

CUPS Plenary

Joint PWG / Open Printing Summit - May 2021
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Topics

- Introduction
 - Apple, Open Printing, and CUPS
- CUPS 2.4
- Deprecations
- Future Stuff
- Q&A
- Resources



Introduction

- CUPS is the standards-based, open source printing system developed by OpenPrinting for Linux® and other Unix®-like operating systems. CUPS uses IPP Everywhere™ to support printing to local and network printers
- CUPS is provided under the Apache License v2.0 with an exception that allows linking to GPL2-only software (like Gutenprint)
- The CUPS web site, source code, and bug database are hosted on Github
 - <https://openprinting.github.io/cups>
 - <https://github.com/openprinting/cups/>
- But wait, I thought that *Apple* was developing CUPS?!?



Apple, OpenPrinting, and CUPS - 1/2

- Apple hasn't been actively developing CUPS since I left in December 2019
 - Two security fixes and an update to the USB backend to support Apple Silicon-based Macs have gone into CUPS 2.3.3 and 2.3.4
- OpenPrinting decided to fork Apple CUPS in September 2020
 - Initial goal was to merge all the common Linux/BSD patches
 - Have a development team consisting of core CUPS packagers with many volunteers
- OpenPrinting has released two updates to Apple CUPS 2.3.3:
 - November 27, 2020: OpenPrinting CUPS 2.3.3op1 (bug fix update)
 - February 1, 2021: OpenPrinting CUPS 2.3.3op2 (security update)
- OpenPrinting is now working towards a CUPS 2.4.0 feature release



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Apple, OpenPrinting, and CUPS - 2/2

- I've been contracted by Apple to apply important OpenPrinting CUPS bug fixes to Apple CUPS on macOS, which will continue to use CUPS 2.3.x
 - This work is ongoing and will yield an Apple CUPS 2.3.5 release in June 2021
- While Apple would like to continue sharing bug fixes going forward, they are not interested in further development of CUPS features for macOS



CUPS 2.4



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CUPS 2.4 - Next Feature Release

- Add AirPrint/Mopria compatibility (done)
 - Shared printers now report all required attributes/keys/values
 - Ready media returns a list of supported values configured for the system
- Add OAuth 2.0/OpenID authentication (to-do)
 - Used for Microsoft Universal Print Service, among other things
- Add pkg-config support (done)
 - Provides cups-config functionality through pkg-config
- Add snapcraft support (mostly done)
- "job-sheets-col" and better "media-col" attribute support (to-do)
- TLS and X.509 improvements (to-do)
- New deprecations: cups-config and Kerberos authentication (done)



CUPS 2.4 - OAuth 2.0/OpenID

- Replacement for Kerberos SSO
 - Doesn't require root access or user changing gymnastics like Kerberos
- Many open source solutions available, including my own:
 - <https://www.msweet.org/moauth>
- SAML and Webauthn authentication backends are commonly available, too
- Support OpenID/RFC 8414 compliant OAuth 2.0 authorization servers
 - Authorization server is reported via IPP "oauth-authorization-server-uri (uri)" attribute
- Bearer and refresh tokens will be cached per-user/auth-server
- Authorization UI will be presented using embedded web view - only available when printing from system console
 - Command-line tool for registering bearer token, too



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Deprecations



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Deprecations

- We periodically deprecate functionality that either is no longer necessary or will prevent us from improving CUPS
- When we deprecate something:
 - We announce the deprecation as far in advance as possible
 - We display a warning that the functionality is going away in a future release of CUPS
 - We help developers and users migrate to any replacement functionality, if applicable
- Deprecation is a necessary step prior to removal from CUPS
- *Deprecated items are still functional until removed*



Deprecations

- After a transition period, deprecated items are removed from CUPS
 - Deprecated CUPS APIs are never fully removed from shared libraries (non-functional stubs remain) to preserve binary compatibility
- We've had some hard exceptions over the years:
 - Security issues forced us to do a hard transition of some cupsd.conf directives to cups-files.conf
 - Security issues forced us to drop interface script support
 - Performance and architectural issues forced us to drop CUPS browsing before Avahi was fully supported/deployed



Deprecations - Raw Queues

- *Raw queues will continue to work in CUPS 2.4.x*
- Why deprecate them?
 - Raw queues pointing to shared printers cause problems for sandboxed applications on macOS and applications using AppArmor/SELinux on Linux (no direct network access)
 - Raw queues pointing to label printers, etc. require applications to provide printer-specific UI and print data, the opposite of what CUPS is about
 - Raw queues do not work with file: device queues, which people still occasionally use with special-purpose printers and software



Deprecations - Printer Drivers

- *Printer drivers and the PPD APIs will continue to work in CUPS 2.4.x*
- PPD files were deprecated in CUPS 1.4 (12 years ago) but we didn't have a replacement strategy for printer drivers at that time
- IPP Everywhere (and related standards) provide the replacement for most printer drivers
 - Strategy for other printers and drivers is to use Printer Applications
- Printer driver support will be removed in CUPS 3.0



Deprecations - Printer Drivers

- Why deprecate printer drivers?
 - At least 98% of all printers sold since 2010 support IPP, Apple/PWG Raster, and JPEG; many (about half) support PDF
 - Holdouts are industrial label printers and certain vertical market printers
 - PPDs and drivers have been holding us back from offering a better user experience (ready media, localization, full range of printer options/values), improved document processing, and improved accounting
 - PPDs and drivers are a security and distribution nightmare



Deprecations - cups-config

- *cups-config will continue to be provided in CUPS 2.4.x*
- This script was provided before pkg-config existed
- Many developers have asked for pkg-config support
 - pkg-config also handles dependencies for us
- cups-config will be removed in CUPS 3.0



Deprecations - Kerberos

- *Kerberos will continue to work in CUPS 2.4.x*
- Kerberos is a legacy Single Sign On (SSO) technology that doesn't scale well, depends on an experimental HTTP authentication method, and requires a lot of special-casing to work
- Primarily used with Microsoft ActiveDirectory, which has moved to OAuth 2.0
- OAuth 2.0 support is coming in CUPS 2.4
- Kerberos support will be removed in CUPS 3.0



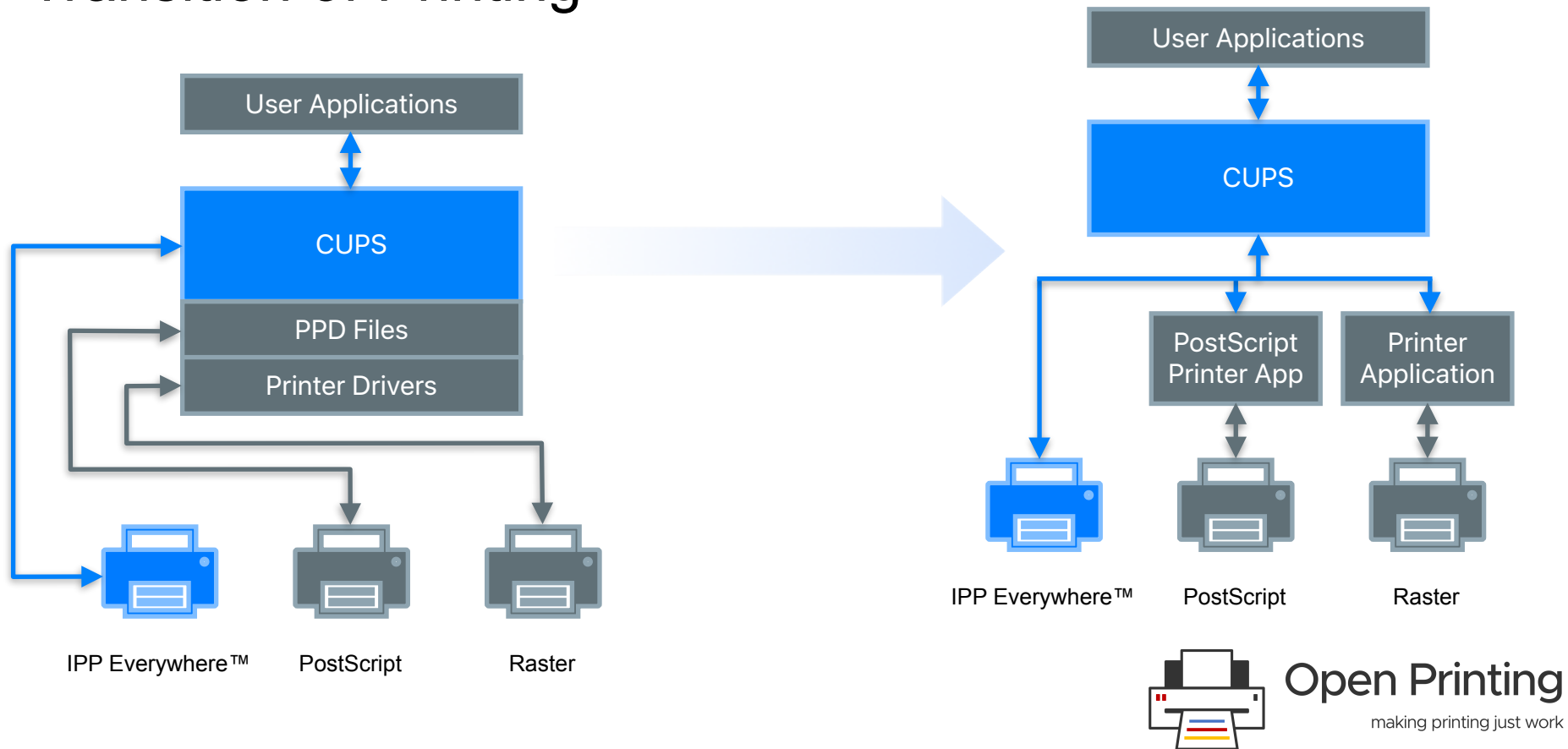


Future Stuff



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Transition of Printing



CUPS 3.0 - Modular Printing Architecture

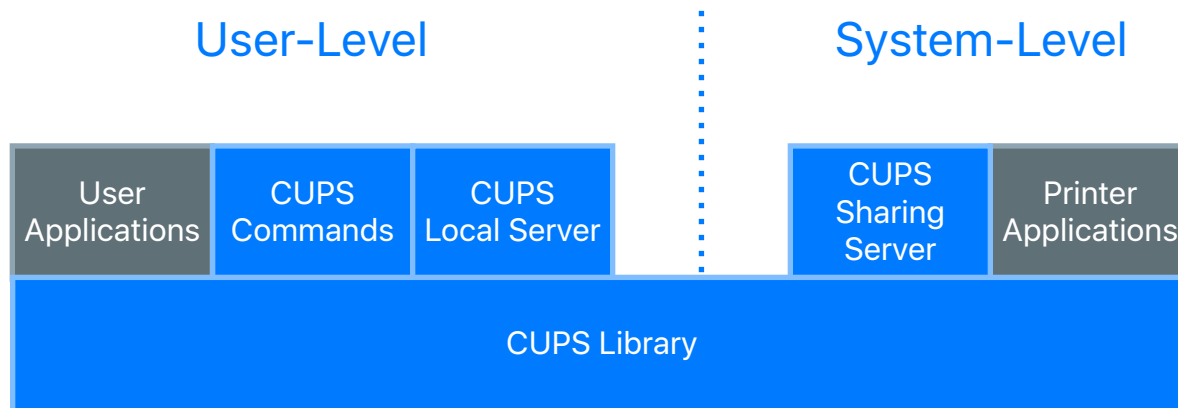
- Commands: lp, lpr, lpstat, cancel, etc.
- Local Server
 - Handles local print requests for desktop/mobile devices
 - Only temporary IPP Everywhere print queues
 - Runs as user
 - UNIX domain socket and/or D-Bus API and/or XPC API
- Sharing Server
 - Handles network print requests and local printing on headless servers
 - Full print accounting/ACLs/pre-processing of documents
 - OAuth 2 and PAM-based authentication
 - IPP Shared Infrastructure Extensions/System support
- Library: libcups, as exists today



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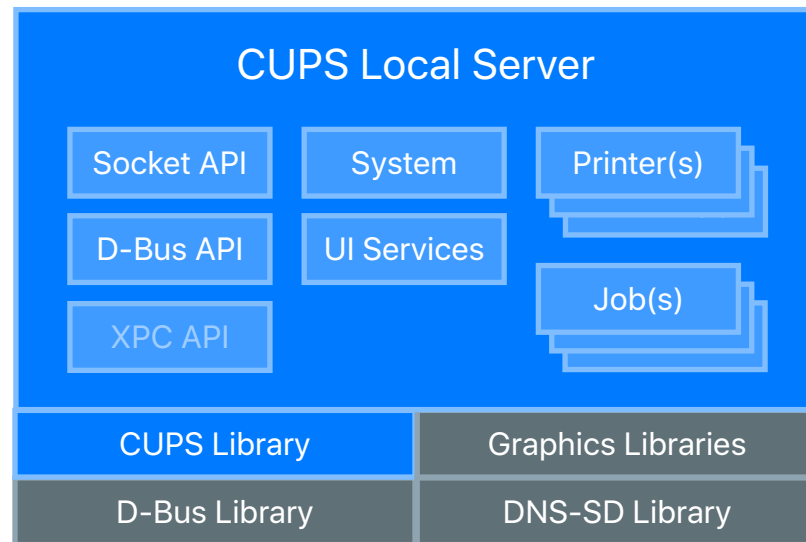
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CUPS 3.0 - Overview



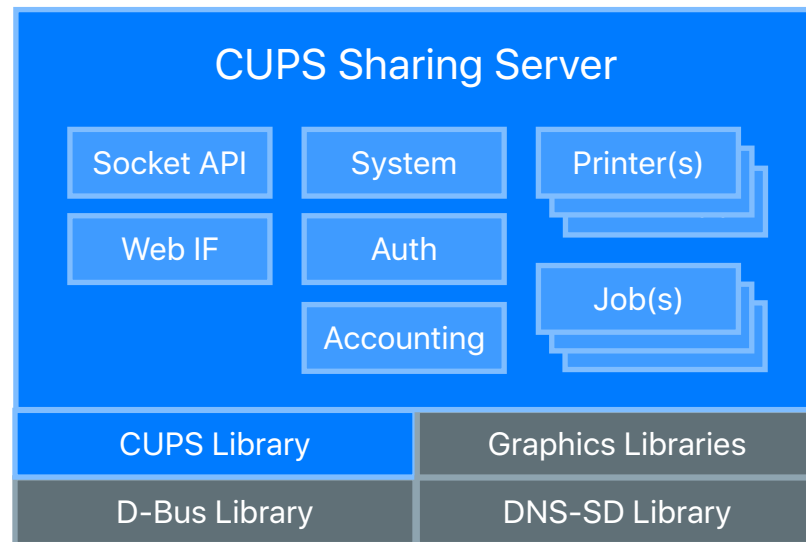
CUPS 3.0 - Local Server

- Handles all discovery and communications with printers
- Handles authentication, authorization, consent, and notification UI
- Converts to/from PDF/raster as needed for printers
- Job history is limited to the current session/login
- No web interface
- Configuration limited to listing specific printers or servers that cannot be discovered via DNS-SD ("profiles")



CUPS 3.0 - Sharing Server

- Handles all communications with printers
- Authorization/consent/notification UI needs to be handled by client
- Converts to/from PDF/raster as needed for printers
- Job history is configurable
- Web interface
- Configuration similar to existing cupsd
- OAuth token introspection (RFC 7662) and scopes for ACLs



CUPS 3.0 - Challenges

- Much broader scope and integration than the original CUPS work
- Desktop support - need to uplift GNOME/KDE/XFCE desktops to new D-Bus API for printing, authorization, consent UI
- Need developers to work on the local and sharing servers, desktop UI/ services
 - Can probably use/adapt PAPPL code for the core server bits
 - Much of the print dialog work can be repurposed
 - Probably have existing authorization/notification UI we can use
- Graphics libraries - current PDF tools/libraries have problematic licenses or other limitations



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Q&A



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Resources

- CUPS Web Site
 - <https://openprinting.github.io/cups>
- CUPS Repository
 - <https://github.com/OpenPrinting/cups>
- CUPS Programming Manual
 - <https://openprinting.github.io/cups/doc/cupspm.html>
 - <https://openprinting.github.io/cups/doc/cupspm.epub>

