Recording Output Intentions for Color Critical Workflows

Technical Note #5413

Version : 1.0

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January 22, 2001

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Introduction

This document describes a means for identifying the color characteristics of the intended output device associated with a PDF document. This is accomplished through an extension of the PDF Language syntax which supplements that found in the PDF Reference, version 2.0. All constructs described herein are backward compatible with the PDF 1.3 specification. As such, they may be included in compliant PDF 1.3 files.

The purpose of this document is to make this information available to software developers as early as possible. Additionally, it provides reference material for PDF/X standardardization efforts which are occurring in parallel to the development of the PDF 1.4 specification.

Most sections in this document contain information that will be added to, or replace the text in the PDF Reference, version 2.0. Other sections in this document introduce new material that will be added to the PDF 1.4 specification.

Use of OutputIntents

The **OutputIntents** array is a repository of information about the color reproduction characteristics of one or more intended output devices. In some workflows this data is provided for informational purposes only. There is no expectation that a PDF production tool would automatically convert source ICC colorant values referring to the same base color space to the specified output space prior to generating output. Nor is it necessarily desirable that they do so when working with CMYK data which is tagged with a source ICC profile only for the purposes of characterization[1]. It is possible that the **DestOutputProfile** of an output intent dictionary be used as a destination profile when converting from source color spaces which are not derived from the same base colorspace. It is possible, but not required that a PDF reading application use a profile or characterization data stored in an output intent dictionary as a target profile. Acrobat 5.0 will not make use of the **DestOutputProfile** out of the box. However, a plug-in developer could develop a tool to do so.

Output intent information may vary depending on expected reproduction workflow and the tools at the production house. For instance, one print production facility may

1. The 4-3-4 transformation performed in a CMYK conversion is likely to produce a loss of fidelity in the black component information.

accept PDF/X-1 compliant files and have tools for processing them. Another facility may use custom Acrobat plug-ins to implement their RGB workflow for document distribution on the web. Each of these scenarios may require different sets of output characterization data. Furthermore, it is possible that one PDF file may be distributed unmodified to multiple vendors for production. This format allows for the definition of multiple output intent dictionaries that may be stored simultaneously in the **OutputIntents** array. It is expected that the purchaser of final output and service provider have prior agreement on which set of information will be used in a particular production run. The language specification intentionally does not provide a selector specifying the output intent dictionary to be used at any given time.

The output intent dictionaries supplement rather than replace information found in an **ICCBased** color space or a default colorspace. These existing mechanisms are specifically used to describe the characteristics of source color component values. Output intent information used in combination with the aforementioned source profiles will provide the capability to convert ICCBased data to that required for a specific output condition and/or enable the display and/or proofing of the intended output.

Workflow Considerations

The following sections describe the expected behavior of applications which manipulate PDF documents containing **OutputIntents** constructs. Execution of the default behavior may occur without user interaction. As a general rule, the default behavior will preserve the color space definitions and color values found in the original PDF page contents.

In some cases, alternative behaviors are described. Application developers are permitted to extend the set of alternative behaviors as needed for implementation of specific workflows. Processing of the document in an alternative manner requires acceptance by the user. Techniques for gaining user acceptance may include, but are not limited to, the following:

- display of a warning dialog
- adherence to preference settings

Merging Content

Insertion into document without OutputIntents array

When content including an **OutputIntents** array is inserted into a document which omits this information, the incoming **OutputIntents** array will be discarded.

Insertion into document with different OutputIntents array

When content including an **OuputIntents** array is merged into a document which contains different output intent information, the incoming **OutputIntents** array is discarded.

Upon consulting the user, the application may do one or more of the following:

- May tag or modify the incoming color information so that is usable in the condition which it is being incorporated.
- Individual output intent dictionaries from the source document may be added to the recipient document providing they are wholly independent of those already existing in the recipient.
- Remove the **OutputIntents** array in the recipient document.

Insertion of content which does not contain OutputIntents

When content that does not specify **OutputIntents** is inserted into a document which does, it does not modify the content of **OutputIntents** array in recipient document. It inherits the identified output conditions.

Branching

When content is extracted from a PDF file containing an **OutputIntents** array entry in the Catalog, this information should be duplicated in the extracted PDF file.

Referencing Content

When consuming referenced PDF content, **OutputIntents** specified in referenced content will be overridden by the specification in the referencing document.

Pre-flight tools may want to identify situations where this would cause loss of fidelity.

Generators of content which is intended to be referenced by other PDF content may find it desirable to identify the intended output condition through the **OutputIntents** mechanism particularly when they are including uncharacterized source data. This provides a means for the consumer to determine whether the actual output conditions are suitable for the source data.

Placing Content

When a PDF containing **OutputIntents** is placed into another document by an aggregating application, the consumer may ignore and/or discard the source **OutputIntents** and simply inherit the intended output conditions of the aggregated document.

A more robust implementation could offer to convert and/or tag colorant values if a destination profile is provided and it does not match the calibration of source data in

the document. If device colorants are specified in the content they may be tagged with the characterization specified in a source **OutputIntents** dictionary. An aggregating application may choose to pre-flight for such conditions.

Defining OutputIntents

Additions to the Catalog

The **OutputIntents** array found in the **Catalog** describes one or more possible output conditions for the entire document. Each output condition is identified with a separate dictionary entry in the **OutputIntents** array. The individual output intent dictionaries found in the array may vary in form and content. Each subordinate output intent dictionary must contain a value for the **S** key which is used to uniquely identify the form and content.

TABLE 1.1 Additions to Catalog

Key	Type	Semantics
OutputIntents	Array	(Optional) Describes one or more intended output conditions applicable to the entire document.

Known forms of Output Intent Dictionaries

Below we describe known forms of output intent dictionaries. The form and content of various output intent dictionaries will be uniquely identified by the value in the **S** key which is required. The value for the **S** key should conform to the guidelines described in Appendix E.

Definition of PDF/X Output Intent Dictionary

The table below describes one form of an output intent component dictionary. It contains the information used by a PDF/X based workflow system. These contents will be found associated with the **S** key having a value of *GTS_PDFX* in the output intent dictionary. This document describes the general syntax requirements for use of a PDF/X output intent dictionary. The PDF/X family of international standards (ISO 15930) identifies multiple conformance levels. At any level, the PDF/X standard may prescribe further restrictions on the use of certain keys and their associated

semantics. Compliance with such standards requires that precedence be given to the requirements stated therein.

The PDF/X family of international standards allows PDF creators to include a specific output profile or identify a printing condition by name. Use of a profile explicitly describes the color capabilities of the intended output device insuring that the intended printing condition matches, or is appropriate for, the named condition. The ICC Characterization Data Registry of standard printing conditions describes printing conditions for which a set of characterization data is separately identified. When the **OutputConditionIdentifier** field is present in a GTS_PDFX output intent dictionary, the consuming workflow system is responsible for insuring that the intended output condition matches or is appropriate for the named condition.

When all source data in the page content is characterized and the contents of the **OutputConditionIdentifier** match an entry in an industry standard output condition registry, such as the ICC Characterization Data Registry of standard printing conditions, inclusion of the profile data in the **DestOutputProfile** key is optional. If a non-standard condition is identified, such as *Custom*, an ICC profile shall be included in the **DestOutputProfile** and a free form description is required in the **Info** key. It is recommended that creators provide a human readable description in the OutputCondition in order facilitate display in a user interface.

The device to PCS (AToB) transform found in a **DestOutputProfile** can be used to enable the remapping of the uncharacterized source color values having a similar base color space to some other destination color space. A typical use of this would be for screen preview or hardcopy proofing. The default behavior of the Acrobat 5.0 application does not make use of this mechanism.

TABLE 1.2 PDF/X Output Intent Dictionary

Key	Type	Semantics
Type	Name	(Required) Object type. The value must be *OutputIntent*
S	Name	(Required) The output intent subtype. The remaining entries below apply to this type. At present, *GTS_PDFX* is the only valid type. Future extensions may introduce other types, which will most likely have a different set of additional entries.

TABLE 1.2 PDF/X Output Intent Dictionary

Key	Type	Semantics
DestOutputProfile	ICCProfile/stream	(Optional in presence of **OutputConditionIdentifier**. Otherwise required.) Any valid bi-directional ICC profile which describes the transformation to device colorants. NOTE: This is not an ICCBased colorspace definition, but rather an ICC Profile stream as described in table 4.16. When used in this context the restriction described therein for output colorspaces are applicable.
OutputConditionIdentifier	String	(Required.) Identification of the intended output condition. It may be the name of a printing condition maintained in an industry standard registry. This field should be human or machine readable. It may be used for presentation in the user interface when the **OutputCondition** key is not defined. The value Custom is recommended for situations where the condition is not an established standard. This indicates that the consuming application should use information in the **Info** key to further identify the intent.
RegistryName	String	(Optional) A string specifying the registry where the **OutputConditionIdentifier** is defined. Conventionally, this is a URI.
OutputCondition	TextString	(Optional) Concise identification of the output condition in the form of a text string that is human readable. It is the intended and preferred key for use in user interface presentation of this information. It may be localized.
Info	TextString	(Optional) Additional information or comments about the output condition.

Changes to restriction on ICC profile stream attributes

The existing description of table 4.16 and associated text in the PDF Reference, version 2.0, identifies a number of restrictions on the contents of an ICC profile stream which arise from the need to use it as a source color space. Those restrictions do not apply to a profile used as a DestOutputProfile.

The following tables and paragraphs describe additions and changes to the existing reference material.

TABLE 1.3 Modifications to table 4.16

Key	Type	Semantics
Alternate	Array or Name	NOTE: *Change to Optional and add the following to the beginning of the description:* (Optional) An alternate source color space to be used in case the one specified in the stream data is not supported. NOTE: *Add the following at the start of the second paragraph:* Note that there is no conversion of source color data when using the alternate color space. NOTE: *Add the following to the end of the second paragraph:* The alternate value is ignored when the stream describes an output colorspace.

Last paragraph on page 175

Reword first sentence of the paragraph as follows:

When the **ICCBased** color space is being used as a source color space, the “toCIE” profile information (AtoB in ICC terminology) is used; The “from CIE” (BToA) information is used only for destination profiles such as those found in the **OutputIntents** entry of the catalog.

Example OutputIntents array

EXAMPLE 1.1 OutputIntents Array using Industry Standard Identifier

```
24 0 obj                                % ICC Profile stream
<<
     /N 4
     /Length 1605
     /Filter      /ASCIIHexDecode
>>
stream
00 00 02 0C 61 70 ....
endstream
endobj

/OutputIntents [
<<
     /Type        /OutputIntent
     /S           /GTS_PDFX
     /DestOutputProfile              24 0 obj
     /OutputConditionIdentifier      (CGATS TR 001)
     /OutputCondition                (CGATS TR 001 \(SWOP\))
     /RegistryName                   (http://www.color.org)
>>
]
```

EXAMPLE 1.2 OutputIntents Array using Custom Identifier

```
/OutputIntents [
<<
     /Type        /OutputIntent
     /S           /GTS_PDFX
     /DestOutputProfile              24 0 obj
     /OutputConditionIdentifier      (Custom)
     /OutputCondition                (Coated)
     /Info                           (Coated 150lpi)
>>
]
```