

Professional colour Printing under Linux

SUMPTUOUS COLOURS

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The driver package Turboprint allows (colour) printers on Linux PCs to easily produce high quality output. Version 1.42, just out, also works with CUPS.

The old print solutions for Linux (lpr, Apsfilter, Ghostscript) suffer primarily from the fact that this system is orientated towards outdated printers. The latest colour printers demand specific controllers, which seems impossible without the co-operation of the printer manufacturers.

Turboprint from Zedonet is a driver package for Linux, which builds on the tried and trusted Ghostscript-based print standard. Turboprint functions as Magicfilter and thereby replaces, Apsfilter.

With the aid of a Turboprint driver Linux users, can use all the features of their printer, such as adaptation to special papers and formats and maximum print resolutions. Equally, brightness, contrast and colour reproduction are adjustable.

The configuration tools of Turboprint work in administrator or user mode. In administrator mode new printers can be added and installed, which are then available to all users. Also, any user can individually alter and save settings.

Turboprint and CUPS together

Turboprint (since version 1.2) has the option of working with the CUPS printing system. CUPS, apart from using the Internet Printing Protocol (IPP) can make unlimited use of the PPD Files (Postscript Printer Definition) from the printer manufacturer.

These files define all the features of the respective devices for Postscript printers. PPD files have a simple ASCII format. PPD acts as a standardising programming language for printer

control, occasionally expanded by manufacturer-specific commands.

With CUPS it is possible to make full use of the contents of these PPD files without additional changes. Owners of Postscript printers can choose from a wealth of PPD files on the Adobe homepage. These are self-unpacking EXE archives for Windows, but they can be unpacked under Linux with the appropriate utilities.

While real Postscript printers can already be used without limitation with the availability of such original PPD files, for non PS-compatible printers (pseudo) PPD files have to be generated via Ghostscript.

PPDs under CUPS and Turboprint

Since the print output is done in the Postscript format, such PPD files must be formatted



Turboprint

Version 1.4, Free Edition

Version 1.42, Full version, EUR 19.95

Download and info: <http://www.turboprint.de/german/index.html>

Manufacturer:

Zedonet

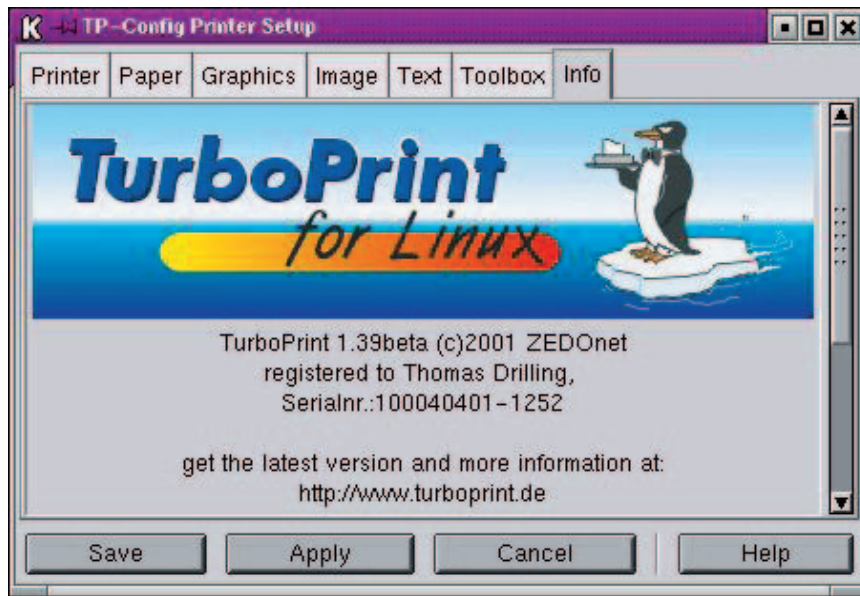
Meinrad-Spiefl-Platz 2

D-87660 Irsee

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Email: mail@turboprint.de



The Gtk front-end `Xtpconfig` is used to configure the special features and the colour correction system. CUPS options can also be configured from here

appropriately for the respective printer – a task for the commercial package Ghostscript from Aladdin. A somewhat older version of Ghostscript is available for free. In most Linux distributions this version serves as the basis for printing without Postscript.

PPD files based on the free Ghostscript are available for all the usual printers. The Perl script `Cupsomatic` prepares the free PPDs for CUPS.

On the linuxprinting.org website, it is possible to click together your printer features with a few mouse clicks and then download using `Create CUPS-PPD`. The `Cupsomatic` script is also downloaded locally; it provides for the integration of the dynamically created PPDs in CUPS.

SuSE Linux 7.2 for example combines such PPD files in the packet `cups-drivers` from series *n*. After installation they can be found and sorted according to manufacturer in `/usr/share/cups/model`. The filter script is installed by SuSE under `/usr/lib/cups/filter/cupsomatic`.

Pure CUPS solutions with CUPS-O-Matic-generated PPDs and front-ends like Til Kampeter's free XPP (X Printing Panel) or Kups and the

commercial software ESP Print Pro from Easysoftware concentrate on the abilities of the IPP. This makes it easier to manage a large number of printers from any location, based on one or more CUPS servers and to control specific features of high-performance professional printers.

Turboprint is aimed more at the inkjet market. It also uses its own process, which goes beyond the CUPS-O-Matic method, to prepare PPD files for CUPS.

Installing and starting up Turboprint

The program is in a tar archive, which is unpacked and installed very easily with an installation script. The script also creates the PPD files for co-operation with CUPS. The software is dynamically linked to the Gtk library 1.2.

The heart of Turboprint is the command line program `/usr/bin/tpprint`. Purists can use this to control Turboprint via the shell. The Turboprint configuration dialogs are `xtpsetup` to install the pool system and `xtpconfig` for configuration of the driver.

Keeping order

The Turboprint driver (`*.TPP`) is found under `/usr/share/turboprint/printers`. The PPDs are in `/usr/share/cups/model/turboprint`, if you prefer to print with Turboprint via CUPS instead of with `lpd`. Details of the variety of drivers supplied can be found both in the list under `/usr/share/turboprint/printers/lprinter` and on the Zedonet homepage.

Turboprint uses two configuration files in `/etc/turboprint`. `turboprint.cfg` contains the printer descriptions which had been created in the administrator mode with `tpsetup`. `system.cfg` mainly lists environment variables with paths to the print spooling system in use, such as CUPS.

To use the CUPS filter with Turboprint, version 1.4 now includes `/usr/share/turboprint/lib/`

History

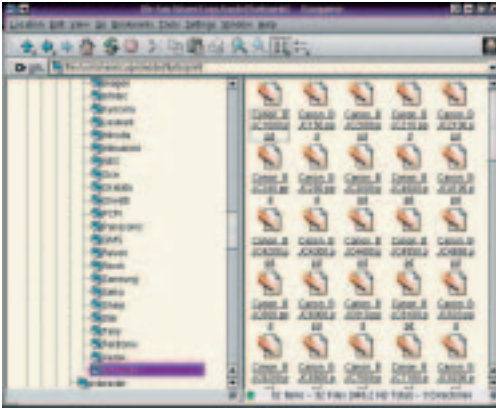
Turboprint does not have the typical Linux genesis. The concept goes back to a development at the end of the eighties for the Commodore Amiga. The developers were – as they still are – somewhat dissatisfied with printing under Linux.

The primary outcome was an image printing program, and later on its own printer drivers emerged from this, which over the years were expanded bit by bit to cover additional printer models. Right out in front came the Turboprint development, with support for the first colour inkjet printers like the legendary HP DeskJet 500 Color.

At that time, many options for image

reproduction and rastering were integrated into the Turboprint driver. Its own algorithms were added to improve the colour purity.

Because the situation was comparable with that of the Amiga era, the developers of the Linux version were able to channel all their experience of Turboprint for the Amiga into the new development. The objective was (and is), to conjure up high quality colour and photo printing from modern inkjet printers under Linux which of at least as good quality as those under Windows with the original drivers from the printer manufacturers. After two years of development



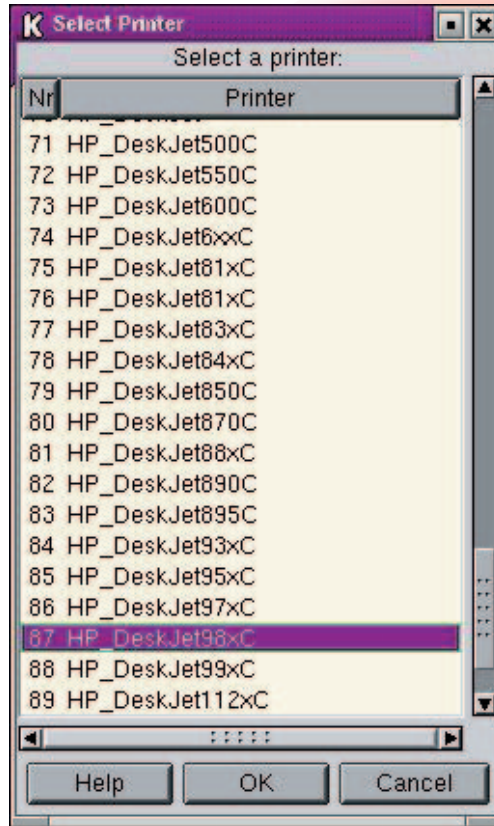
To work with CUPS, Turboprint needs its own integration into the PPD files. These are created automatically during installation and are kept in the CUPS directory under `/usr/share/cups/model/turboprint`

rastertoturboprint. The PPD files created in the course of the Turboprint setup are in the CUPS driver directory under `/usr/share/cups/model/turboprint`.

Any CUPS configuration front-end, such as KUPS, can use the Turboprint PPDs as an alternative to the CUPS printer drivers. The user will also find, in the CUPS printer selection for the respective standard CUPS printer model, Turboprint-specific drivers or models listed as `<Model>-Turboprint`. When Tpprint itself is called up, each individual print job is performed, by either the filter in `/usr/share/turboprint/lib/tpfilter` or `/usr/share/turboprint/lib/rastertoturboprint` respectively.

The Turboprint installer makes up its own mind

On first installation, Turboprint analyses the computer environment. So the print system currently in use is identified. Then Turboprint is adapted to the respective requirements. Since modern print systems like CUPS have their own API, the environment variables and paths in `system.cfg` only come into use if the print system will not



The printer model selection list (TPP drivers) of Turboprint includes over 100 devices.

integrate elegantly via the respective API.

The installation script dynamically creates the PPD files. Turboprint can communicate with the existing print system in two ways: If Turboprint sets up lpd, then `/usr/share/turboprint/lib/tpfilter` acts as a substitute for the default printer filter of a standard print system like Apsfilter or Magicfilter and performs the Turboprint run with the classic Ghostscript – but taking account of the Turboprint driver.

The free Ghostscript is then used for the RIP process. If on the other hand Turboprint is used together with CUPS, the more powerful version of Ghostscript integrated in CUPS is used for the RIP process.

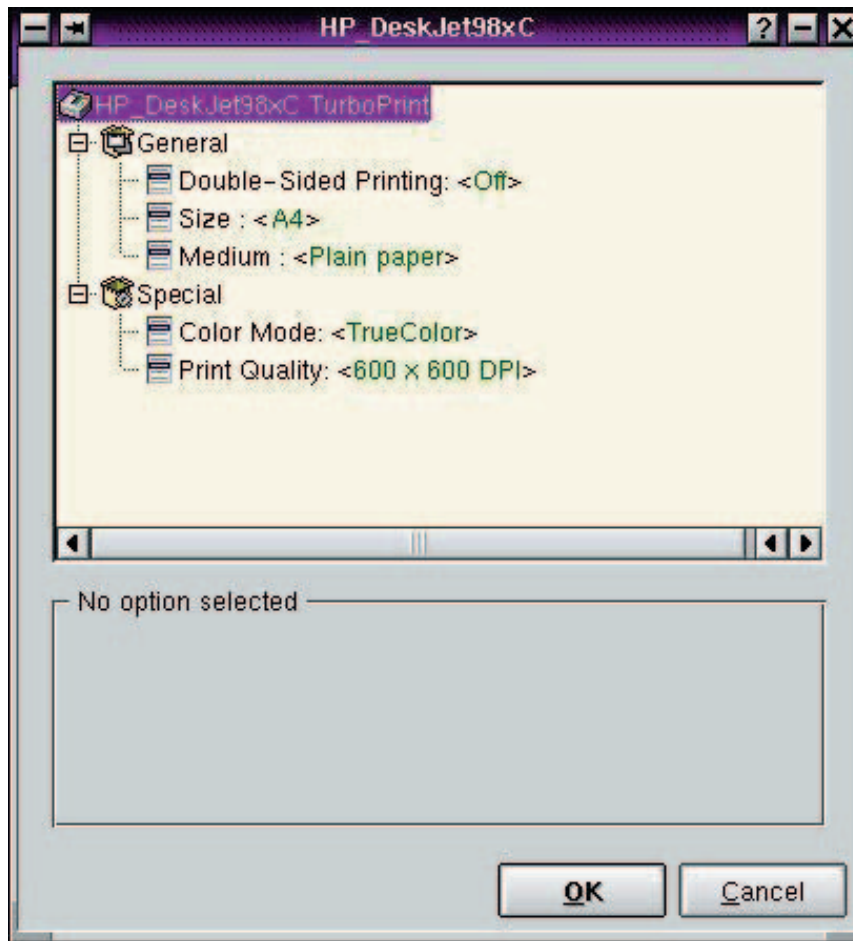
Turboprint for Linux 1.0 emerged from the Amiga program in the spring.

The Amiga code was written completely in Assembler – for porting onto Linux in C++ it had to be almost completely re-written. Only a few algorithms and the printer database with the colour profiles were taken over. In this way a few of the new print techniques and improvements got a look in, so that the Linux version of Turboprint will cope admirably with professional demands.

In the first versions, Turboprint still integrated itself in the usual way as a classic magic filter in

the LPR/LPRng printer spooling system. There is a graphical Gtk-based configuration menu for the expanded setting options available with Turboprint, such as brightness and colour saturation.

As it became apparent that lpr would sooner or later replace the powerful CUPS spooling system, the developers modified the latest Turboprint 1.2 in such a way that it works together as easily with CUPS as with lpr. The Turboprint settings menu `xtpconfig` specifically adapts itself to the special features of CUPS, but also offers the original Turboprint-specific setting options as well.



If the Turboprint drivers have been correctly installed, any Turboprint printer can be addressed with Kups

True Match – colour processing with colour profiles

Most colour printers produce and print any colour from the four basic colours yellow, magenta, cyan and black. In computer terms, yellow, cyan and magenta are sufficient to represent colours; but black is still needed since in practice the three basic colours don't produce a true black tone. Printing text would incur high costs.

The question now arises as to how thousands of colours should be created for photo-realistic printing with millions of colour nuances. In principle it would be necessary to print the basic colours in various levels of brightness, but only a few special

printers are able to do this.

In practice, a process for rastering print colours is used. Colours are applied in a regular (ordered) or irregular pattern (error-diffusion), so that by placing more or fewer coloured dots, the viewer gets the impression of areas of different colour intensity. To do this, the necessary intensities of the printer complementary colours for a true colour reproduction of cyan, magenta and yellow must be calculated from the red, green and blue components of the screen colours. So much for theory.

One major problem arises in practice. Printer manufacturers each use different colour nuances of the basic colours, which never correspond exactly to the pure complementary colours of the screen colours red, green, blue. So it is also impossible in principle to create a pure blue from the screen, such as by mixing a theoretical 50 per cent magenta and 50 per cent cyan.

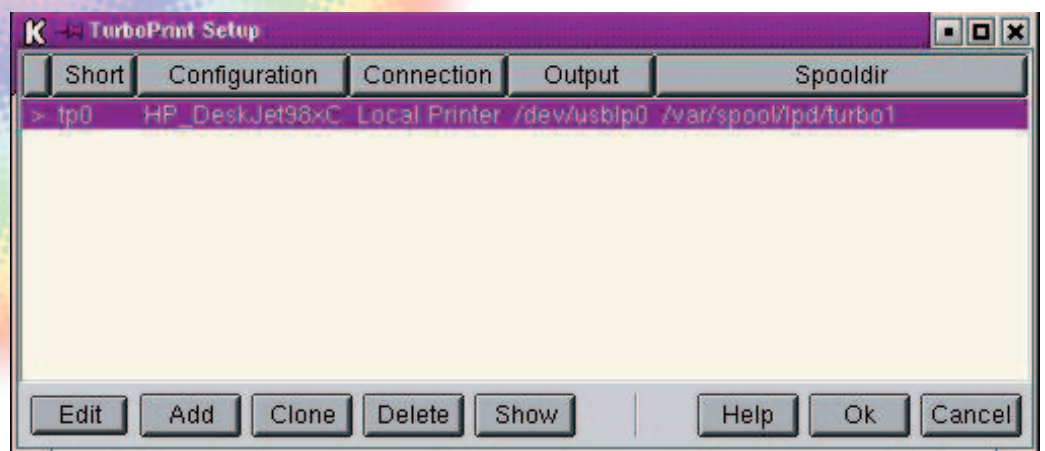
Depending on the colour cast of the basic printer colours, the proportions of colour are weighted differently. Also, there are always slight impurities in the print colours (for example a small proportion of yellow in the cyan) due to manufacturing.

To make things harder, paper variation allows the inks to flow into each other to varying degrees and the chemical coating of inkjet printer paper slightly alters each colour tone. The result is that the colours in a photo printed with the same printer and driver will look different on different types of paper.

All in all, the effect on the resulting colour tone due to ink (colour tone, flow characteristics, mixture properties and so on) and paper (chemical coating, absorption behaviour) is so complex that the ideal amount of ink to be applied can only be calculated approximately, even with a complicated formula, from the screen colours.

A really true colour print result is only achievable if one knows the ideal mixture of printing ink for almost every screen colour and lays it out in some form – such as a table or a colour profile. This is produced by doing test prints with various colour patterns and analysing them using a colour measurement device. Separate colour profiles are needed, for different sorts of paper. The print

Xtpsetup is an easy-to-use Gtk front-end for the management and configuration of the Turboprint environment. New printers can easily be added by the administrator with Add



quality in this system is critically dependent on the quality of the colour profile.

Colour correction and raster

For Linux, the drivers of Turboprint have so far been the only ones to realise a real colour profile technique. The True-Match colour correction system developed by Zedonet also contains colour profiles for specialist printer papers, so that in fact in every situation one can achieve high-quality colour reproduction in the printouts.

Correct rastering is of almost equal importance to the appropriate mix proportions of the colours, so that the individual droplets of ink can be discerned as little as possible and an even, photo-realistic impression is created. Turboprint, when set to *Error-Diffusion*, works with a special raster algorithm, which distributes the droplets evenly over the paper and at the same time arranges them as far as possible so that none of them produces a pattern discernible to the eye. Also, light grey tones are not printed using black ink, but mixed from coloured inks so the visibility of the print raster is greatly reduced.

A few printer models offer special techniques for even application of colour, which Turboprint also supports. The best known is the six-colour or seven-colour print with special photo cartridges, such as those supplied with the Epson Stylus Photo printers. The process also uses less colour-intensive inks to print lighter colour tones, which produces scarcely visible raster dots.

Other processes such as C-Ret III from Hewlett-Packard are based on variable droplet sizes. This technique is found in all modern inkjet printers, as is a process of overlapping the print lines for stripe-free printing, which Epson calls microweaving.

The processes mentioned can only be controlled and used if the printer driver takes account of them right from the start in the colour processing. Printers which can use such techniques can also be controlled with simpler drivers, but they do not achieve their maximum print quality. In the standard setting Turboprint always tries for a printout which is true to the screen. Slide controllers available are used to alter the brightness, contrast, colour saturation or colour cast.

Handling Turboprint

The core of the Turboprint package is */usr/bin/tpprint*. The program can be addressed, using the following syntax

```
tpprint -ddrivename [Options] \  
Input [Output]
```

from the command line, but it is controlled more

easily via the Turboprint configuration programs *Xtpsetup* and *Xtpconfig*. Both programs also come in a command line version: *Tpsetup* and *Tpconfig*. The tasks of *Tpprint* and its printer configuration can also be done by *Kups*. Turboprint's own drivers then appear in the printer selection list of *Kups* with the addition of *Turboprint*. *Tpprint* starts, whenever any print job is done, from */usr/share/turboprint/lib/tpfilter*.

Costs

Originally the manufacturer had intended to make Turboprint available to the Linux community free of charge and to have the driver development financed by the printer manufacturers. But so far, most manufacturers have not been won over to such a commitment to Linux.

At EUR 19.95 (about £13), though, the licence costs are in a very reasonable. Anyone who shies away from spending even this amount can obtain the free version 1.4 from the Turboprint homepage, which at the maximum resolution and with special paper, places an advertising logo of Turboprint on every printout.

Conclusion

The old Linux print system comes to grief on today's colour printers on the specific control. The new CUPS, through its ability to read in Windows PPD files, is countering the lack of commitment to Linux of the printer manufacturers in a sophisticated way. This is also an advantage when administering network printers on the basis of the IPP protocol.

But it is only in combination with Turboprint that the full extent of its capability unfolds, as Turboprint, with its True Match colour correction system is finally lending colour and photo printing under Linux the same professionalism as under Windows. And the whole has an easy configuration.

From the point of view of Turboprint, though, CUPS serves as an easy and welcome vehicle for printer administration which is the same throughout the system, even on a network. Excellent print results are also achieved by Turboprint without CUPS on the basis of the old print system. Which is why the economical software should actually be part of the obligatory investment of every Linux user with a modern inkjet printer. ■

Info

Turboprint Homepage

<http://www.turboprint.de>

PPD files from Adobe for Postscript printers

<http://www.adobe.com/products/printerdrivers/winppd.html>

Site of Grant Taylor with CUPS-O-Matic and Cupsomatic

<http://www.linuxprinting.org>

List of printers supported by Turboprint

<http://www.turboprint.de/printers.html>