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Foreword

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This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 28, *Office equipment*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html and www.iec.ch/national-committees.

Introduction

This document applies to the distribution of print settings profiles to large format colour inkjet printers.

An important consideration of a printer controller for a colour printer is the ability to apply colour management. This is especially the case for commercial printing where the output products should be of sellable quality.

The process of colour management is typically accomplished through the use of print settings profiles, sometimes referred to as a “colour profile”.

A print settings profile is created by printing out swatches or charts, measuring them using colour measurement devices, and using the measurement data to generate the settings and calibration data.

Ideally a separate print settings profile should be created for each situation comprising of at least the following: type or make and model of the print medium; print mode; make and model and version of the controlling software; and environmental factors such as temperature and humidity. That is because each of these elements may substantively affect the content of the print settings profile. It can also be necessary to create a separate profile for intellectual property, licensing, or legal reasons.

However, it is not always possible or feasible to obtain a print settings profile through this method of printing and measurement because of issues with cost, time, expertise, etc.

Another way to obtain a profile is to download a pre-made one from the Internet. This typically involves browsing or manually searching for a profile, downloading it if it is available, then installing it in the printer controller if possible.

This document describes a method to acquire pre-made print settings profiles from the Internet in a more seamless and automated fashion. The primary benefit of this method is to save time and reduce the likelihood of error for the printer operators.

This method is especially useful for large format inkjet printers due to several reasons:

- they tend to be used for printing on a variety of print media;
- they typically already have printer controllers with sophisticated colour management;
- they typically have skilled operators;
- they are typically used for commercial purposes.

This method might apply to other types of printers as well, but it is not clear at the moment. There might be additional parts to this document that cover those types of printers at a later time.

In the future, there is a possibility that print settings profiles can be computationally generated for each situation through a combination of ‘big data’ and AI technologies, bypassing the need for pre-made profiles.

There is also a possibility that print settings profiles can factor in more situational parameters, such as different illuminant or observer conditions.

Information technology — Office equipment — Automated colour profile distribution

1 Scope

This document specifies a method of automated colour profile distribution to large format inkjet printers.

This document applies to digital colour printers and their printer controllers for which ICC colour management is necessary or desired. This document also applies to the print settings profile providers.

The extent of automation covered includes the printer controller acquiring information about the overall situation, connecting to a print settings profile provider on the Internet, determining the best possible profile to download (if it exists), and downloading and installation of the profile.

This document covers general concepts and procedures and does not go into a level of detail necessary to establish syntactic or semantic interoperability. This document covers ICC version 4 output profiles as specified by ISO 15076-1, but does not cover device link profiles.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
credential
private information required for authentication and authorization

3.2
automated
operated with minimal or no human intervention

3.3
colour management
communication of the associated data required for unambiguous interpretation of colour content data, and application of colour data conversions, as required, to produce the intended reproductions

Note 1 to entry: Colour content can consist of text, line art, graphics, and pictorial images, in raster or vector form, all of which can be colour managed.

Note 2 to entry: Colour management considers the characteristics of input and output devices in determining colour data conversions for these devices.

[SOURCE: ISO 15076-1:2010, 3.1.11]

3.4
print settings profile provider
software and hardware system designed to distribute *print settings profiles* (3.10)

3.5
complete print medium name
identifier for *print medium* (3.9) having unique reproduction characteristics

Note 1 to entry: This often includes the manufacturer brand and model brand name and may require additional qualifications.

3.6
ICC profile
digital file formatted in accordance with ISO 15076-1:2010

3.7
colourant set
identifier for colourants having unique reproduction characteristics

Note 1 to entry: Usually this often includes the manufacturer brand and model brand name and may require additional qualifications.

3.8
colourant setting
setting related to colourant restrictions or other colourant-related options as typically set in *printer controllers* (3.12)

3.9
print medium
material or sets of materials to be loaded into a printer and printed on

Note 1 to entry: The plural version of this term is print media.

3.10
print settings profile
digital file that is or contains an ICC output profile along with *colourant settings* (3.8) and optional additional metadata

3.11
print mode
mode of printing that usually implies some specific printer resolution and/or number of passes

3.12
printer controller
hardware, firmware, and software that collectively controls a printer, including managing colour

3.13
roll medium
medium in roll form

3.14
sheet medium
medium in rectangular sheet form that may be flexible, semi-rigid, or rigid

3.15
application programming interface
API
set of well-defined methods, functions, protocols, routines or commands which application software uses with facilities of programming languages to invoke services

Note 1 to entry: An API is available for different types of software, including Web-based system/ecosystem.

[SOURCE: ISO/TS 23029:2020, 3.1]

4 Preliminary requirements

The printer controller shall be capable of applying a print settings profile to ensure intended colour reproduction.

The printer controller shall also be able to connect to and make a request to a server. It shall be able to download and store print settings profiles.

The print settings profile provider shall include all settings needed for colour management (besides the ICC output profile) in its print settings profiles. This can include but is not limited to individual and total ink limits, resolution, pass mode, and print direction.

5 Overall situation

5.1 Flow of information

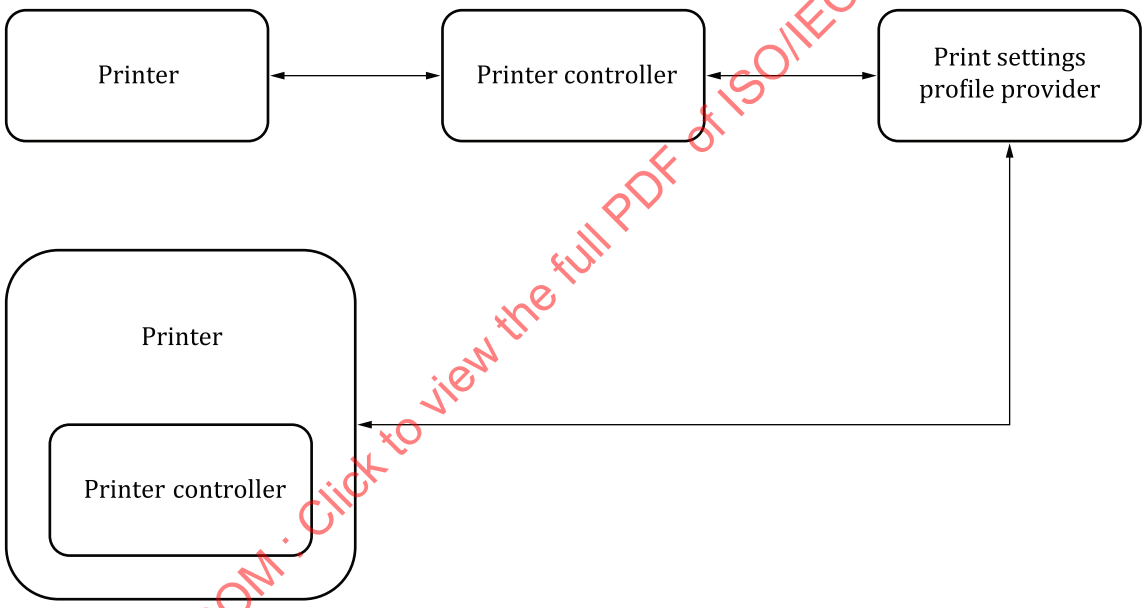

Figure 1 — Two arrangements for a printer controller

As shown in Figure 1, the printer controller can be external to a printer or it can be within a printer. The arrows indicate the flow of information to and from each entity.

The printer controller shall have information about the overall situation it is in, in order to effectively communicate to a print settings profile provider.

5.2 Medium identification

The complete print medium name of the medium loaded into the printer shall be either found automatically by or specified manually into the printer controller.

NOTE 1 In some cases, a roll medium has an identification device or chip attached to the inside of its core.

NOTE 2 In some cases, a sheet medium is packaged with a machine-readable identification label, device or chip.

5.3 Colourant identification

The colourant set loaded into the printer shall be either found automatically by or specified manually into the printer controller.

NOTE In most cases, the cartridge, bag, or other container containing the colourant contains identification information for the colourant set.

5.4 Printer controller identification

The printer controller shall have information about its version and the version information of any constituent components, such as firmware, printer driver, and raster image processing engine, where available.

5.5 Environment

The printer controller should provide information about the atmospheric environment, such as temperature, relative humidity, and barometric pressure, where such information is available.

6 Communicating with a print settings profile provider

The printer controller shall identify and include the URI for one or more print settings profile providers to communicate with. This information should be checked regularly and updated when necessary.

NOTE Multiple print settings profile providers can be handled in various ways. Through pre-defined custom rules, the printer controller can choose only one of the providers to contact. These rules can take into account such factors as the complete print medium name and the colourant set.

Alternatively, the printer controller can concurrently contact all print settings profile providers at once. How to handle results from multiple providers is described in 8.3.

The printer controller may provide information used for identification or authentication purposes, such as credentials, serial number, etc. to at least one of the print settings profile providers.

Communication shall be established between the printer controller and the print settings profile provider, including any identification and authentication that is required. The information described in Clause 5 shall then be submitted to the print settings profile provider(s).

7 Requirements for a print settings profile provider

7.1 API endpoint

The print settings profile provider shall provide an API endpoint on the internet that a printer controller may communicate with.

7.2 Authentication and authorization

The print settings profile provider may authenticate an API call based on the printer controller's sent identity and/or authentication information.

Based on any identity information given, the print settings profile provider may then determine what data the printer controller is authorized to be given. This would be based on the print settings profile provider's business logic. That business logic in turn may be based on a pre-defined contractual agreement between the print settings profile provider and the printer controller's manufacturer.

7.3 Storage

The print settings profile provider shall have or have access to a database, data hub, or file repository containing print settings profiles.

7.4 Versioning

The print settings profile provider shall provide a versioning (i.e. revision history) system where older versions of profiles are persistently and separately stored alongside the most current version. Each version shall be date-stamped with the date and time that the version was stored; as well as the date and time that the version was created if available. If the date and time that the version was created is not available, it shall be set as the same date and time as when it was stored.

NOTE The date and time that the version was created can be obtained from the header of the ICC output profile.

7.5 Compatibility

The print settings profile provider should be aware of how a print settings profile applies to a variety of different situations besides just the situation it was created for. For example, it can be aware that some set of profiles might be compatible with all of a particular series of printers rather than just one printer in that series. So, if a profile were created with printer A, and printer B is identical to printer A except wider, then that profile could also be compatible with printer B.

7.6 Filtering

Based on the information given in Clause 5 by the printer controller along with compatibility information, the print settings profile provider shall search and filter for print settings profiles that would apply to the printer controller's situation.

7.7 Selection

If, for a given print mode, there are multiple compatible profiles found for the printer controller's situation, the print settings profile provider shall decide through pre-defined logic which one profile to select. An example of such logic is to pick the most recently created or updated profile.

7.8 Delivery capability

The print settings profile provider shall deliver profiles reliably and should deliver them quickly and securely. In particular, the print settings profile provider is recommended to accommodate the ability to pause and restart downloads on the printer controller side. Information about the creation date and time shall be included with the profile.

8 Selection, downloading and installation

8.1 No-result scenario

If every print settings profile provider reports back to the printer controller that there are no compatible results, then nothing is downloaded or installed. The printer controller may report to the user that no suitable profile is found through its automated system. The user can then be prompted to perform alternative actions, such as use a built-in generic print settings profile within the printer controller.

Alternatively, the printer controller may automatically fall back to using a built-in generic print settings profile and may or may not inform the user about this action. In this case, the printer controller shall have an algorithm that intelligently selects the appropriate generic profile.

When a print settings profile provider receives a request for which there are no compatible results, the request may be logged by the print settings profile provider and used to improve the print settings profile provider's profile variety and selection. It is recommended to log at least the information described in Clause 5 for each of these requests.

8.2 Print mode selection

The user may choose, through their printer controller, to always download all available print settings profiles for all possible print modes given their situation.

Alternatively, the user may pick and choose which specific print modes are to be downloaded. This capability would be useful where the Internet connection may be slow or unreliable.

8.3 Handling results from multiple print settings profile providers

NOTE This assumes that the concurrent contact method from Clause 6 is used.

If the printer controller receives notice that there are multiple compatible profiles each from different print settings profile providers for a given print mode, then the printer controller shall decide through pre-defined logic which one to select for downloading and installation. Examples of such logic include:

— giving preferential treatment to certain print settings profile providers (i.e. establishing a hierarchy);

— selecting the newest profile by creation date;

— selecting the profile that best matches the situation's temperature or humidity.

Alternatively, the user can pick and choose which profile to download and install.

8.4 Downloading

The printer controller shall be capable of reliably downloading profiles. It is recommended to have the capability to pause and restart downloads. Each downloaded profile shall be date-stamped with the time and date of download completion. An identifier corresponding to the print settings profile provider as well as the profile creation date and time shall be stored with each profile.

8.5 Installation

The printer controller shall apply the ICC profile as well as any other necessary print settings, such as the resolution and number of passes in a print mode, for example, in order to achieve the intended results. Other settings within the print settings profile may also be optionally (automatically) applied.

The printer controller should not apply settings from the profile that instead should be manually set in accordance with the individual printer's characteristics. A common example is feed compensation.

If the printer controller determines that the profile is incorrectly formatted or contains invalid data, a different profile shall be chosen and downloaded in accordance with 8.3. If no more profiles are available, then 8.1 applies.

9 Handling updates

The printer controller may check for updated print settings profiles at some arbitrarily defined frequency (e.g. every day or prior to every print job).

The user shall be prompted for approval for updating a profile. Older versions of profiles shall be locally retained by the printer controller in case a reversion is needed. Whether or not an update is available for a profile shall be determined by comparing the creation date and time of its latest stored version against the creation dates and times of the versions stored by the corresponding print settings profile

