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## Generating PDF/X- and PDF/A-compliant PDFs with pdfTeX — pdfx.sty

C. V. Radhakrishnan, Hàn Thế Thành,  
Ross Moore and Peter Selinger

### 1 Introduction

The `pdfx` package (`pdfx.sty`) currently supports generation of PDF/X- and PDF/A-compliant documents using pdfTeX, in some variants of these standards. Support for additional standards, such as PDF/E and PDF/VT is also available; the complete list is in Section 2.1 below. 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, etc.) along with the version and/or level of conformance. The 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 L<sup>A</sup>T<sub>E</sub>X 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. Section 2.2 describes how this file should be constructed.

What this package *does not* do is 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 [11] requires well-structured parts, using Form XObject sections tagged as ‘/DPart’. Similarly PDF/A-1a (and 2a and 3a) [3–5] require a fully ‘Tagged PDF’, including a detailed structure tagging which envelops the complete contents of the document. This is beyond the current version of pdfTeX, 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 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 [3–5, 12–14, 16, 17] that define different subsets of the PDF standard [1, 6]. 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 [8] intended for documents used in engineering workflows. PDF/VT [11] allows for high-volume customised form printing, such as utility bills. PDF/UA (‘Universal Accessibility’) is emerging as a standard [9, 10] 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 two of these. The others are the subject of further work; revised versions of this package can be expected in later years.

### 2 Usage

The package can be loaded with the command:

```
\usepackage[options]{pdfx}
```

where the options are as follows.

#### 2.1 Options

##### 2.1.1 PDF/A options

PDF/A is an ISO standard [3–5] 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, and 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. 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. There is no conformance level “u” in version 1 of the standard. 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’ 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 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.

### 2.1.3 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. Experimental, not fully implemented.
- **vt-2:** generate PDF/VT-2. 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 other aspects—PDFInfo declaration, metadata and color profile—of the PDF/VT variants are correctly handled.

### 2.1.4 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 known as X-1, X-1a, X-3, X-4, and X-5. (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 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.
- **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-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.

### 2.1.5 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).
- `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.

## 2.2 Data file for metadata

As mentioned above, standards-compliant PDF documents require metadata to be included. The `pdfx` package expects the metadata to be supplied in 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 `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 define at least the title and the author. Here is an example of a short `.xmpdata` file:

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

Please note that multiple authors and keywords have been separated by `\sep`. The `\sep` macro is only permitted in the `\Author`, `\Keywords`, and `\Publisher` fields.

After processing, the local directory contains a file named such as `pdfa.xmpi` or `pdfx.xmpi` according to the PDF variant required. This file is the complete XMP metadata packet. It can be checked for validity using an online validator, such as:

<http://www.pdflib.com/knowledge-base/xmp-metadata/free-xmp-validator>

## 2.3 List of supported metadata fields

Here is a complete list of user-definable metadata fields currently supported, and their meanings. More may be added in the future. These commands can only be used in the `.xmpdata` file.

### 2.3.1 General information:

- `\Author`: the document's human author. Separate multiple authors with `\sep`.
- `\Title`: the document's title.
- `\Keywords`: list of keywords, separated with `\sep`.
- `\Subject`: the abstract.
- `\Publisher`: the publisher.

### 2.3.2 Copyright information:

- `\Copyright`: a copyright statement.
- `\CopyrightURL`: location of a web page describing the owner and/or rights statement for this document.
- `\Copyrighted`: "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 can be overridden. For example, if the copyright statement is "Public Domain", this should be set to "False".

### 2.3.3 Publication information:

- `\PublicationType`: The type of publication. If defined, must be one of book, catalog, feed, journal, magazine, manual, newsletter, pamphlet. This is automatically set to "journal" if `\Journaltitle` is specified, but can be overridden.
- `\Journaltitle`: The title of the journal where the document was published.
- `\Journalnumber`: The ISSN for the publication in which the document was published.
- `\Volume`: Journal volume.
- `\Issue`: Journal issue/number.
- `\Firstpage`: First page number of the published version of the document.

- `\Lastpage`: Last page number of the published version of the document.
- `\Doi`: Digital Object Identifier (DOI) for the document, without the leading “doi:”.
- `\CoverDisplayDate`: Date on the cover of the journal issue, as a human-readable text string.
- `\CoverDate`: Date on the cover of the journal issue, in a format suitable for storing in a database field with a “date” data type.

## 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. (Encodings other than UTF-8 are not currently supported in the metadata). 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 only permitted within `\Author`, `\Keywords`, and `\Publisher`. Its intention is to separate multiple authors, keywords, etc. However, for validation purposes, multiple authors and keywords must not be truly separated. The package takes care of this, even when `\sep` is used.

It turns out that other  $\TeX$  macros can be used, provided the author is very careful and does 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.

For example, `\pdfxEnableCommands` is needed with the name of one of our authors, Hàn Th  Thanh, due to the doubly-accented letter  . 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 ...
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
```

```
\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 ‘ ’ 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  , without resorting to combining accents, wherever possible. If the metadata does not have the same, irrespective of Unicode normalisation, then validation fails.

With the latest version 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. Work is ongoing to extend this input encoding to additional languages (e.g., extended Latin, Cyrillic, Greek, etc.). 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, this can become memory intensive, so significant testing will be required before this becomes a standard part of the `pdfx` package.

## 2.5 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 L<sup>A</sup>T<sub>E</sub>X 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.

Users who wish to use a specific color profile can do so by including a `\setRGBcolorprofile` or `\setCMYKcolorprofile` command in the .xmpdata file. Note that PDF/A and PDF/E accept an RGB color profile, while PDF/X and PDF/VT require a CMYK color profile. 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 \%. The defaults are:

```
\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_arg1.icc}
  {Coated FOGRA39}
  {FOGRA39 (ISO Coated v2 300\% (ECI))}
  {http://www.argyllcms.com/}
```

Some color profile files may be obtained from the International Color Consortium; please see <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 shown in Table 1.

As of the time of writing, 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 current versions of Adobe Acrobat Pro software. It

**Table 1:** Commands for various color profiles.

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

is unclear whether the others (incl. `\IFRAXXVI` and `\IFRAXXX`) fail due to incorrect data or problems in the validation software. All but those last two can be used for valid embedded profiles, providing the corresponding files can be found. The following macro is used to set the (absolute or relative) path, on the local operating system, to the location of color profile files.

```
\pdfxSetColorProfileDir
  {<path to Adobe color profiles>}
```

## 2.6 Notes on 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, and is an XML-based format. See the Adobe XMP Development Center (<http://www.adobe.com/devnet/xmp>) for more exhaustive information about XMP. An XMP Toolkit SDK which supports the GNU/Linux, Macintosh and Windows operating systems is also provided under the modified BSD license.

Some of the metadata, such as the author, title, and keywords, are 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. All of this is taken care of automatically by the `pdfx` package.

In principle, users can resort to alternate ways to create an XMP file for inclusion in PDF. In this case, users should create a file `pdfa.xmp` or `pdfx.xmp` (etc., depending on the PDF flavor) containing the pre-defined data. 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 authors.

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

### 2.7 Tutorials and technical notes

A tutorial with step-by-step instructions for generating PDF/A files is at:

<http://www.mathstat.dal.ca/~selinger/pdfa>

Some technical notes about production problems that authors have encountered in generating PDF/A-compliant documents are at:

[http://support.river-valley.com/wiki/index.php?title=Generating\\_PDF/A\\_compliant\\_PDFs\\_from\\_pdftex](http://support.river-valley.com/wiki/index.php?title=Generating_PDF/A_compliant_PDFs_from_pdftex)

## 3 Installing

The `pdfx` package is available on CTAN as usual, via <http://ctan.org/pkg/pdfx>. It is also included in  $\text{\TeX}$  distributions such as  $\text{\TeX}$  Live and Mi $\text{\TeX}$ .

### 3.1 Limitations and dependencies

`pdfx.sty` works with pdf $\text{\TeX}$  and also Lua $\text{\TeX}$ . It further depends on the following other packages:

1. `xmpincl` for insertion of metadata into PDF.
2. `hyperref` for hyperlinking, bookmarks, etc.
3. `glyptounicode.tex` for mapping glyph names to corresponding Unicode.

### 3.2 Files included

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

#### 3.2.1 Package files

- `pdfx.sty`: main package file (from `pdfx.dtx`).
- `pdfa.xmp`: specimen `xmp` template for PDF/A.
- `pdfx.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.
- `l8uenc.def`: input encoding macro declarations.

- `glyptounicode-cmr.tex`: maps glyph names to corresponding Unicode for Computer Modern and other  $\text{\TeX}$ -specific fonts.
- `coated_FOGRA39L_arg1.icc`: CMYK color profile (freely distributable).
- `sRGB_IEC61966-2-1_black_scaled.icc`: RGB color profile (freely distributable).
- `ICC_LICENSE.txt`: license for the color profiles.
- `AdobeColorProfiles.tex`: macros for inclusion of Adobe-supplied color profiles.
- `AdobeExternalProfiles.tex`: macros for use of external color profiles.

### 3.2.2 Documentation

- `README`: usual top-level information.
- `manifest.txt`: file list.
- `sample.tex`, `sample.xmpdata`: a sample file with sample metadata.
- `small2e-pdfx.tex`, `small2e-pdfx.xmpdata`: another sample file with sample metadata.

### 3.2.3 Sources

- `src/pdfx.dtx`: literate source combining code and documentation.
- `src/pdfx.ins`: installer batch file.
- `src/rvdtx.sty`: used by `pdfx.dtx`.
- `src/Makefile`: a Makefile for building the documentation.

## 3.3 Licensing and contact

The package is released under the  $\text{\LaTeX}$  Project Public License. Bug reports, suggestions, feature requests, etc., may be sent to any of the authors at the addresses below.

## Bibliography

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- [2] Dublin Core Metadata Element Set, Version 1.1, October 2010. <http://dublincore.org/documents/dces/>
- [3] ISO 19005-1:2005; Document Management — Electronic document file format for long term preservation — Part 1: Use of PDF 1.4 (PDF/A-1); Technical Committee ISO/TC 171/SC 2 (Sept. 2005). Revisions via Corrigenda: ISO 19005-1:2005/Cor 1:2007 (March 2007); ISO 19005-1:2005/Cor 2:2011 (Dec. 2011). [http://www.iso.org/iso/catalogue\\_detail?csnumber=38920](http://www.iso.org/iso/catalogue_detail?csnumber=38920).
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- [6] ISO 32000-1:2008; Document management — Portable document format (PDF 1.7); Technical Committee ISO/TC 171/SC 2 (July 2008). Also available as [1]. [http://www.iso.org/iso/catalogue\\_detail?csnumber=51502](http://www.iso.org/iso/catalogue_detail?csnumber=51502).
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◇ C. V. Radhakrishnan  
River Valley Technologies  
Trivandrum, India 695014  
cvr (at) river-valley dot org  
<http://cvr.cc/>

◇ Hàn Thế Thành  
River Valley Technologies  
Trivandrum, India 695014  
thanh (at) river-valley dot org

◇ Ross Moore  
Mathematics Department  
Macquarie University  
Australia 2109  
ross (at) mq dot edu dot au  
<http://maths.mq.edu.au/~ross/>

◇ Peter Selinger  
Department of Mathematics and Statistics  
Dalhousie University  
Halifax, Nova Scotia B3H 4R2  
Canada  
selinger (at) mathstat dot dal dot ca  
<http://www.mathstat.dal.ca/~selinger/>