



cups-filters

The non-Apple part of CUPS, maintained by
OpenPrinting

ippusbxd

Standards-conforming support for
IPP-over-USB printers

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- **cups-filters takes up everything from CUPS which Mac OS X does not need (CUPS 1.6.x)**
 - Started end of 2011 by OpenPrinting, overtaking most of CUPS' **filters**
 - Switched filters over from PostScript-centric to **PDF-centric** workflow
 - **cups-browsed** introduced end of 2012, to introduce browsing of DNS-SD-advertised remote CUPS queues, as CUPS dropped its own broadcasting/browsing
- **In 8 years of development cups-filters improved a lot**
 - cups-browsed auto-creates print queues for **IPP network** and **IPP-over-USB** printers, especially **driverless** printing, not competing with **CUPS' own temporary queues**.
 - **Mobile** printing support: No printer setup tool needed, auto-setup of printers, driverless, cups-browsed auto-shutdown
 - Load-balanced **printer clusters**, with client-side or server-side queue
 - Do **legacy CUPS broadcasting/browsing** to work with old CUPS
 - Filters support **Ghostscript**, **Poppler**, and **MuPDF** as PDF interpreter
 - Filters support all PDLs for **driverless printing**: **PDF**, **Apple Raster**, **PWG Raster**, and **PCLm**



Role of cups-browsed

- **CUPS auto-generates its own temporary queues to point to remote IPP/CUPS printers, why continue cups-browsed?**
 - **Printer clustering** (like the former Implicit Classes)
 - Configurable: Automatic (by equal remote queue names) and manual (by cups-browsed.conf)
 - Load balancing of clustered queues
 - Auto-selection of destination printer by job and job settings (soon)
 - **Fine-grained filtering** of which remote printers are available
 - Not only servers/IP addresses, but also service names. PDLs, color, duplex, ...
 - When using CPDB CUPS backend turn off display of temporary CUPS queues
 - Support for **new driverless printing technologies** not (yet) supported by CUPS
 - Currently: PCLm
 - **Legacy technology** support
 - Legacy CUPS server (1.5.x and older) interoperability
 - **Interoperability with old print dialogs** (which do not use cupsEnumDests() and new CUPS API, nor CPDB)
 - Support for legacy (IPP 1.x) IPP network printers



cups-filters Development: cups-browsed

- **No new features landed after the last OpenPrinting Summit**
 - A bunch of new features developed by Deepak Patankar in GSoC 2018, will get added soon
 - This year was all about reliability for enterprise use, as this is where cups-browsed is most useful
- **Bug fixes**
 - Distribution of jobs in clusters now triggered via "job-state" CUPS notification
 - Formerly used "printer-state-changed" does not contain job ID, required unreliable IPP request for job ID
 - Discovered in 12000-OpenSUSE-machine setup in German government organization
 - I fixed quickly myself to put weight on not returning to Windows
 - Correct handling of HTTP timeouts to avoid CPU hogging
 - Upgrade to IPPS if the printer uses IPP port 631 and IPPS port 443
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cups-filters Development: cups-browsed

- **Bug fixes**

- More reliable recognition of remote CUPS queues
- More reliable on making temporary CUPS queues permanent
- Block lost queue recreation when removing and recreating queue to make it permanent, to avoid infinite loops causing CPU hogging
- Fixed several crashes on advanced configuration settings: Manual clusters, BrowseFilter



cups-filters Development: PPD generator

- **Bug fixes**

- Poll printer capabilities with IPP get-printer-attributes request with attributes "all" and "media-col-database"
 - Same way as in CUPS
 - Really polls the complete data
 - There are some Canon inkjet printers with broken output
- Add "*cupsManualCopies: true" when printing in raster as then pdftopdf has to generate the copies



- **pdftoopvp and pdftoijs deprecated**
 - Now after more than a year no complaint about them missing
 - Only user hint to use of pdftoopvp points to years-old Canon and NEC drivers
 - So can be fully removed soon
- **QPDF-based solutions**
 - pdftopdf: Flattening forms to static PDF is now internal, using QPDF
 - Filled interactive PDF forms need to get flattened to static PDF before applying manipulations like N-up, scaling, ...
 - Was GSoC project 2 years ago, not completed, QPDF upstream Jay Berkenbilt completed it (in QPDF), Tobias Hoffmann former student/mentor helped
 - Slowish calls of external utilities for the time being, still available as fallback
 - Avoids unneeded pipes and PDF interpreter runs, much faster
 - bannertopdf is based on QPDF and not using Poppler through undocumented interfaces any more, thanks to Sahil Arora's Google Summer of Code work.



- **New options for scaling/fitting images/page content**
 - **"-o fill"**: Scales input page (photo) to completely fill output page
 - Output page can be different aspect ratio
 - Input page is cropped to fit aspect ratio then scaled, some content lost
 - To print photo so that it fills a given frame
 - **"-o crop-to-fit"**: Fit an input page into a different output page size without scaling
 - Maintain size of page content when output paper size slightly differs
 - Typically A4 -> Letter, Letter -> A4
 - Page content centered, not scaled, cropped to destination page size
 - Contributed by Dheeraj Yadav, student of GSoC 2019, for the Printer Application Framework project



- **Bug fixes**

- No duplicate execution of pdftopdf on client and server (with remote CUPS queue)
- Correct handling of output-order, collated copies on driverless printers
- Continuous adaptation to Poppler changes
 - pdftoraster gets hopefully fixed this GSoC
 - pdftoopvp and pdftoijis are deprecated and we will remove them soon
- imageto...: Fixed crashes and hangs on broken/forged GIFs, contributed by Dheeraj Yadav
- pdftops filter applies Ghostscript->Poppler quirk for all models of Apple LaserWriter XX/YY series, sends only PS level 2 to Brother now
- Lots of fixes and improvements for the Braille embosser support from Samuel Thibault



cups-filters Development: General

- Fixes according to Coverity scan
- Continuous adaptation to changes in CUPS, Ghostscript, ...
- Lots of minor bug fixes



Future of cups-filters

- Make cups-browsed re-startable in-process
 - For example to re-read its configuration and restart on "kill -HUP" (like most other daemons).
- Let cups-browsed not use CUPS PPD APIs any more (Deepak Patankar, GSoC 2018)
 - Do not download PPDs from remote CUPS printers
- Let cups-browsed treat IPP network printers and remote CUPS printers equal (Deepak Patankar, GSoC 2018)
 - Allow clustering of any combination of printers.
- Make cups-browsed auto-select printers in a cluster of very different printers depending on the job and the option settings supplied by the user (Deepak Patankar, GSoC 2018)
- Not using CUPS PPD APIs in the filters (and/or otherwise removing the deprecation warnings from CUPS)
- Provide infrastructure (library functions, ...) for Printer Applications?
- Translate PPDs into languages supported by CUPS' translations tables.



- **General**

- IPP-over-USB daemon (Printer Application) to mirror IPP-over-USB printer to standard-conforming `ipp://localhost:<port>/ipp/print`
 - Web admin interface goes to `http://localhost:<port>/`
 - Default port: 60000, any other free port can be used
 - Avahi does not support localhost ("lo"), simple patch fixes this, final solution needs to get worked out.

- **ippusbxd development**

- No code changes, no new features, no functional changes
 - For us it just works
 - Not commonly used, so no bug reports/feature requests
 - Needed Avahi patch not widely adopted, only by Ubuntu
 - Blocks scanning on MF devices, therefore HPLIP preferred on HP (IPP scanning urgently needed)

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- **Features for the coming year**

- Fix overall slowness found in the web interface, due to many parallel requests from the browser for which there are not enough USB interfaces. Needs to be re-checked.
- Re-use code for Printer Applications (library?)
- IPPS support: Actually needed for direct USB connection? Or needed to correctly fulfill the standard? Implemented in printers?



- **Moved from BZR to GIT in the OpenPrinting GitHub**
- **Adapted OpenPrinting web app for the database appropriately**
 - New scripts by Dheeraj Yadav



- **Needs to support services on localhost (loopback device "lo")**
 - For **ippusbxd** and **Printer Applications** in general
 - **Patch** is available
 - Simple changes:
 - Loopback (lo) interface support (done by me)
 - "localhost" hostname in lo-DNS-SD messages (Rithvik Patibandla, GSoC 2017 student)
 - Patch as distro patch in Ubuntu, not accepted by other distros because not upstream
 - Submitted upstream as pull request
 - Maintainer Trent Lloyd (one of the original authors) accepts only first part (loopback support), the rest must be fixed in CUPS



- **Printer Applications**

- Printer Application: Daemon like ippusbxd, emulating a driverless IPP printer, running input data through driver for printer's PDL and to printer via IPP, Socket, USB, ...
- Change driver design guidelines for manufacturers (to create Printer Application Snaps)
- Snap all Printer Applications and put in Snap Store
- Printing Stack Snap DOES NOT need a driver interface any more
- LSB Printer driver packages are deprecated

- **Framework for Printer Applications**

- GSoC 2019 project by Dheeraj Yadav
- Wrap legacy drivers (Foomatic, HPLIP, Gutenprint, foo2zjs, ...) into Printer Applications: Universal CUPS driver wrapper Printer Application



- **Will CUPS backends (except IPP) be deprecated?**
 - Should be turned into library functions for Printer Applications.
- **ippusbxd is a special form of a Printer Application**
 - Pass-through, as no PDL conversion needed, only connection type conversion.
- **Printer Applications: ipp(s)://localhost:<port>/...,**
 - Same Avahi changes as for ippusbxd needed



Questions?



- **From version 1.6.x on CUPS dropped features not needed for Mac OS X**
 - Filters for file conversion and Postscript workflow: imagetops, pdftops, pstoraster, ...
 - Serial and parallel backends
 - CUPS broadcasting/browsing for automatic availability of shared printers on remote CUPS client, replacement technology DNS-SD has only broadcasting and no browsing, also incompatible with old CUPS versions
- **Dropped CUPS filters were put into there own source package on CUPS SVN → Seed for cups-filters**
- **cups-filters started by OpenPrinting end of 2011**
 - Legacy filters package of CUPS with pure PS workflow filters dropped
 - PDF workflow filters (formally maintained as CUPS add-on) added
 - cups-browsed added end of 2012 for DNS-SD browsing and legacy CUPS broadcasting/browsing



The Filters and Backends

- **Dropped CUPS filters made up a PostScript-based print workflow**
- **cups-filters supplies filters for the new PDF-based print workflow**
 - Filters from CUPS legacy package: commandtoescpx, commandtopclx, imagetoraster, pdftops, rastertoescpx, rastertopclx
 - PDF filters from OpenPrinting Japan: pdftopdf (old Poppler-based), pdftoraster (Poppler-based), pdftoopvp (deprecated), imagetopdf
 - Filters from Google Summer of Code projects: texttopdf, pdftoijs (deprecated), pdftopdf (new QPDF-based), rastertops, mupdfstoraster, rastertopclm
 - Also added: bannertopdf, texttotext, gstopdf, rastertopdf, gstoraster, gstopxl, foomatic-rip, filters for Braille embossers
 - Dropped filters from CUPS legacy package: bannertops, imagetops, texttops
- **cups-filters adopts serial and parallel backends**
- **cups-filters used with Ghostscript, Poppler, or MuPDF as PDF interpreter, Ghostscript allows also PS input**



- **CUPS 1.6.x drops CUPS broadcasting and browsing**
- **CUPS 1.6.x does DNS-SD broadcasting as defined as PWG standard, but does no DNS-SD browsing**
- **cups-browsed solves the problems caused by this (works with all apps):**
 - In **default configuration**, cups-browsed does **DNS-SD browsing** and auto-generates local queues pointing to the discovered remote CUPS queues, solving the problem with remote CUPS 1.6.x servers
 - **Legacy Option** (via config file): cups-browsed does **CUPS browsing** on CUPS 1.6.x clients with older remote CUPS servers
 - **Legacy Option**: cups-browsed does **CUPS broadcasting** on CUPS 1.6.x servers for older remote CUPS clients.
 - **Legacy Option**: cups-browsed does **BrowsePoll**, on CUPS 1.6.x clients for servers with broadcasting turned off.
- **Alternative: Adding DNS-SD browsing to the print dialog (GUI apps using this dialog only!)**



- **Mobile systems have different printing system demands:**
 - Move between different local networks (home, office, ...)
 - No local printers, only network printers
 - Simple UI, no printer setup tool
 - Lightweight printing stack → No driver/PPD library
 - Save battery power, avoid permanently running daemons
- **cups-browsed browses DNS-SD broadcasts:**
 - It picks up remote CUPS queues
 - It picks up network-connected printers:
 - Only IPP printers, as they provide capability info
 - IPP Everywhere, AirPrint, Mopria, Wi-Fi Direct driverless (PDF or raster formats, excellent capability info)
 - Other known PDLs: PostScript, PCL 5c/5e/6/XL
 - Auto-generate PPD, create queue
 - Removes queues on shutdown or when printer disappears
- **cups-browsed optionally shuts down automatically when not needed any more**