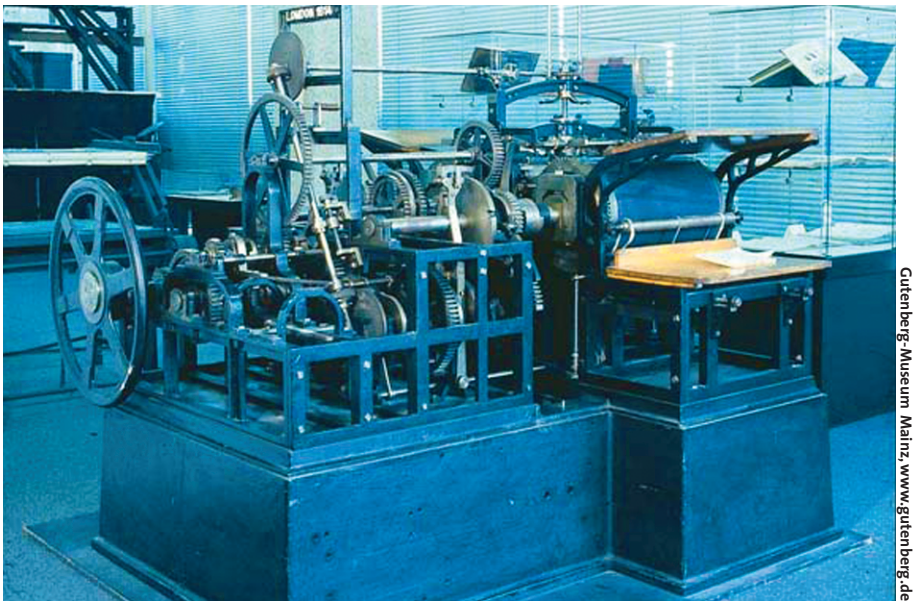
Finding the right printer for Linux users

Printing Decisions

Your choice of printer will be influenced by the jobs you need to print. Linux users partly base their choice on the kind of support the operating system provides for the printer model. This article provides useful information and a decision making guide. BY TILL KAMPPETER



Gutenberg-Museum Mainz, www.gutenberg.de

The shelves of the electronic discounters are jam-packed with printers for various tasks. From low-budget inkjets for less than 50 dollars to high-end lasers, and large-format plotters that can easily cost thousands, the choice is seemingly infinite. Which of these printers is a good choice for Linux?

The first question you need to ask has nothing to do with the operating system. The most important criterion is what you intend to print, and the printing volumes you expect.

Laser printers are quick and produce premium hard copy, but they are not good at photo printing. They are quite expensive, especially if you need color. On the other hand, the maintenance costs, and the price per hard copy is fairly low.

In contrast, inkjets are a lot cheaper in terms of the initial investment; many of them are capable of producing photos in a similar quality to laboratories. Unfortunately, they are a lot slower, and the cost per page of printed output, is far higher, especially if you use photo paper. If you print a lot of text, and occasionally need colored hard copy, you might even consider purchasing two printers: a monochrome laser, and a color inkjet. This mitigates the impact of the inkjet's higher running costs.

The most difficult thing about buying a printer is finding a model with Linux support for its full range of features. This will depend on two things. Firstly, the page description language the printer uses, and secondly, what kind of Linux support the manufacturer, or a third party – such as a free project – provides.

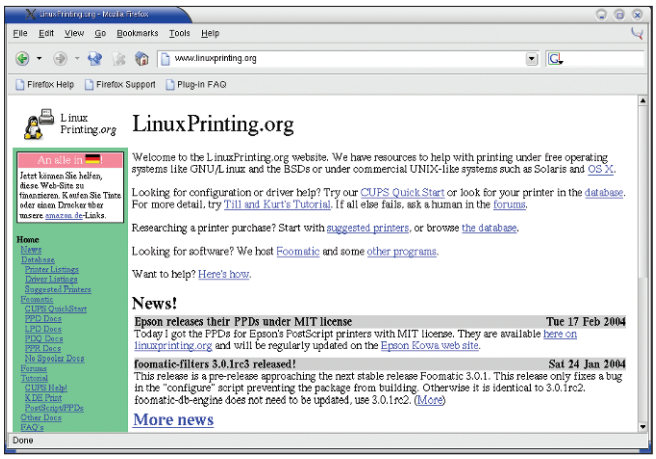


Figure 1: Linuxprinting.org is the ideal place to go, if you are having difficulty printing on Linux.

Postscript and PCL

One thing is clear right from the outset: Linux will always provide full support for Postscript devices. Of course, this assumes that the manufacturer has not hidden the commands for accessing the printer's features in a Windows driver DLL, but in an ASCII PPD (Postscript Printer Description) [1] file, as required by the standard. This guarantees at least the same level of functionality for Postscript models as on Windows NT.

PCL support is not quite as advanced, but you can at least guarantee that a PCL-based printer will print on Linux. It will also allow you to control basic settings, such as the resolution or paper size. Special features, such as tray selection, toner saving mode, or font smoothing may not be available in standard Linux drivers.

Postscript and PPDs

Manufacturers of Postscript printers typically provide a PPD with the the driver for MS Windows and MacOS. The PPD includes Postscript

Figure 2: The HP Deskjet 450 is a good choice for mobile users. Linux support, good printing quality, six-color photo printing, and no mains power required.

or PJL encoded commands for each of the device's special features, such as duplex printing, tray selection, or even stapling and punching. The code needs to be embedded in the printer file to allow access to the job options when parsed by the interpreter. Before the Common Unix Printing System (CUPS) established itself as the standard for Linux, PPD files were commonly ignored. CUPS can handle a printer description file natively, whereas other spooling system use the Foomatic RIP filter to parse the information in the PPD. This means that full support is available for Postscript printers on Linux.

However, you should ensure that the Postscript interpreter really is embedded in the device's hardware, rather than in a Windows-based emulation tool!

PCL and PJL

The printer-specific commands for PCL printers are mainly implemented as PJL commands (Printer Job Language). PJL is a de-facto standard. It is not always possible to get a printer to talk PJL. Printers often strictly keep to PCL escape sequences and commands. In this case, you can only hope that the manufacturer provides useful documentation, or that an inquisitive developer has analyzed the output from the Windows driver and found out how to control the printer.

However, there are some models that implement PCL support for reasons of compatibility to DOS programs only, using the Windows driver to do so. The DOS program sends PCL to the driver and the driver converts this code to a proprietary bitmap. In this case, it does not make any sense at all to send PCL data to the printer on Linux.

Top Secret Protocols

There are many printers that use proprietary languages or protocols that their manufacturers keep top secret. Most of them are low-budget devices, but some of them are actually quite expensive. If the manufacturers fail to provide a driver, printers that belong to this category are completely useless under Linux, until an independent developer finds time to examine the output from the Windows driver and guess the protocol. Even then, the output quality often fails to reach the standard achieved on Windows.

You can check the Foomatic database at [3] to find out if a printer is supported on Linux. The database has a list of all known printers, and indicates how well they perform on Linux. This article includes a few recommendations for various printer types and price categories.

Color Inkjets

Despite the large numbers of inkjet manufacturers, there are only two whose printers support Open Source software really well: Epson and HP. Epson Stylus printers in particular are a good choice for Linux.

Epson released information about its protocols to the Gimp Print [4] developers quite a while back. This allows Gimp Print to support new Epson models as soon as they are launched. Gimp Print is free software and provides high quality color output. The tool has a wide range of settings that give the user lots of leeway, from a good compromise between quality and speed, to photo realistic color reproductions. This makes Epson printers an interesting proposition for amateur photographers with Linux.

Most non-Postscript printers by HP use HP's own free HPIJS [5] driver. This driver supports all the major features that HP devices provide, such as duplex printing, tray selection, and six-ink printing. The photo and text output quality is impressive, especially with newer models. However, the driver does lack options for more granular control.

Printers by other manufacturers should be avoided. You might be able to support a Canon printer with a commercial Turboprint [6] license, or with a free, but proprietary license from Canon Japan [7]. The page is in Japanese. Just download the RPMs and install. Some models have different names in Japan, Europe and the USA. Not all models are supported.

Lexmark & Canon

Lexmark introduced the first proprietary drivers for some models quite a few years back. It is difficult to get this generation of printers to work on modern systems. Lexmark have now introduced a new driver concept, which unfortunately is also proprietary. The drivers are supposed to work with most modern distributions [8], although we have not been able to confirm this so far. Besides poor driver support, Lexmark also loses points due to its high prices for consumables.

There are one or two free driver projects for Lexmark and Canon, but the functionality they provide is restricted, as the developers typically have no alternative but to reverse engineer propriet- ary output. If you are interested, check the driver database at *Linuxprinting.org* for more recent information [9]. See Figure 1.

Drivers for printers by other manufacturers are unknown. What this all boils down to, is that you should opt for Epson and HP if you are looking for an inkjet with Linux support. HP's design with the printhead integrated in the expendable cartridge is preferable in environments where nozzles tend to clog. In contrast, Epson has permanent piezo printheads; the cartridges are simply ink reservoirs. Epson also supplies special inks for archiving purposes,

Figure 3: The Epson C84 is a useful general purpose inkjet. Gimp Print version 4.2.7 is required to provide perfect support on Linux.

Figure 4: Linux support is questionable for low-budget Epson laser printers. The Epson EPL6200L only has partial support as it uses a proprietary protocol.

grayscale inks, and continuous ink systems.

Users should be wary of low-budget offers when purchasing a printer. Support is typically poor, or non-existent, for printers in this price range, or the operating costs are extremely high due to consumable pricing.

Low-Budget, but It Works!

The C42 and C44 are Epson's entry level models. Both have been supported since Gimp Print 4.2.6. Ink cartridge prices are at the top of the scale. The C64 is cheap, but requires Gimp Print 4.2.7 or later.

HP's entry level models are the Deskjet 33xx, 34xx, and 36xx. These devices use LIDIL (Lightweight Imaging Device Interface Language). As HPIJS does not fully support LIDIL, these models cannot be recommended. Low-budget PCL printers with HPIJS support include the Deskjet 38xx series and the Deskjet 5150.

Rock Solid Desktop Printers

Epson's best all-round inkjet printers for A4 standard paper are the Stylus C82 and C84 (see Figure 3). They have separate cartridges for all four colors, and provide premium text and photo quality hard copy. These models use non-fading pigment inks. The C84 needs Gimp Print 4.2.7 or later.

The Deskjet 5625 is our choice of HP A4 inkjet printer. Thanks to its duplex unit, it uses half as much paper, and if you have the special photo cartridges, you can use six-color mode for photo printing. You can add a second tray to expand the paper capacity to 400 sheets. HPIJS allows you to use all of this printer's features with the exception of borderless printing. According to HP, work on supporting this feature is in progress.

The best mobile printer at present is the HP Deskjet 450 (see Figure 2). It offers mobile users the same hard copy quality as its bigger desktop siblings, and even six-ink photo printing on battery power and all in an attractive compact case.

Models in the HP Business Inkjet range are recommended for larger volume printing. These models are quicker and have better paper and ink capacities.

Most of HP's newer inkjets allow you to replace the black cartridge with a photo cartridge that includes black, light cyan, and light magenta. This allows for perfect photo printing quality. There is no need to modify the driver to support six-ink mode. The printer handles color management internally.

Photo Printers

HP's Photosmart range is specifically designed for printing hard copies of digital images. Almost all of these models have a card reader that allow direct printing without a PC. The 100 and 200 series are portable models that can handle maximum paper sizes of 10x15 cm. The 7000 series can handle A4, and the 7960 even offers eight-color printing (black, mid and light gray, cyan, magenta, yellow, light cyan, and light magenta).

HP's own multifunctional device driver, HPOJ [10], allows access to the card reader on Linux. The latest models (14x, 24x, 72xx, 76xx, 77xx, 79xx) actually handle the card reader as a USB mass storage device.

The Epson Stylus Photo series supports photo printing. The "classical" six-color printers produce excellent hard copy using Gimp Print. The newer models R200, R300, and R800 are not supported at present. Thus, the recommended models are the 830U, the 925, or the 950. The 925 has a card reader that can be accessed as a USB mass storage device (kernel 2.4.21 or newer), the 950 has six separate print cartridges.

Multifunctional Devices

These include devices that provide printing, scanning, and other functions, such as fax or card reading facilities in a single case. Unfortunately, none of the current crop of devices offers PC-based fax support with free software. Printing, scanning, and card reader access will work on all Epson and HP devices, with the exception of the Epson Stylus Photo RX500, although work is in progress on a Gimp Print driver. Devices by other manufacturers will print in some cases, and do nothing in others.

The HP devices need the low level driver, to access all their components. HPOJ provides an interface that accepts printjobs, a Sane driver for the scanner, and card reader access via MTools [11]. HPIJS is used as the printer filter.

Epson's devices act as if they were separate printing, scanning, and card reading devices. Gimp Print is used for printing. The *epson* back-end for Sane supports scanning [12], and card reader access is handled via USB mass storage.

With the exception of the "LIDIL" printers, the PSC 1xxx and the Officejet 4xxx, any HP models can be recommended. The LIDIL multifunctional devices are partially supported by HPOJ. Avoid the Epson RX800, as Gimp Print does not provide a driver for this model.

If you need A3 size printing, check out the four-color Epson Stylus Color 1160, 1520, and 3000 models, or the six-color

Figure 5: The Officejet 7130 by HP is a multifunctional device with good Linux support. You can even use this model's cut sheet feeder.

Epson Stylus Photo 1290(S) and 2100. In the HP corner, try the CP1700, and the Deskjet 93xx printers for four color printing. Photo cartridges are available for the Deskjet 96xx series.

The Epson Stylus Pro can print DIN A3 oversizes. Gimp Print handles this without any trouble. However, the developers were unable to fine tune the color management and optimization for this series due to a lack of test machines. The A1 Stylus Pro 7000 and 7500 printers have been tested and provide a similar quality to their smaller Stylus Photo siblings. The Stylus Pro 9000 and 9500, are the A0 versions of the 7000, and should also produce premium color hard copy. Gimp Print even supports the current Stylus Pro 7600 and 9600 models.

If you decide to opt for a product by HP, or some other manufacturer, make sure it is a top of the range model with a hardware-based Postscript interpreter.

Monochrome Lasers

Most laser printer manufacturers do not provide native support for Linux. Fortunately, most models use the standard PCL and/or Postscript languages, so many printers work perfectly well without native driver support.

However, there are a large number of printers – especially in the low-budget section – that use proprietary protocols, and do not provide driver support. Many of them have a suffix, such as "L" for "Light" at the end of their names, and most of them have a bigger sibling that speaks PCL or Postscript. Make sure you choose the premium model, when buying a printer.

Many low-cost machines do not support free software. Once again, fortunately, there are quite a few PCL and Postscript printers, and there are even a few drivers for proprietary protocols. In general, you should look to purchasing a PCL or Postscript printer. Remember that many low-cost lasers lose this advantage due to expensive consumables.

Low-Cost Lasers

Kyocera laser printers, with the exception of the multifunctional devices, typically speak Postscript or at least PCL. In addition, they have a permanent drum, which has the pleasant side effect of offering low printing costs per page. Kyocera's FS-1010 and FS-1020D models both speak Postscript, the FS-1020D also has a duplexer unit.

Lexmark laser printers are far friendlier to free software that their inkjets. Almost all the models in the Optra range either speak PCL or Postscript.

Lexmark has its own Postscript interpreter, and this allows even the low-budget Optras to speak Postscript. The Lexmark website indicates the Linux compatibility of the models; driver downloads are available. The entry-level PCL5e models (HP LaserJet 4 compatible), E220 and E321, are a good low-budget choice.

Brother mainly has PCL and Postscript lasers, and provides native Linux support with its own driver page [13]. Many Brother printers that uses Brother's proprietary protocol work well, as the Ghostscript *hl7x0* filter helps produce good results. Separate toner and drum

Over 10,000 Red Hat Certified Engineers

The leading certification for Linux has reached another milestone: over 10,000 RHCEs worldwide, and over 3,500 RHCTs. RHCE certification includes both 'hands-on'and theoretical training. Students must 'prove what they can do' in order to be certified.

redhat CERTIFIED TECHNICIAN

RED HAT CERTIFIED TECHNICIAN
Core sys admin skills
- install and configure new Red Hat systems
- attach new systems to an existing network
- perform core system administration

Starting from scratch? Our new RHCT certification may be just what you need. Fewer required classes. Same legendary hands-on training and performance-based testing. As a Red Hat Certified Technician, you'll learn what you need to know to get the job done. And RHCT is the first step towards RHCE.

redhat CERTIFIED ENGINEER

RED HAT CERTIFIED ENGINEER
Senior sys admin skills
- RHCT-level skills plus:
- set up networking services
- configure security
- diagnostics and troubleshooting

Want to be a Linux guru? RHCE is the gold standard certification. According to Certification Magazine/Fairfield Research. RHCE is the #1 certification for overall quality of program, #1 for quality of tests and exams, and #1 for overall educational quality.

Tel: 01483 734909
www.europe.redhat.com/training
Email: training-uk@redhat.com

redhat

© 2004 Red Hat, Inc. All rights reserved. "Red Hat," Red Hat Linux, the Red Hat "Shadow Man" logo, and the products listed are trademarks or registered trademarks of Red Hat, Inc. in the US and other countries. Linux is a registered trademark of Linus Torvalds.

modules allow for low operating costs. The entry-level models, HL 1430 and HL 5130, are both PCL5e printers.

Epson's cheapest laser printers are the models in the EPL "L" range (for example the EPL 6200L), however, they use a proprietary protocol. See Figure 4. Epson does not supply a Linux driver, nor does it provide any information on the protocol. Although an independent project is working on developing a driver [14], this range of printers cannot be recommended.

As the world's largest laser printer manufacturer, HP has a wide range of PCL and Postscript printers. HP uses the HPIJS driver to support PCL, and provides PPDs under the free MIT license for Postscript – and even allows *Linuxprinting.org* to distribute them [15].

The cheapest laser printers that provide full support for free software are the Postscript lasers LJ 1200 and 1300. The LJ 1010, 1012, and 1015 models tend to crash due to PCL compatibility issues. The HP LaserJets 1000 and 1005 both work with the *foo2zjs* driver [16], but they do need a firmware upload on restarting. Again, it is probably best to avoid these models.

Mid-Range

Mid-range, so-called workgroup printers have quicker engines, network ports, and are extensible. All of these printers support either PCL or Postscript, and most of them support PJL. This more-or-less rules out issues with free software. HP, Kyocera, and OCE all provide PPD files for their Postscript models as free software under the MIT license [17]. Epson provides free drivers for its PCL laser printers (the EPL series without an "L" at the end of the model identifier). Both Brother and Lexmark offer driver downloads.

Manufacturer-Specific Pros & Cons

All of the printer manufacturers discussed in this article have their up and downsides. Lexmark has quicker printers, and better firmware, than HP at the same price. HP toner cartridges and drums are typically sold as a single unit, and this can mean higher operating costs. Kyocera's permanent drum and, Epson and Brother's separate consumables are more cost-efficient. On the other hand, HP's hardware has the reputation of being more durable.

Many entry-level color lasers either provide no free software support whatsoever, or are subject to restrictions. This kind of printer is not recommended. The HP Color LaserJet 1500 (work on developing a driver has started [18]), the HP LaserJet 3500, and the Epson Aculaser 1000 are examples. The Minolta Magicolor 2200 DL, and 2300 DL both use a proprietary protocol, but they work quite well with the *foo2zjs* driver.

Incidentally, ensure that PCL or Postscript is implemented in the hardware, rather than as an emulation. Models that provide this are the Kyocera FS-8000C, and the HP Color LaserJet 2500, 3700, and 4600. Some manufacturers give users access to freeware drivers, such as the Epson Aculaser 1900, 2000, 4000, 8500, and 8600.

High-End Printers

High-volume printing, larger departments in enterprises, or special tasks such as punching, stapling, or binding, are typically the domain of high-end laser printers with speeds of 100 pages per minute or more. The paper trays typically have capacities of more than 2000 pages. Add-on devices include finishers with booklet making, or creasing facilities, mailbox and sorting, and inline finishing of printed pages.

Figure 6: For high volume printing: a Digimaster by Heidelberger. These monsters have no objections to being controlled by Linux computers.

Devices of this type normally have an internal Postscript interpreter. They work perfectly with free software. If you use the PPD file, you can access the same options as users with the Windows or Mac operating systems.

Communication via Internet Protocols

There is a noticeable trend to multifunctional devices in high-end model ranges. Many high-end printers started off life as digital copiers, with additional printing and scanning modules. If the scanner provides a Web interface, and outputs image data as email, HTTP, or FTP, you can scan with any operating system. If not, the scanning facility provided by the multifunctional device will not be available on Linux. ■

INFO

[1] Specification of PPD format: *http://partners.adobe.com/asn/tech/ps/index.jsp*
[2] Foomatic Tutorial: *http://tinyurl.com/3gf2g*
[3] Foomatic database on Linuxprinting.org: *http://www.linuxprinting.org/database.html*
[4] Gimp Print project homepage: *http://gimp-print.sourceforge.net/*
[5] HPIJ driver project: *http://hpinkjet.sourceforge.net/*
[6] Turboprint, commercial driver for inkjet printers: *http://www.turboprint.de/english.html*
[7] Driver for Canon inkjet: *http://cweb.canon.jp/drv-upd/bj/bjlinux220.html*
[8] New Lexmark drivers: *http://support.lexmark.com/en/ldk/index.htm*
[9] Driver database: *http://www.linuxprinting.org/driver_list.cgi*
[10] HP driver for chip card reader: *http://hpoj.sourceforge.net/*
[11] MTools: *http://www.tux.org/pub/tux/knaff/mtools/index.html*
[12] Sane scanner project: *http://www.sane-project.org/*
[13] Brother drivers: *http://solutions.brother.com/linux/*
[14] EPL driver development: *http://epsonepl.sourceforge.net/*
[15] PPDs for HP lasers: *http://www.linuxprinting.org/download/PPD/HP/*
[16] Foo2zjs: *http://foo2zjs.rkkda.com/*
[17] PPD downloads: *http://www.linuxprinting.org/download/PPD/*
[18] Project for HP color laser: *http://www.epkowa.co.jp/english/linux_e/dl_laser.html*