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Graphic technology — Variable printing data exchange —

Part 1:
Using PPML 2.1 and PDF 1.4 (PPML/VDX-2005)

Technologie graphique — Échange de données d'impression variables —

Partie 1: Utilisant PPML 2.1 et PDF 1.4 (PPML/VDX-2005)

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 16612-1 was prepared by Technical Committee ISO/TC 130, *Graphic technology*.

ISO 16612-1 is based on ANSI/CGATS.20-2002, *Graphic technology — Variable printing data exchange using PPML and PDF (PPML/VDX)*.

ISO 16612 consists of the following parts, under the general title *Graphic technology — Variable printing data exchange*:

— *Part 1: Using PPML 2.1 and PDF 1.4 (PPML/VDX-2005)*

Introduction

ISO 16612 defines a data format and its usage for facillitating methods of exchange of digital data for variable data printing. It focuses on the exchange of files between establishments as well as within an integrated environment that produces variable data printing. In particular, ISO 16612 is concerned with the exchange of content information as well as data representing the final appearance of customized or personalized print products to be manufactured. This part of ISO 16612 is based on the use of PPML version 2.1, PDF version 1.4, and JDF version 1.2. Subsequent parts of ISO 16612 may use later revisions of these reference documents. However, because it will be important to be able to separately identify different versions of PPML/VDX, these will be created as individual parts of ISO 16612.

This part of ISO 16612 is intended to respond to the workflow requirements associated with the efficient and reliable exchange of final form data between one or more senders or receivers. The workflows addressed by this part of ISO 16612 can differ in their degree of optimization, flexibility and level of integration. It is recognized that increasing flexibility can lead to the possibility of uncertainty or error in the interpretation of page appearance data as intended by the originator. Two conformance levels are identified that provide a reasonable balance between flexibility and predictability.

Unlike conventional digital master formats that describe the final appearance of pages of a single document, a variable document format must define many related documents and the final graphical appearance of the pages of each document. Such documents are referred to in this part of ISO 16612 as "instance documents". It is important to note that instance documents within a job may vary in page count, graphical content, page dimensions and finishing. The pages of instance documents are referred to in this part of ISO 16612 as "compound pages" where all pages of each document are defined in reader order.

Each compound page is an assembly of one or more partial pages or graphical content objects referred to in this part of ISO 16612 as "compound elements". In most cases, many compound page definitions share a common set of compound element definitions. This part of ISO 16612 takes advantage of this content data sharing by allowing compound element data to be defined once regardless of the number of times it is referenced from the various compound page definitions. This effectively minimizes the overall size of the data that need to be exchanged, to a size that is manageable for most exchange scenarios.

The layout data entity that defines the instance documents and their compound pages is referred to in this part of ISO 16612 as the "layout data" of a PPML/VDX instance, where such a file set is referred to as a "PPML/VDX instance". The layout data is defined using the *Personalized Print Markup Language* (PPML) data format, which is based on XML syntax.

The PPML layout data can also carry meta-information that characterizes the re-use of specific renderings of compound element data as they appear as graphical marks on compound pages. This re-used information is intended to provide developers and manufacturers of reader software, such as a PPML/VDX conforming print or display rendering system, with opportunities to improve the efficiency of page rasterization.

All compound element data of a PPML/VDX instance referenced from the PPML layout data must be defined in the PDF format as defined in the Adobe *PDF Reference*, or as further restricted by the ISO 15930 family of International Standards (PDF/X). More specifically, the data that define a compound element as laid out on a compound page by the PPML data is a page of a PDF file. To clarify this concept further, the pages of one or more single or multiple page PDF files are used as the compound element data in a PPML/VDX instance.

PPML/VDX enables the sender to identify the rigor with which the data being exchanged is defined and thus also identifies the areas in which the receiver is being asked to assume responsibility. This also enables the recipient of a file to clearly understand the liability assumed in accepting the file.

This part of ISO 16612 does not have a provision for specifying data specific to a given reader process or printing device. Therefore, PPML/VDX has no provision for conveying device control information such as imposition layout, trapping parameters, or any other device-specific information.

This part of ISO 16612 does, however, allow data that describe print product intent to be included in a conforming PPML/VDX instance. "Print product intent" data, as they are referred to in this document, provide information that describes various characteristics of the finished, variable print products to be manufactured in a way that is device-independent. Characteristics such as binding style, media type and folding instructions are allowed to vary per instance document and per compound page. The print product intent data of a PPML/VDX instance is defined by a restricted subset of the *JDF Specification* that is based on XML syntax.

Two conformance levels are defined in this part of ISO 16612 and are referred to as *PPML/VDX-Strict* and *PPML/VDX-Relaxed*.

PPML/VDX-Strict provides the sender with maximum control and portability of the exchanged data and is the conformance level most suitable for blind complete exchange. All information necessary for defining a complete variable data job is included in the exchanged data. All content data must be encoded as either PDF/X-1a and/or PDF/X-3 (see ISO 15930-1 and ISO 15930-3).

PPML/VDX-Relaxed is used where not all information required by the receiver to manufacture the job is required to be included in the exchanged data. Data not provided in the exchange may be submitted separately, or identified through communication between sender and receiver, and it will be the recipient's responsibility to provide the additional data and properly bind them to the PPML/VDX data. This conformance level may also make use of PDF files not conforming to the PDF/X-1a or PDF/X-3 International Standards.

The two conformance levels of PPML/VDX accommodate multiple exchange modes (including single file single transfer, multiple file single transfer and multiple file multiple transfer) while insuring reliable exchange of all data components. PPML/VDX is therefore suitable for collaborative authoring workflows where more than one sender may exchange data components of the same job with a receiver, where the receiver can reliably determine when all components of the exchanged job are under their local control.

A set of application notes for this part of ISO 16612 may be found at http://www.npes.org/standards/tools.html. In addition, pointers may be found on this site to development tools provided for the assistance of developers and users of applications prepared, based on this part of ISO 16612.

It is anticipated that a variety of products will be developed around PPML/VDX, including readers, writers and viewers of PPML/VDX files, as well as validation pre-flight tools and products that offer combinations of these features. Different products will incorporate various capabilities to prepare, interpret and process conforming files based on the application needs as perceived by the suppliers of the products. However, it is important to note that a conforming reader must be able to read and appropriately process all files conforming to a specified conformance level.

Graphic technology — Variable printing data exchange —

Part 1:
Using PPML 2.1 and PDF 1.4 (PPML/VDX-2005)

1   Scope

This part of ISO 16612 specifies the methods for the use of the Personalized Print Markup Language (PPML) and the Portable Document Format (PDF) for the exchange or identification of all elements necessary to render a variable data imaging job as intended by the sender. This part of ISO 16612 specifies document layout and content data and makes provision for product intent specifications using the Job Definition Format (e.g. paper selection, binding, finishing, etc.).

This part of ISO 16612 is not directly intended to address applications where printing is started before the file creation and transfer is complete (often called streaming applications). However, there are methods that allow it to be used for such applications.

2   Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced (including any amendments) applies.

ISO 15930-1:2001, *Graphic technology — Prepress digital data exchange — Use of PDF — Part 1: Complete exchange using CMYK data (PDF/X-1 and PDF/X-1a)*

ISO 15930-3:2002, *Graphic technology — Prepress digital data exchange — Use of PDF — Part 3: Complete exchange suitable for colour-managed workflows (PDF/X-3)*

ISO 15930-4:2003, *Graphic technology — Prepress digital data exchange using PDF — Part 4: Complete exchange of CMYK and spot colour printing data using PDF 1.4 (PDF/X-1a)*

ISO 15930-6:2003, *Graphic technology — Prepress digital data exchange using PDF — Part 6: Complete exchange of printing data suitable for colour-managed workflows using PDF 1.4 (PDF/X-3)*

Extensible Markup Language (XML) 1.0 (Second Edition), 6 October 2000, World Wide Web Consortium, *Available from internet <http://www.w3.org>*

JDF Specification, Release 1.2, 2004, CIP4 Organization, *Available from internet <http://www.CIP4.org>*

PDF Reference: Adobe Portable Document Format Version 1.4, third edition, 2001, Adobe Systems Incorporated (ISBN 0-201-75839-3) and its *errata dated 2003/06/18, available from internet <http://partners.adobe.com/asn/acrobat/docs/PDF14errata.txt>*

Personalized Print Markup Language Functional Specification, version 2.1, Print On Demand Initiative, Dated July 31, 2002, *available from internet <http://www.PODi.org>*

RFC 1321: The MD5 Message-Digest Algorithm, April 1992, Ron Rivest, *available from internet <http://www.IETF.org>*

RFC 2396: Uniform Resource Identifiers (URI): Generic Syntax, 1995, Internet Engineering Task Force, *available from internet <http://www.IETF.org>*

3   Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
compound element
single appearance entity that is a composite of one or more content types including text, graphics, line art or image data

3.2
instance document
set of related pages, the exact composition of which will vary with different applications

NOTE   Typical applications use JOB elements to represent an instance document.

3.3
JDF
Job Definition Format

3.4
layout data
meta information encoded in **PPML** (3.9) that defines all instance documents and compound page layouts and is stored as a single object either within a **PPML/VDX layout file** (3.13), or within a separate **XML** (3.18) file

3.5
MD5 checksum algorithm
computational procedure defined in RFC 1321

3.6
Portable Document Format
PDF
file format defined in the *PDF Reference*

3.7
PDF/X-1a
conformance level defined in ISO 15930-1:2001 or ISO 15930-4:2003

3.8
PDF/X-3
conformance level defined in ISO 15930-3:2002 or ISO 15930-6:2003

3.9
PPML
Personalized Print Markup Language

3.10
PPML Specification
Personalized Print Markup Language Functional Specification

3.11
PPML/VDX content file
PDF file containing pages that define one or more compound elements of a **PPML/VDX instance** (3.12)

3.12
PPML/VDX instance
set of one or more files constituting the layout, content and product intent data representing a single PPML/VDX job

3.13
PPML/VDX layout file
PDF file that contains a single PPML/VDX data stream object and one or more PDF pages

3.14
reader
software application that is able to read and appropriately process files

3.15
URI
Uniform Resource Identifier defined in RFC 2396

3.16
URL
Uniform Resource Locator defined in RFC 2396

3.17
writer
software application that is able to write files

3.18
XML
data format defined in *Extensible Markup Language (XML) 1.0 (Second Edition)*

4   Notations

PDF operators, PDF keywords, the names of keys in PDF dictionaries, and other predefined names are written in a bold sans serif type font; e.g. the **ID** key.

Operands of PDF operators or values of dictionary keys are written in an italic sans serif font; e.g. the (*PPML/VDX:2005*) value for the **GTS_PPMLVDXVersion** key defined in 6.7.

PPML element and XML element names in general are written in a bold sans serif type font, e.g. the **DOCUMENT** element.

Values of attributes of XML elements are written in an italic sans serif font.

Attribute names of PPML and XML elements are written in a bold italic sans serif font; e.g. the ***Subset*** attribute of the **CONFORMANCE** element.

Placeholders for normally variable information are written in an italic serif font.

EXAMPLE   PDF and XML fragments are written in a monospaced font and this convention overrides previously defined conventions. Within examples, use of bold font has no technical significance and is used for emphasis only.

5   Conforming files, readers and writers

This document identifies two conformance levels, PPML/VDX-Strict and PPML/VDX-Relaxed.

PPML/VDX-Strict requires that all content information be contained in either PDF/X-1a and/or PDF/X-3 data files as further restricted below. This implies that all data are present and the intended colour is fully defined; this shall be indicated by the value of the ***IntendedColor*** attribute of both the **Self** and **Binding** elements,

which shall be set to *"true"*. It is also required that the **UniqueID** and **MD5_Checksum** attributes of all **Binding** sub-elements of the **ContentBindingTable**, as defined in Annex A, are present. If the optional product intent data are also supplied in the data, the use of the print product intent specification data, as defined in Annex B, is required without the use of the user-defined semantics as defined in B.4. It further requires all XML data, including the **JDF** element and the **PPML** element, to be included in the PPML/VDX layout file as defined in Annex C, where use of either the **JDFRef** or **PPMLRef** elements is prohibited. Use of the *BaseID* attribute of the **Binding** element defined in A.2 are also prohibited in PPML/VDX-Strict.

PPML/VDX-Relaxed allows the sender and receiver to agree upon specific relaxations of the specified requirements. Specifically, any PDF file as restricted below may be used in place of PDF/X-1a and/or PDF/X-3. It may not be necessary to transfer all data, but only identify it (*UniqueID* and *MD5_Checksum* attributes of the **Binding** element may not be present), and user-defined print product intent semantics as defined in Annex B may be used. It further allows the **JDF** and **PPML** elements to be defined in separate XML data files as set out in Annex C.

A conforming PPML/VDX instance comprises one or more PDF files and up to two XML files in which those features necessary for the exchange of a PPML/VDX instance adhere to this part of ISO 16612. See Annex D.

A conforming PPML/VDX content or layout PDF file may also include other valid PDF features that do not affect the final rendered appearance of the compound element.

A conforming writer is a software application that shall be able to write files conforming to the requirements of this part of ISO 16612.

NOTE 1   For the most reliable blind exchange, it is suggested that writers generate single file PPML/VDX-Strict conforming instances.

A conforming reader is a software application that shall be able to read and appropriately process all instances conforming to this part of ISO 16612.

NOTE 2   There are no separate conformance levels for PPML/VDX-Strict and PPML/VDX-Relaxed readers.

All conforming readers shall parse all PDF files but may ignore those features not required by this part of ISO 16612.

All conforming readers shall parse all JDF data but may ignore those features not required by this part of ISO 16612.

Rendering conforming files shall be performed as defined in the *PPML Specification* and the *PDF Reference* as extended by ISO 15930-1 and ISO 15930-3. Entries in PDF objects not defined in these references shall not change the rendered result.

6   Technical requirements

6.1   Data structure

6.1.1   PDF

The PDF features not restricted by this part of ISO 16612 shall be used as prescribed in the *PDF Reference*. PDF data restrictions are specified in 6.6.

The PDF file format has a data structure that consists of four sections: header, body, cross-reference table, and trailer. The body of a PDF file contains a sequence of numbered objects such as numbers, names, strings, dictionaries, streams, text characters, graphics, images and their associated resources. The cross-reference table of the PDF file provides a reader process with efficient random access to the various objects defined within the body of the PDF file.

NOTE   For more information on the structure of a PDF file refer to the *PDF Reference*.

6.1.2 PPML

The layout data of a PPML/VDX instance shall be defined by a restricted subset of the *PPML Specification* as summarized in Annex E.

Features not restricted in 6.9 and 6.10 shall be used as prescribed in the *PPML Specification*.

The PPML data format itself has a hierarchical tree structure comprising nested node or element definitions and uses a nested XML tag syntax. Within the outermost PPML tag context are nested element definitions that define every unique document, page, and page mark. In PPML parlance, page marks are rendering contexts that describe how compound element source data (defined in this specification as PDF page objects), defined external to the PPML data stream, are to appear on a compound page with respect to location, clipping, size, rotation, and skew. If a compound element is known to occur multiple times with an equivalent appearance, hint information can be stored in the PPML mark-up data to communicate reuse knowledge to an optimized consuming process. Such prior hint information, or meta-data, allows a consuming processor to anticipate content entity reuse and make more efficient use of the computing and memory resources available to it.

NOTE   For more information on the definition of the PPML data format refer to the *PPML Specification.*

6.1.3 URI and URL

All URIs and URLs shall be created in accordance with the requirements defined in RFC 2396.

6.2 Components of a PPML/VDX instance

A PPML/VDX instance shall consist of a single PDF format PPML/VDX layout file and zero or more PDF format PPML/VDX content files.

Under the PPML/VDX-Relaxed conformance level, the file set may also include up to two XML data files, one that includes the **PPML** element, and another that includes the **JDF** element.

Under PPML/VDX-Strict all XML data must be embedded in the PPML/VDX layout file.

6.3 PPML/VDX file naming

A PPML/VDX layout file should use the file extension *.vdx*

EXAMPLE   MyVariableDataJob.vdx

A PPML/VDX content file should use the file extension .pdf

EXAMPLE   `MyContentdata.pdf`

6.4 Structure of PPML/VDX files

6.4.1 Structure of a PPML/VDX layout file

A PPML/VDX layout file shall contain exactly one embedded **PPMLVDX** element as defined in Annex C.

A PPML/VDX layout file shall contain a first PDF page that provides a visual indication that the file is a PPML/VDX layout file that will display in ways not expected by the user. This page shall not be used as a compound element referenced from the PPML data.

A PPML/VDX layout file may contain one or more additional PDF pages that may be used as compound elements referenced by the PPML layout data defined within, or referenced from, the **Layout** sub-element of the **PPMLVDX** element as defined in Annex C.

5

6.4.2 Structure of a PPML/VDX content file

A PPML/VDX content file is a PDF, PDF/X-1a or PDF/X-3 file that contains content data referenced from a PPML/VDX layout file.

6.5 Placement, orientation and interaction of compound elements

The *Position* attribute of the PPML **OBJECT** element shall define the placement of the lower left hand corner of the PDF page object's *MediaBox* regardless of the size and location of the *CropBox*.

A PPML/VDX reader shall ignore the value of the *Rotate* entry of the PDF page object.

A PPML/VDX reader shall not automatically clip to the *BleedBox*, *TrimBox*, or *ArtBox* entry of the PDF page object.

NOTE 1   It is entirely appropriate for an authoring application to specify a PPML **CLIP_RECT** derived from the PDF page *BleedBox*. Similarly the intent of the *Rotate* entry of a PDF page object can be encoded in a PPML **TRANSFORM** element.

A PPML/VDX reader shall interpret each PDF page's *Contents* entry independent of any graphic state changes made during the interpretation of the *Contents* entry of any other PDF page.

As stated in the *PPML Specification* 2.1, 5.3.1, all painting operations in the PDF content data are considered as marking the conceptual raster of an individual **MARK**. This includes fills, strokes and images, and applies even if the painting operation would have no visible effect if the PDF page comprising the **MARK** were rendered individually rather than in the context of PPML/VDX.

NOTE 2   One example of an operation that would have no visible effect is an object defined in DeviceCMYK, where C=M=Y=K=0, set to overprint, and within a context where the PDF overprint mode parameter of the extended graphics state (**OPM**) is non-zero.

The overprint state of elements within a **MARK** has no effect on the determination of the final page raster when that **MARK** is placed over another.

NOTE 3   In the terminology used in the *PPML Specification* overprinting is a case of partial transparency; thus overprinting between **MARK** elements is not supported.

6.6 PDF data restrictions

A PPML/VDX content file shall have the value for both the permanent and changing unique identifiers of the **ID** key of the PDF **trailer** dictionary set to unique identifier strings derived in accordance to the method specified in the *PDF Reference*.

NOTE 1   While the **ID** key is optional in the *PDF Reference*, it is required by this part of ISO 16612. The value of the **ID** key can be used as an alternate method of identifying the file by reference if the file name itself is changed, e.g. as a result of transmission due to differences in the originating and receiving operating systems. Refer to the *PDF Reference*, 2001, 5.16. The **ID** key and its values are required to be defined in the **trailer** dictionary of all PPML/VDX content files so that the **Binding** sub-element of the **ContentBindingTable** (defined in Annex A) can guarantee a positive binding.

The **SMask** key, if present in an **ExtGState** object or in an Image **Xobject**, shall only have the value *None*.

A **Group** object shall not be included in a **Form XObject** if it includes an **S** key with a value of *Transparency*.

The following keys, if present in an **ExtGState** object, shall have the values shown:

> **BM**   Normal or Compatible
>
> **CA**   1.0
>
> **ca**   1.0