UNIX
PRINTING
SYSTEM

CUPS Software Users Manual

CUPS–SUM–1.1.15

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Table of Contents

Table of Contents

Preface

This software users manual describes how to use the Common UNIX Printing System^{TM} ("CUPS^{TM}") Version 1.1.15.

System Overview

CUPS provides a portable printing layer for UNIX®−based operating systems. It has been developed by Easy Software Products to promote a standard printing solution for all UNIX vendors and users. CUPS provides the System V and Berkeley command−line interfaces.

CUPS uses the Internet Printing Protocol ("IPP") as the basis for managing print jobs and queues. The Line Printer Daemon ("LPD") Server Message Block ("SMB"), and AppSocket (a.k.a. JetDirect) protocols are also supported with reduced functionality. CUPS adds network printer browsing and PostScript Printer Description ("PPD") based printing options to support real−world printing under UNIX.

CUPS also includes a customized version of GNU Ghostscript (currently based off GNU Ghostscript 5.50) and an image file RIP that are used to support non−PostScript printers. Sample drivers for HP and EPSON printers are included that use these filters.

Document Overview

This software users manual is organized into the following sections:

Notation Conventions

Various font and syntax conventions are used in this guide. Examples and their meanings and uses are explained below:

Example	Description
`lpstat` `lpstat(1)`	The names of commands; the first mention of a command or function in a chapter is followed by a manual page section number.
/var */usr/share/cups/data/testprint.ps*	File and directory names.
`Request ID is Printer-123`	Screen output.
lp –d printer filename ENTER	Literal user input; special keys like **ENTER** are in ALL CAPS.
12.3	Numbers in the text are written using the period (.) to indicate the decimal point.

Abbreviations

The following abbreviations are used throughout this manual:

kb

    Kilobytes, or 1024 bytes

Mb

    Megabytes, or 1048576 bytes

Gb

    Gigabytes, or 1073741824 bytes

Other References

CUPS Software Administrators Manual
    An administration guide for the CUPS software.

CUPS Software Programmers Manual
    A programmer guide for interfacing with and/or extending the CUPS software.

Abbreviations

1 – Printing System Overview

This chapter provides an overview of how the Common UNIX Printing System works.

The Printing Problem

For years *the printing problem* has plagued UNIX. Unlike Microsoft® Windows® or Mac OS, UNIX has no standard interface or system in place for supporting printers. Among the solutions currently available, the Berkeley and System V printing systems are the most prevalent.

These printing systems support line printers (text only) or PostScript printers (text and graphics), and with some coaxing they can be made to support a full range of printers and file formats. However, because each varient of the UNIX operating system uses a different printing system than the next developing printer drivers for a wide range of printers and operating systems is extremely difficult. That combined with the limited volume of customers for each UNIX varient has forced most printer vendors to give up supporting UNIX entirely.

CUPS is designed to eliminate *the printing problem*. One common printing system can be used by all UNIX varients to support the printing needs of users. Printer vendors can use its modular filter interface to develop a single driver program that supports a wide range of file formats with little or no effort. Since CUPS provides both the System V and Berkeley printing commands, users (and applications) can reap the benefits of this new technology with no changes.

The Technology

CUPS is based upon an emerging Internet standard called the Internet Printing Protocol. IPP has been embraced by dozens of printer and printer server manufacturers and is supported by Microsoft Windows 2000.

IPP defines a standard protocol for printing as well as managing print jobs and printer options like media size, resolution, and so forth. Like all IP–based protocols, IPP can be used locally or over the Internet to printers hundreds or thousands of miles away. Unlike other protocols, however, IPP also supports access control, authentication, and encryption, making it a much more capable and secure printing solution than older ones.

IPP is layered on top of the Hyper–Text Transport Protocol ("HTTP") which is the basis of web servers on the Internet. This allows users to view documentation, check status information on a printer or server, and manage their printers, classes, and jobs using their web browser.

CUPS provides a complete IPP/1.1 based printing system that provides Basic, Digest, and local certificate authentication and user, domain, or IP–based access control. TLS encryption will be available in future versions of CUPS.

Jobs

Each file or set of files that is submitted for printing is called a *job*. Jobs are identified by a unique number starting at 1 and are assigned to a particular destination, usually a printer. Jobs can also have options associated with them such as media size, number of copies, and priority.

Classes

CUPS supports collections of printers known as *classes*. Jobs sent to a class are forwarded to the first available printer in the class.

Filters

Filters allow a user or application to print many types of files without extra effort. Print jobs sent to a CUPS server are filtered before sending them to a printer. Some filters convert job files to different formats that the printer can understand. Others perform page selection and ordering tasks.

CUPS provides filters for printing many types of image files, HP–GL/2 files, PDF files, and text files. CUPS also supplies PostScript and image file Raster Image Processor ("RIP") filters that convert PostScript or image files into bitmaps that can be sent to a raster printer.

Backends

Backends perform the most important task of all – they send the filtered print data to the printer.

CUPS provides backends for printing over parallel, serial, and USB ports, and over the network via the IPP, JetDirect (AppSocket), and Line Printer Daemon ("LPD") protocols. Additional backends are available in network service packages such as the SMB backend included with the popular SAMBA software.

Backends are also used to determine the available devices. On startup each backend is asked for a list of devices it supports, and any information that is available. This allows the parallel backend to tell CUPS that an EPSON Stylus Color 600 printer is attached to parallel port 1, for example.

Printer Drivers

Printer drivers in CUPS consist of one of more filters specific to a printer. CUPS includes sample printer drivers for Hewlett−Packard LaserJet and DeskJet printers and EPSON 9−pin, 24−pin, Stylus Color, and Stylus Photo printers. While these drivers do not generate optimal output for the different printer models, they do provide basic printing and demonstrate how you can write your own printer drivers and incorporate them into CUPS.

Networking

Printers and classes on the local system are automatically shared with other systems on the network. This allows you to setup one system to print to a printer and use this system as a printer server or spool host for all of the others. Users may then select a local printer by name or a remote printer using "name@server".

CUPS also provides *implicit classes*, which are collections of printers and/or classes with the same name. This allows you to setup multiple servers pointing to the same physical network printer, for example, so that you aren't relying on a single system for printing. Because this also works with printer classes, you can setup multiple servers and printers and never worry about a single point of failure unless all of the printers and servers go down!

2 – Using the Printing System

This chapter shows you how to submit, query, and cancel print jobs to different printers.

Submitting Files for Printing

CUPS provides both the System V (`lp(1)`) and Berkeley (`lpr(1)`) printing commands. Type the following command to print a file to the default (or only) printer on the system:

```
lp filename ENTER
```

or:

```
lpr filename ENTER
```

CUPS understands many different types of files directly, including PostScript and image files. This allows you to print from inside your applications or at the command–line, whichever is most convenient!

Choosing a Printer

Many systems will have more than one printer available to the user. These printers can be attached to the local system via a parallel, serial, or USB port, or available over the network.

Use the `lpstat(1)` command to see a list of available printers:

```
lpstat -p -d ENTER
```

The −p option specifies that you want to see a list of printers, and the −d option reports the current system default printer or class.

Use the −d option with the `lp` command to print to a specific printer:

```
lp -d printer filename ENTER
```

or the −P option with the `lpr` command:

```
lpr -P printer filename ENTER
```

Setting Printer Options

For many types of files, the default printer options may be sufficient for your needs. However, there may be times when you need to change the options for a particular file you are printing.

The `lp` and `lpr` commands allow you to pass printer options using the −o option:

```
lp -o landscape -o scaling=75 -o media=A4 filename.jpg
lpr -o landscape -o scaling=75 -o media=A4 filename.jpg
```

The available printer options vary depending on the printer. The standard options are described in Chapter 3, "Standard Printing Options".

Printing Multiple Copies

Both the `lp` and `lpr` commands have options for printing more than one copy of a file:

```
lp -n num-copies filename ENTER
lpr -#num-copies filename ENTER
```

Copies are normally *not* collated for you. Use the −o Collate=True option to get collated copies :

```
lp -n num-copies -o Collate=True filename ENTER
lpr -#num-copies -o Collate=True filename ENTER
```

Checking the Printer Status from the Command−Line

The `lpstat` command can be used to check for jobs that you have submitted for printing:

```
lpstat ENTER
Printer-1 johndoe 4427776
Printer-2 johndoe 15786
Printer-3 johndoe 372842
```

The jobs are listed in the order they will be printed. Use the −p option to see which files and printers are active:

```
lpstat -p ENTER
printer DeskJet now printing DeskJet-1.
```

Use the −o and −p options together to show the jobs and the printers:

```
lpstat -o -p ENTER
Printer-1 johndoe 4427776
Printer-2 johndoe 15786
Printer-3 johndoe 372842
printer DeskJet now printing DeskJet-1.
```

Checking the Printer Status from the Web

Since CUPS uses the Internet Printing Protocol, it is also a fully−functional web server. To use your web browser to monitor the printers on your system, open the URL:

http://localhost:631

From there you can view the status of classes, jobs, and printers with the click of a button!

Canceling a Print Job

The cancel(1) and lprm(1) commands cancel a print job:

```
cancel job-id ENTER
lprm job-id ENTER
```

The job-id is the number that was reported to you by the lp or lpstat commands.

Checking the Printer Status from the Web

3 – Standard Printer Options

This chapter describes the standard printer options that are available when printing with the `lp` and `lpr` commands.

General Options

The following options apply when printing all types of files.

Selecting the Media Size, Type, and Source

The `-o media=xyz` option sets the media size, type, and/or source:

```
lp -o media=Letter filename ENTER
lp -o media=Letter,MultiPurpose filename ENTER
lpr -o media=Letter,Transparency filename ENTER
lpr -o media=Letter,MultiPurpose,Transparency filename ENTER
```

The available media sizes, types, and sources depend on the printer, but most support the following options (case is not significant):

- `Letter` – US Letter (8.5x11 inches, or 216x279mm)
- `Legal` – US Legal (8.5x14 inches, or 216x356mm)
- `A4` – ISO A4 (8.27x11.69 inches, or 210x297mm)
- `COM10` – US #10 Envelope (9.5x4.125 inches, or 241x105mm)
- `DL` – ISO DL Envelope (8.66x4.33 inches, or 220x110mm)
- `Transparency` – Transparency media type or source
- `Upper` – Upper paper tray
- `Lower` – Lower paper tray
- `MultiPurpose` – Multi–purpose paper tray
- `LargeCapacity` – Large capacity paper tray

The actual options supported are defined in the printer's PPD file in the `PageSize`, `InputSlot`, and `MediaType` options.

Setting the Orientation

The `-o landscape` option will rotate the page 90 degrees to print in landscape orientation:

```
lp -o landscape filename ENTER
lpr -o landscape filename ENTER
```

Printing On Both Sides of the Paper

The `-o sides=two-sided-short-edge` and `-o sides=two-sided-long-edge` options will enable duplexing on the printer, if the printer supports it. The `-o sides=two-sided-short-edge` option is suitable for landscape pages, while the `-o sides=two-sided-long-edge` option is suitable for portrait pages:

```
lp -o sides=two-sided-short-edge filename ENTER
lp -o sides=two-sided-long-edge filename ENTER
lpr -o sides=two-sided-long-edge filename ENTER
```

The default is to print single–sided:

```
lp -o sides=one-sided filename ENTER
lpr -o sides=one-sided filename ENTER
```

Banner Options

The following options apply when printing all types of files.

Selecting the Banner Page(s)

The `-o jobsheets=start,end` option sets the banner page(s) to use for a job:

```
lp -o job-sheets=none filename ENTER
lp -o job-sheets=standard filename ENTER
lpr -o job-sheets=classified,classified filename ENTER
```

If only one banner file is specified, it will be printed before the files in the job. If a second banner file is specified, it is printed after the files in the job.

The available banner pages depend on the local system configuration; CUPS includes the following banner files:

- `none` – Do not produce a banner page.
- `classified` – A banner page with a "classified" label at the top and bottom.
- `confidential` – A banner page with a "confidential" label at the top and bottom.
- `secret` – A banner page with a "secret" label at the top and bottom.
- `standard` – A banner page with no label at the top and bottom.
- `topsecret` – A banner page with a "top secret" label at the top and bottom.
- `unclassified` – A banner page with an "unclassified" label at the top and bottom.

Document Options

The following options apply when printing all types of files.

Selecting a Range of Pages

The `-o page-ranges=pages` option selects a range of pages for printing:

```
lp -o page-ranges=1 filename ENTER
lp -o page-ranges=1-4 filename ENTER
lp -o page-ranges=1-4,7,9-12 filename ENTER
lpr -o page-ranges=1-4,7,9-12 filename ENTER
```

As shown above, the `pages` value can be a single page, a range of pages, or a collection of page numbers and ranges separated by commas. The pages will always be printed in ascending order, regardless of the order of the pages in the `page-ranges` option.

The default is to print all pages.

Selecting Even or Odd Pages

Use the `-o page-set=set` option to select the even or odd pages:

```
lp -o page-set=odd filename ENTER
lp -o page-set=even filename ENTER
lpr -o page-set=even filename ENTER
```

The default is to print all pages.

N–Up Printing

The `-o number-up=value` option selects N–Up printing. N–Up printing places multiple document pages on a single printed page. CUPS supports 1, 2, 4, 6, 9, and 16–Up formats; the default format is 1–Up:

```
lp -o number-up=1 filename ENTER
lp -o number-up=2 filename ENTER
lp -o number-up=4 filename ENTER
```

```
lpr -o number-up=16 filename ENTER
```

The `-o page-border=value` option chooses the border to draw around each page:

- `-o page-border=double`; draw two hairline borders around each page
- `-o page-border=double-thick`; draw two 1pt borders around each page
- `-o page-border=none`; do not draw a border (default)
- `-o page-border=single`; draw one hairline border around each page
- `-o page-border=single-thick`; draw one 1pt border around each page

The `-o number-up-layout=value` option chooses the layout of the pages on each output page:

- `-o number-up-layout=btlr`; Bottom to top, left to right
- `-o number-up-layout=btrl`; Bottom to top, right to left
- `-o number-up-layout=lrbt`; Left to right, bottom to top
- `-o number-up-layout=lrtb`; Left to right, top to bottom (default)
- `-o number-up-layout=rlbt`; Right to left, bottom to top
- `-o number-up-layout=rltb`; Right to left, top to bottom
- `-o number-up-layout=tblr`; Top to bottom, left to right
- `-o number-up-layout=tbrl`; Top to bottom, right to left

Setting the Brightness

You can control the overall brightness of the printed output using the `-o brightness=percent` option:

```
lp -o brightness=120 filename ENTER
lpr -o brightness=120 filename ENTER
```

Values greater than 100 will lighten the print, while values less than 100 will darken it.

Setting the Gamma Correction

You can control the overall gamma correction of the printed output using the `-o gamma=value` option:

```
lp -o gamma=1700 filename ENTER
lpr -o gamma=1700 filename ENTER
```

Values greater than 1000 will lighten the print, while values less than 1000 will darken it. The default gamma is 1000.

Text Options

The following options apply when printing text files.

Setting the Number of Characters Per Inch

The `-o cpi=value` option sets the number of characters per inch:

```
lp -o cpi=10 filename ENTER
lp -o cpi=12 filename ENTER
lpr -o cpi=17 filename ENTER
```

The default characters per inch is 10.

Setting the Number of Lines Per Inch

The –o lpi=value option sets the number of lines per inch:

```
lp –o lpi=6 filename ENTER
lpr –o lpi=8 filename ENTER
```

The default lines per inch is 6.

Setting the Number of Columns

The –o columns=value option sets the number of text columns:

```
lp –o columns=2 filename ENTER
lpr –o columns=3 filename ENTER
```

The default number of columns is 1.

Setting the Page Margins

Normally the page margins are set to the hard limits of the printer. Use the –o page-left=value, –o page-right=value, –o page-top=value, and –o page-bottom=value options to adjust the page margins:

```
lp –o page-left=value filename ENTER
lp –o page-right=value filename ENTER
lp –o page-top=value filename ENTER
lp –o page-bottom=value filename ENTER
lpr –o page-bottom=value filename ENTER
```

The value argument is the margin in points; each point is 1/72 inch or 0.35mm.

Pretty Printing

The –o prettyprint option puts a header at the top of each page with the page number, job title (usually the filename), and the date. Also, C and C++ keywords are highlighted, and comment lines are italicized:

```
lp –o prettyprint filename ENTER
lpr –o prettyprint filename ENTER
```

Image Options

The following options apply when printing image files.

Positioning the Image

The –o position=name option specifies the position of the image on the page:

- center – Center the image on the page (default)

- `top` – Print the image centered at the top of the page
- `left` – Print the image centered on the left of page
- `right` – Print the image centered on the right of the page
- `top-left` – Print the image at the top left corner of the page
- `top-right` – Print the image at the top right corner of the page
- `bottom` – Print the image centered at the bottom of the page
- `bottom-left` – Print the image at the bottom left corner of the page
- `bottom-right` – Print the image at the bottom right corner of the page

Scaling the Image

The `-o scaling=percent`, `-o ppi=value`, and `-o natural-scaling=percent` options change the size of a printed image:

```
lp -o scaling=percent filename ENTER
lp -o ppi=value filename ENTER
lpr -o natural-scaling=percent filename ENTER
```

The `scaling=percent` value is a number from 1 to 800 specifying the size in relation to the page (*not* the image.) A scaling of 100 percent will fill the page as completely as the image aspect ratio allows. A scaling of 200 percent will print on up to 4 pages.

The `ppi=value` value is a number from 1 to 1200 specifying the resolution of the image in pixels per inch. An image that is 3000x2400 pixels will print 10x8 inches at 300 pixels per inch, for example. If the specified resolution makes the image larger than the page, multiple pages will be printed to satisfy the request.

The `natural-scaling=percent` value is a number from 1 to 800 specifying the size in relation to the natural image size. A scaling of 100 percent will print the image at its natural size, while a scaling of 50 percent will print the image at half its natural size. If the specified scaling makes the image larger than the page, multiple pages will be printed to satisfy the request.

Adjusting the Hue (Tint) of an Image

The `-o hue=value` option will adjust the hue of the printed image, much like the tint control on your television:

```
lp -o hue=value filename ENTER
lpr -o hue=value filename ENTER
```

The `value` argument is a number from –360 to 360 and represents the color hue rotation. The following table summarizes the change you'll see with different colors:

Original	hue=−45	hue=45
Red	Purple	Yellow−orange
Green	Yellow−green	Blue−green
Yellow	Orange	Green−yellow
Blue	Sky−blue	Purple
Magenta	Indigo	Crimson
Cyan	Blue−green	Light−navy−blue

The default hue adjustment is 0.

Adjusting the Saturation (Color) of an Image

The `−o saturation=percent` option adjusts the saturation of the colors in an image, much like the color knob on your television:

```
lp −o saturation=percent filename ENTER
lpr −o saturation=percent filename ENTER
```

The `percent` argument specifies the color saturation from 0 to 200. A color saturation of 0 produces a black−and−white print, while a value of 200 will make the colors extremely intense.

The default saturation is 100.

HP−GL/2 Options

The following options apply to HP−GL/2 files.

Printing in Black

The `−o blackplot` option specifies that all pens should plot in black:

```
lp −o blackplot filename ENTER
lpr −o blackplot filename ENTER
```

The default is to use the colors defined in the plot file or the standard pen colors defined in the HP−GL/2 reference manual from Hewlett Packard.

Fitting the Plot on the Page

The `−o fitplot` option specifies that the plot should be scaled to fit on the page:

```
lp −o fitplot filename ENTER
lpr −o fitplot filename ENTER
```

The default is to use the absolute distances specified in the plot file.

> **NOTE:**
>
> This feature depends upon an accurate plot size (PS) command in the HP–GL/2 file. If no plot size is given in the file than the HP–GL/2 filter assumes the plot is ANSI E size.

Setting the Default Pen Width

The `-o penwidth=value` option specifies the default pen width for HP–GL/2 files:

```
lp -o penwidth=value filename ENTER
lpr -o penwidth=value filename ENTER
```

The pen width `value` specifies the pen width in micrometers. The default value of 1000 produces lines that are 1 millimeter in width. Specifying a pen width of 0 produces lines that are exactly 1 pixel wide.

> **NOTE:**
>
> This option is ignored when the pen widths are set in the plot file.

Raw or Unfiltered Output

The `-o raw` option allows you to send files directly to a printer without filtering. This is sometimes required when printing from applications that provide their own "printer drivers" for your printer:

```
lp -o raw filename ENTER
lpr -o raw filename ENTER
```

The `-l` option can also be used with the `lpr` command to send files directly to a printer:

```
lpr -l filename ENTER
```

4 – Saving Printer Options and Defaults

This chapter describes how to save printer options for your printer and set your own default printer.

Printer Options

Each printer supports a large number of options, which you learned about in Chapter 3, "Standard Printer Options". Rather than specifying these options each time you print a file, CUPS allows you to save them as "default" options for the printer.

The `lpoptions(1)` command saves the options for your printers. Like the `lp` and `lpr` commands, it accepts printer options using the `-o` argument:

```
lpoptions -o prettyprint ENTER
lpoptions -o media=A4 -o sides=two-sided-long-edge ENTER
lpoptions -o media=Legal -o scaling=100 ENTER
```

Once saved, any `lp` or `lpr` command will use them when you print.

Setting Options for a Specific Printer

The previous example shows how to set the options for the default printer. The `-p printer` option specifies the options are for another printer:

```
lpoptions -p laserjet -o prettyprint ENTER
lpoptions -p laserjet -o media=A4 -o sides=two-sided-long-edge ENTER
```

```
lpoptions -p deskjet -o media=Legal -o scaling=100 ENTER
```

Removing Options

The previous two examples shows how to set options for the default and a specific printer. Below, shows you how to remove the saved option using the −r argument:

```
lpoptions -r prettyprint ENTER
lpoptions -p laserjet -r prettyprint ENTER
```

Viewing the Current Defaults

The lpoptions command can also be used to show the current options by not specifying any new options on the command−line:

```
lpoptions ENTER
media=A4 sides=two-sided-long-edge
lpoptions -p deskjet ENTER
media=Legal scaling=100
```

Viewing Options for a Specific Printer

You can display the supported options using the lpoptions command with the −l option, as follows:

```
lpoptions -p laserjet -l ENTER
```

Setting the Default Printer

The administrator normally will set a system−wide default printer that is normally used as the default printer by everyone. Use the −d printer option to set your own default printer:

```
lpoptions -d deskjet ENTER
```

The printer can be local (deskjet) or remote (deskjet@server).

Printer Instances

Besides setting options for each print queue, CUPS supports *printer instances* which allow you to define several different sets of options for each printer. You specify a printer instance using the slash (/) character:

```
lpoptions -p laserjet/duplex -o sides=two-sided-long-edge ENTER
lpoptions -p laserjet/legal -o media=Legal ENTER
```

The lp and lpr commands also understand this notation:

```
lp -d laserjet/duplex filename ENTER
lpr -P laserjet/legal filename ENTER
```

Removing Instances

Use the `-x printer/instance` option to remove a printer instance that you no longer need:

```
lpoptions -x laserjet ENTER
lpoptions -x laserjet/duplex ENTER
lpoptions -x laserjet/legal ENTER
```

The `-x` option only removes the default options for that printer and instance; the original print queue will remain until deleted with the `lpadmin(8)` command by the administrator.

A – Software License Agreement

Common UNIX Printing System License Agreement

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Introduction

The Common UNIX Printing System^{TM}, ("CUPS^{TM}"), is provided under the GNU General Public License ("GPL") and GNU Library General Public License ("LGPL"), Version 2, with exceptions for Apple operating systems and the OpenSSL toolkit. A copy of the exceptions and licenses follow this introduction.

The GNU LGPL applies to the CUPS API library, located in the "cups" subdirectory of the CUPS source distribution and in the "cups" include directory and library files in the binary distributions. The GNU GPL applies to the remainder of the CUPS distribution, including the "pdftops" filter which is based upon Xpdf and the CUPS imaging library.

For those not familiar with the GNU GPL, the license basically allows you to:

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- Sell verbatim copies of the software for a media fee, or sell support for the software.
- Distribute or sell printer drivers and filters that use CUPS so long as source code is made available under the GPL.

What this license **does not** allow you to do is make changes or add features to CUPS and then sell a binary distribution without source code. You must provide source for any new drivers, changes, or additions to the software, and all code must be provided under the GPL or LGPL as appropriate. The only exceptions to this are the portions of the CUPS software covered by the Apple operating system license exceptions outlined later in this license agreement.

The GNU LGPL relaxes the "link–to" restriction, allowing you to develop applications that use the CUPS API library under other licenses and/or conditions as appropriate for your application.

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In addition, as the copyright holder of CUPS, Easy Software Products grants the following special exceptions:

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> Derek B. Noonburg
> Email: derekn@foolabs.com
> WWW: http://www.foolabs.com/xpdf/

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