



Printer Driver Communications Standard

Version 0.01
August 25, 2003

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Abstract (Ira)

Printers print.

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FSG Open Printing – Printer Driver API

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1. Introduction

*Printer not ready.
Could be a fatal error.
Have a pen handy?*

-- Pat Davis

Currently, there are many printer drivers written for Linux.

2. Background (Glen)

Monolithic approach.

IJS similarities / divergence.

Why can PDC replace this.

3. Terminology and Acronyms (ALL)

3.1 Conformance Terminology (take from job ticket)

In this document, the uppercase terms “MUST”, “MUST NOT”, “REQUIRED”, “SHOULD”, “SHOULD NOT”, “RECOMMENDED”, “MAY”, and “OPTIONAL” are intended to be interpreted as described in [RFC2119]

In this document, each conformance statement uses one of the terms:

<i>Term</i>	<i>Meaning</i>
MUST	Implementation support is REQUIRED for conformance to this specification.
SHOULD	Implementation support is RECOMMENDED for conformance to this specification.
MAY	Implementation support is OPTIONAL for conformance to this specification.

In this document, each operation, object, or attribute is defined as:

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<i>Term</i>	<i>Meaning</i>
REQUIRED	Each implementation MUST support object operations or attributes.
RECOMMENDED	Each implementation SHOULD support object operations for interoperability
OPTIONAL	Each implementation MAY support object operations or attributes .

3.2 Other Terminology

Table 4.0 Miscellaneous Terms

<i>Term</i>	<i>Meaning</i>

3.3 Acronyms

Table 5.0 Acronyms

<i>Acronyms</i>	<i>Meaning</i>	<i>Source</i>
FSG	Free Standards Group	http://www.freestandardsgroup.org/
FSG/OP	Free Standards Group – Open Printing	http://www.openprinting.org/
PDC	Printer Driver Communications	
JP	Job Properties	
CJP	Common Job Properties	
NCJP	Non-Common Job Properties	

4. Requirements (ALL)

job ticket & papi support

platforms: embedded devices. high end production printing

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printer: injet printers. high end laserjet printers.

support bi-directional communications

support device fonts

support high level drawing calls

5. Print driver model (Mark)

Job properties are properties that can change on a per-job basis. For example, someone can submit a color print job that uses legal paper while someone else can submit a monochrome print job on A4 paper to the same print queue. Every printer driver shares a set of common job properties such as Form, Media, and Orientation. Currently, each printer driver uses different names for those job properties. One driver can use “Form=Letter” while another uses “form=LTR”.

5.1 Common Job Properties

Common Job Properties is the standardization of job properties that should be understood by all printer drivers.

Come up with definitions for the terms physical page, logical page, and side of a page, X dimension, and Y dimension, unit values, rgb FFFFFFF is white/000000 is black, binary 1 is black/0 is black, grey ..., .

ColorInput

The key ColorInput specifies the colors and the depth of each color of the input rendered image. The ColorInput values are key=value pairs where the order of the pairs determine the order of the color planes. Each pair describes the color plane and the number of bits for each pel in the color plane. The default is Red=8,Green=8,Blue=8.

ColorOutput

The key ColorOutput specifies the color-mode of the output raster image. The legal values are Color, Grey, Black-White. The value of Color means the color capability of the printer. We do not tell the printer what color model to use. Grey means monotonically increasing values from black to white. Black-White means two-states: either black or white. Note that you cannot create color from black and white input! Three options on the table 1) Color is always the default even for black and white printers 2) PrinterSpecific (which tell the user nothing) 3) Have two defaults depending on the color capability.

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Copies

The key Copies specifies the desired number of copies for the print job. If Copies is changed between pages, then the last Copies is the one that is used when the print job is finished. The default value is 1.

Margins

The key Margins specifies the desired margins for the print job pages. If the Margins are not changed between pages of a job then the previously specified Margins is assumed. The margins are expressed as four integer numbers representing the Top, Left, Bottom and Right unprintable areas and the units. The margins cannot be set less than the MediaUnprintableMargins. The default margins are equal to the corresponding MediaUnprintableMargins.

MediaBackCoating

The key MediaBackCoating specifies the coating on the back side of the physical media. If the MediaBackCoating is not changed between pages of a job then the previously specified MediaBackCoating is assumed. MediaBackCoating is specified by an enumeration value of a named coating type of the back side of the media such as coated, glossy, high-gloss and so forth. The possible list of named MediaBackCoating is an extensible list of defined from the capabilities of the printer. The default MediaBackCoating is None indicating that no media back coating is specified.

MediaColor

The key MediaColor specifies the color of the media to be used for the print job pages. If the MediaColor is not changed between pages of a job then the previously specified MediaColor is assumed. MediaColor is specified by a six digit hexadecimal string representing the red, green and blue values. The default MediaColor is FFFFFFFF indicating that white media color is specified.

MediaFrontCoating

The key MediaFrontCoating specifies the coating on the front side of the physical media. If the MediaFrontCoating is not changed between pages of a job then the previously specified MediaFrontCoating is assumed. MediaFrontCoating is specified by an enumeration value of a named coating type of the front side of the media such as coated, glossy, high-gloss and so forth. The possible list of named MediaFrontCoating is an extensible list defined from the capabilities of the printer. The default MediaFrontCoating is None indicating that no media Front coating is specified.

MediaInputTrayName

The key MediaInputTrayName specifies the name of the tray from which the media is to be taken. If the MediaInputTrayName is not changed between pages of a job then the previously specified

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MediaInputTrayName is assumed. MediaInputTrayName is specified by an enumeration value of named input trays of the printer such as Bottom, AutoSelect, InsertTray-3 and so forth. The possible list of named MediaInputTrayName is a non-extensible list. The default MediaInputTrayName is AutoSelect.

MediaSizeName

The key MediaSizeName specifies the size of the media in a self-describing name that conforms to IEEE/ISTO 5101.1-2003 specification. If the MediaSizeName is not changed between pages of a job then the previously specified MediaSizeName is assumed. MediaSizeName is specified by a string name of media size such as jis_b1_728x1030mm, jis_b0_1030x1456mm, jis_exec_216x330mm and so forth. The possible list of named MediaSizeName is an extensible list. There is no default value.

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MediaType

The key MediaType specifies the type of media for the print job pages. If the MediaType is not changed between pages of a job then the previously specified MediaType is assumed. MediaType is specified by an enumeration value of a named media types such as card-stock, disc, envelope and so forth. The possible list of named MediaType is a non-extensible list. The default MediaType is ??????.

MediaUnprintableMargins

The key MediaUnprintableMargins specifies the area on the boundary of the physical media which the printer is unable to print. The MediaUnprintableMargins may have a dependency upon the Mediatype, the MediaSizeName, the MediaBackCoating and MediaFrontCoating key-values in addition to the specific printer model. The unprintable margins are expressed as four integer numbers representing the Top, Left, Bottom and Right unprintable areas (margins). There are no assumed default values.

NumberUp

The key NumberUp specifies how many logical pages are placed on one side of a physical page. The value is expressed by two integers separated by an 'x'. The first number specifies how many columns of logical pages there will be and the second number specifies how many rows there will be. If this value is changed during the print job then the following will occur:

if this is the last logical page in the set for the old value, then the new value will take effect.

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A) otherwise, the new value will take effect when the current page fills up.

B) otherwise, the current page will be ejected and a new page will start with the new values

The default value is 1x1.

NumberUpPresentationDirection

The key NumberUpPresentationDirection specifies the direction that the logical pages print out on the side of the page. If this value is changed during the print job and NumberUp is not 1x1, then the current page will be ejected and a new page will start. The default value is TorightTobottom.

OutputBinName

The key OutputBinName specifies which output bin is used to accept the print job. If this value is changed during the print job, then the new value is used. The default value is Top.

PrintQuality

The key PrintQuality specifies the quality of the print job. This quality is a relative value. Economy tells the printer driver to use the least amount of time and resources to print the job while High tells it to use the most amount of time and resources to print the job. If this value is changed during the print job, then the new result is used. The default value is Normal.

Resolution

The key Resolution specifies the resolution of the dots per inch on the printed page. The value is expressed by two integers separated by an 'x'. The first number is the horizontal resolution and the second number is the vertical resolution. If this value is changed during the print job, then the new value is used. There is no default value.

Rotation

The key Rotation specifies the orientation of the page. If this value is changed during the print job, then the new value is used. The default value is Portrait.

ScalingType

The key ScalingType specifies what type of scaling needs to be performed on the page basis by the driver. The scaling is performed on the received print job data before the print job data is printed. The scaling types are

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- None – Perform no scaling.
- FitToPage – Scale the print job to the maximum vertical or horizontal media dimension while maintaining the print job data width-to-height aspect ratio.
- RotateAndOrFit - Need definition from job ticket group
- Clip - Do not print the portions of the logical page that fall outside of the physical page.

This is called FitPolicy to agree with Job Ticket

ScalingPercentage

The key ScalingPercentage specifies a pair of integers representing the scaling percentage in the X and Y dimensions. The X and Y dimensions need to be specified. Problem: using long and short sides fail if sides are equal and there is letter-head on the page.

SheetCollate

The key SheetCollate specifies ordering of pages when more than one copies are requested. If this value is changed during the print job, then the new value is used. The default value is SheetUncollated.

Sides

The key Sides specifies how logical pages of a print job will combine sides of a page together on a physical page (it is also known as duplexing in the print industry). There are two general choices: printing on one side of the page or printing on two sides of the page. The different choices are the results of all possible orientations when printing on one side or two sides.

StitchingAngle

The key StitchingAngle specifies the angle of rotation of a stitching when placed on the page. This angle is relative to the StitchingReferenceEdge.

StitchingCount

The key StitchingCount specifies how many stitchings are placed on the page.

StitchingPosition

The key StitchingPosition specifies where stitchings are placed on the page after a print job is completed.

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StitchingReferenceEdge

The key `StitchingReferenceEdge` specifies which edge is used as a reference point when measuring the distance to place a stitching on the page.

StitchingType

The key `StitchingType` specifies the type of the stitching.

<i>Key</i>	<i>Value</i>	<i>Notes</i>
<code>ColorInput</code>	n	Legal values are comma separated of the following:
		Red=n
		Green=n
		Blue=n
		Cyan=n
		Magenta=n
		Yellow=n
		Black=n
		Black-White=n
<code>ColorOutput</code>	Color	
	Grey	
	Black-White	
		In the future, we need a key <code>ColorValue</code> which is a method for telling the driver what a particular color name has as a RGB color. Ex: <code>TurquoiseGreen</code>
<code>Copies</code>	1	copies is supported
	integer	
	None	copies
<code>MediaColor</code>	RxGxB	This is read-only.
<code>MediaBackCoating</code>	Glossy	
	HighGloss	
	SemiGloss	

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<i>Key</i>	<i>Value</i>	<i>Notes</i>
	Satin	
	Matte	
	Inkjet	
	None	
MediaFrontCoating	Glossy	
	HighGloss	
	SemiGloss	
	Satin	
	Matte	
	Inkjet	
	None	
MediaInputTrayName	AutoSelect	
	AnySmallFormat	
	AnyLargeFormat	
	Bottom	Lower is an alias
	BypassTray	
	BypassTray-n	
	Continuous	Fanfold or perforated
	Disc	Tray that contains media such as CD or DVD
	Disc-n	
	Envelope	
	Envelope-n	
	Front	
	InsertTray	
	InsertTray-n	
	LargeCapacity	Main is an alias
	LargeCapacity-n	
	Left	
	Middle	
	Rear	
	Right	
	Roll	
	Roll-n	

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<i>Key</i>	<i>Value</i>	<i>Notes</i>
	Side	
	Top	Upper is an alias
	Tray	Cassette, SheetFeeder is an alias
	Tray-n	Cassette-n, SheetFeeder is an alias
	None	
MediaSizeName	na_letter_8.5x11in	
	iso_a4_210x297mm	
	...	
MediaType	Plain	
	Stationery	
	TransparencyEnvelope	
	EnvelopePlain	
	EnvelopeWindow	
	Continuous	
	ContinuousLong	
	ContinuousShort	
	TabStock	
	PreCutTabs	
	FullCutTabs	
	MultiPartForms	
	Labels	
	MultiLayer	
	Screen	
	ScreenPaged	
	Photographic	
	CardStock	
	Other	
	None	
MediaUnprintableMargins	integerXintegerXintegerXintegerUNITS	The four unprintable areas on the page in the following order: top, right, bottom, left. This is read-only.
Margins	integerXintegerXintegerXintegerUNITS	defaults to MediaUnprintableMargins

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<i>Key</i>	<i>Value</i>	<i>Notes</i>
NumberUp	1x1	
	integerXinteger	
	None	
NumberUpPresentationDirection	TorightTobottom	
	TobottomToright	
	ToleftTobottom	
	TobottomToleft	
	TorightTotop	
	TotopToright	
	ToleftTotop	
	TotopToleft	
	None	
OutputBinName	Top	
	Booklet	
	Bottom	
	Center	
	FaceDown	
	FaceUp	
	FitMedia	
	LargeCapacity	
	Left	
	MailBox-n	
	Middle	
	MyMailbox	
	Rear	
	Right	
	Side	
	Stacker-n	
	Top	
	Tray-n	
	None	

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<i>Key</i>	<i>Value</i>	<i>Notes</i>
PrintQuality	Normal	
	Economy	
	Draft	
	High	
	Fine	
	Photo	
	None	
Resolution	integerXinteger	
Rotation	Portrait	
	Landscape	
	ReversePortrait	
	ReverseLandscape	
	None	
ScalingType	None	
	FitToPage	
	RotateAndOrFit	
	Clip	
ScalingPercentage	None	
	double	100 or 1000 multiple?
SheetCollate	SheetUncollated	
	SheetCollated	
	SheetAndJobCollated	
	SheetUncollated	
Sides	OneSidedFront	
	OneSidedBackflipX	
	OneSidedBackflipY	
	TwoSidedFlipX	
	TwoSidedFlipY	
	None	

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<i>Key</i>	<i>Value</i>	<i>Notes</i>
StitchingPosition	None	
	integer	
StitchingReferenceEdge	Top	
	Bottom	
	Left	
	Right	
	None	
StitchingType	Corner	
	Saddle	
	Side	
	None	
StitchingCount	1	
	integer	
	None	
StitchingAngle	0	
	integer	
	None	

While it would be nice to require every driver to at least understand the above Common Job Property keys and values, we have decided to allow some of the keys to be optionally supported.

<i>Key</i>	<i>Conformance</i> (<i>Must, Should, May</i>)			
	<i>Embedded/Mobile</i>	<i>Desktop/Home</i>	<i>Office/Network</i>	<i>Production</i>
BitsPerColor	Must	Must	Must	Must
Color	Must	Must	Must	Must
Copies	May	May	Must	Must
MediaColor	May	May	Must	Must
MediaBackCoating	May	May	May	Must
MediaFrontCoating	Must	Must	Must	Must

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<i>Key</i>	<i>Conformance</i> (<i>Must, Should, May</i>)			
	<i>Embedded/Mobile</i>	<i>Desktop/Home</i>	<i>Office/Network</i>	<i>Production</i>
MediaInputTrayName	May	May	Must	Must
MediaSizeName	Must	Must	Must	Must
MediaType	Must	Must	Must	Must
MediaUnprintableMargins	Must	Must	Must	Must
Margins	Must	Must	Must	Must
NumberUp	May	Must	Must	Must
NumberUpPresentationDirection	May	May	May	Must
OutputBinName	May	Must	Must	Must
PrintQuality	Must	Must	Must	Must
Resolution	Must	Must	Must	Must
Rotation	May	Must	Must	Must
ScalingType	Must	Must	Must	Must
ScalingPercentage	May	Must	Must	Must
SheetCollate	May	Must	Must	Must
Sides	May	Must	Must	Must
StitchingPosition	May	May	May	Must
StitchingReferenceEdge	May	May	May	Must
StitchingType	Must	Must	Must	Must
StitchingCount	May	May	May	Must
StitchingAngle	May	May	May	Must

If a job property is Required and it is not handled by the driver, then the print job or print related query will fail. The other two categories, Recommended and Optional, are statements that tell the driver what will give the user a better print experience.

The job properties that are not Required are handled by the print sub-system (either by the driver or a higher level component like a rasterizer). They fall into a number of categories. The first one is the set of job properties that can be handled by the driver or simulated by the rasterizer. An example of this is “Copies” or “NumberUp”. The driver can handle these properties through commands sent to the print device. Otherwise, the rasterizer will simulate the property to the driver. For example, if “Copies=2” appears in the job properties and the driver does not understand “Copies”, then the rasterizer will send two print jobs to the driver. If it is handled by the driver, then the driver will only receive one print job. Another set of properties that cannot be simulated by the rasterizer will only allow a minimal level of support. This support is limited to one default value that can be enumerated or set. For example, “SheetCollate” can only be “SheetCollate=SheetUncollated” if the

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driver does not understand collation.

5.2 Non-Common Job Properties

All of the other job properties for a printer driver falls in the category of non-common job properties.

5.3 Raster simulation

- 1) Handle high level drawing call
- 2) Otherwise, call is broken down into series of lower level drawing calls
- 3) Otherwise, a series of banded bitmaps is received

5.4 Discovery

The print sub-system needs some way to know what driver are installed that can handle this standard.

Registry in etc file

Certain directory

TCP/IP daemon

5.5 Communication

Separation of driver from application in regards to licensing

5.6 C-API

5.7 Java-API

APPENDIX: X CHANGES < Editor >

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<i>Date</i>	<i>Affected Version</i>	<i>Author</i>	<i>Change</i>