx@save@ee
\global\let ^^ef\pdfx@save@ef
\global\let ^^f0\pdfx@save@fo
\global\let ^^f1\pdfx@save@fi
\global\let ^^f2\pdfx@save@fii
\global\let ^^f3\pdfx@save@fiii
\fi

\endgroup

%%
%% controls the color model and conversions with  xcolor  package
%%
\ifpdfx@cmyk
 %
 % this will have been done already for PDF/X
 %
 \PassOptionsToPackage{cmyk,hyperref}{xcolor}
 \def\pdfx@handlexcolor{\def\@@mod{cmyk}\selectcolormodel{cmyk}%
   \convertcolorsUtrue\convertcolorsDtrue}
 \ifpdfx@x
 \else
%%  \AtBeginDocument{%
%%   \def\@linkcolor{0 1 1 0}%
%%   \def\@anchorcolor{0 0 0 1}%
%%   \def\@citecolor{1 0 1 0}%
%%   \def\@filecolor{.5 0 0 .5}%
%%   \def\@urlcolor{0 1 0 0}%
%%   \def\@menucolor{0 1 1 0}%
%%   \def\@runcolor{.5 0 0 .5}%
%%   \def\@linkbordercolor{0 1 1 0}%
%%   \def\@citebordercolor{1 0 1 0}%
%%   \def\@filebordercolor{.5 0 0 .5}%
```

```
%%   \def\@urlbordercolor{1 0 0 0}%
%%   \def\@menubordercolor{0 1 1 0}%
%%   \def\@runbordercolor{.7 0 0 .3}%
%%   \def\Fld@bcolor{0 0 0 0}%
%%   \def\Fld@bordercolor{0 1 1 0}%
%%  }
 \fi
\else
 \PassOptionsToPackage{rgb,hyperref}{xcolor}
 \def\pdfx@handlexcolor{\def\@@mod{rgb}\selectcolormodel{rgb}%
   \convertcolorsUtrue\convertcolorsDtrue}
\fi
\@ifpackageloaded{xcolor}{\pdfx@handlexcolor
 \ifpdfx@cmyk\else\color{black}\fi}{%
 \AtBeginDocument{\@ifpackageloaded{xcolor}{\pdfx@handlexcolor}{}}
}

%%--------------------------------------------------------------------------
%%  Disable some actions in Beamer navigation
\@ifclassloaded{beamer}{%
 \let\real@insertslidenavigationsymbol
   \insertslidenavigationsymbol
 \let\real@insertbackfindforwardnavigationsymbol
   \insertbackfindforwardnavigationsymbol
 \def\pdfx@insertslidenavigationsymbol{{%
  \let\Acrobatmenu\pdfx@Acrobatmenu@noaction
  \real@insertslidenavigationsymbol
 }}%
 \def\pdfx@insertbackfindforwardnavigationsymbol{{%
  \let\Acrobatmenu\pdfx@Acrobatmenu@noaction
  \real@insertbackfindforwardnavigationsymbol
 }}%
 \AtBeginDocument{%
  \ifHy@pdfa
   \let\insertslidenavigationsymbol
     \pdfx@insertslidenavigationsymbol
   \let\insertbackfindforwardnavigationsymbol
     \pdfx@insertbackfindforwardnavigationsymbol
  \fi}%
}{}

%%--------------------------------------------------------------------------
\ifpdfx@transliterated
%% support for bookmarks with transliterated input
 \ifxetex\let\pdf@escapehex\empty\fi  % don't need it
 \expandafter\ifx\csname pdf@escapehex\endcsname\relax
  \PackageWarning{pdfx}{%
   Missing an implementation of \string\pdf@escapehex ^^J
   Translated Bookmarks cannot be generated.^^J}%
  \newcommand{\pdfxBookmark}[4][]{#2[#1]{#4}}%
 \else
  \def\pdfx@GeneratePdfString#1#2{%
```

```
 % converts a UTF-8 string to UTF-16be
 \StringEncodingConvert{#1}{#2}{utf8}{utf16be}%
 \edef#1{\string\376\string\377\pdfescapestring{#1}}%
}
\newtoks\pdfx@DisabledCommands
\def\pdfxDisableCommands#1{%
\expandafter\pdfx@DisabledCommands
 \expandafter{\the\pdfx@DisabledCommands#1}}
\pdfxDisableCommands{%
 \def\80{}%    else   \000\( --> \000\80\050   \000\000\050
 \aftergroup\let\aftergroup\HyPsd@ConvertToUnicode\aftergroup\@gobble}
\let\Hy@@writetorep\@@writetorep
\def\pdfx@@writetorep#1#2#3#4#5{%
 \begingroup
  \pdfx@xmpunimarkup
  \pdfx@prebookmark
  \edef\pdfstringdefPreHook{%\pdfstringdefPreHook
   \the\pdfx@DisabledCommands}%
  \Hy@@writetorep{#1}{#2}{#3}{#4}{#5}%
 \endgroup
}
\newcommand{\pdfxBookmark}[4][]{%
 \ifx\relax#3\relax
  \PackageError{pdfx}{Unknown macro \string#3.
    A proper bookmark cannot be created}%
   {Proceed to process the \string#1 as usual.}%
  #2{#4}%
 \else
  \ifluatex  % use the utf8 directly
   \let\pdfx@temp#3\relax
   \def\pdfx@prebookmark{%
    \pdfx@DisabledCommands{}%
    \let#3\pdfx@temp
   }%
  \else\ifxetex  % use the utf8 directly
   \let\pdfx@temp#3\relax
   \def\pdfx@prebookmark{%
    \pdfx@DisabledCommands{}%
    \let#3\pdfx@temp
   }%
  \else
   % convert the utf8 to utf16be
   \pdfxBookmarkString\pdfx@temp{#3}%
  \fi\fi
  \let\@@writetorep\pdfx@@writetorep
  \ifx\empty#1\empty
   \def#3{#4}%
   #2{#3}%
  \else
   \def#3{#1}%
   #2[#3]{#4}%
  \fi
```

```
3022     \let\@@writetorep\Hy@@writetorep
3023    \fi
3024    \ignorespaces
3025   }
3026 %%  use as:  \pdfxBookmark{\section}{\sectAtitle}{...}
3027 %%  use as:  \pdfxBookmark[<opt-title>]{\section}{\sectAtitle}{...}
3028 %%  only needed by pdfTeX --- Lua-/XeTeX use the utf8 directly
3029   \def\pdfxBookmarkString#1#2{%
3030    \pdfx@GeneratePdfString#1{#2}%
3031    \def\pdfx@prebookmark{%
3032     \pdfxDisableCommands{\let#2#1}%
3033    }%
3034   }
3035 %% use as:  \pdfxBookmarkString\PdfSectA\sectAtitle
3036 %%  where \sectAtitle has been defined by e.g.
3037 %%  \pdfxEnableCommands{\xdef\sectAtitle{\textLGR{...}}}
3038
3039  \fi % end of \ifx\pdf@escapehex\relax
3040 \fi % end of \ifpdfx@transliterated
3041
3042 %%--------------------------------------------------------------------------
3043
3044 %% disable hyperref options,
3045 %%   to prevent changes that will cause an incompatibility
3046  \Hy@DisableOption{pdfauthor}%
3047  \Hy@DisableOption{pdftitle}%
3048  \Hy@DisableOption{pdfsubject}%
3049  \Hy@DisableOption{pdfcreator}%
3050  \Hy@DisableOption{pdfcreationdate}%
3051  \Hy@DisableOption{pdfmoddate}%
3052  \Hy@DisableOption{pdfproducer}%
3053  \Hy@DisableOption{pdfkeywords}%
3054 %% once set correctly, don't let this change
3055  \Hy@DisableOption{pdfa}\let\Hy@pdfafalse\relax\let\Hy@pdfatrue\relax
3056 \endinput
3057 %%
3058 %% End of file 'pdfx.sty'.
```

7. Index

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

Symbols

Numbers

A

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Z

8. Change History