OpenPrinting

The New Printing GUIs

GNOME Control Center and Common Print Dialog Backends

Demo + AMA (Ask Me Anything)

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Introduction

- **The New Architecture – Pure IPP for Printing**
  - CUPS 3.0/CUPS Snap: R. I. P. PPD files, all-IPP workflow
- **Printer Setup Tools**
  - IPP Services, not Queues; Printer Applications, not drivers
- **Print Dialogs**
  - IPP Attributes, not PPD options; Temporary Queues, Common Print Dialog Backends

The New Architecture

- For 23 years now, since its 1.0 launch, CUPS uses principally the same architecture:
  - **PostScript was standard job format** as printers typically used with UNIX were PostScript (or plain text)
  - Capabilities of a printer are described by a **PPD (PostScript Printer Description)** file
  - PPD describes all user-settable options, resources (trays, paper sizes, resolution, quality, color, …) in a static text file
  - To cover non-PostScript printers **PPD format got extended** (by Michael Sweet) to specify a filter to generate printer’s native format
  - Filters use **Ghostscript** to convert PostScript input
  - **Manually created queue** with driver (= PPD + filter)

The New Architecture

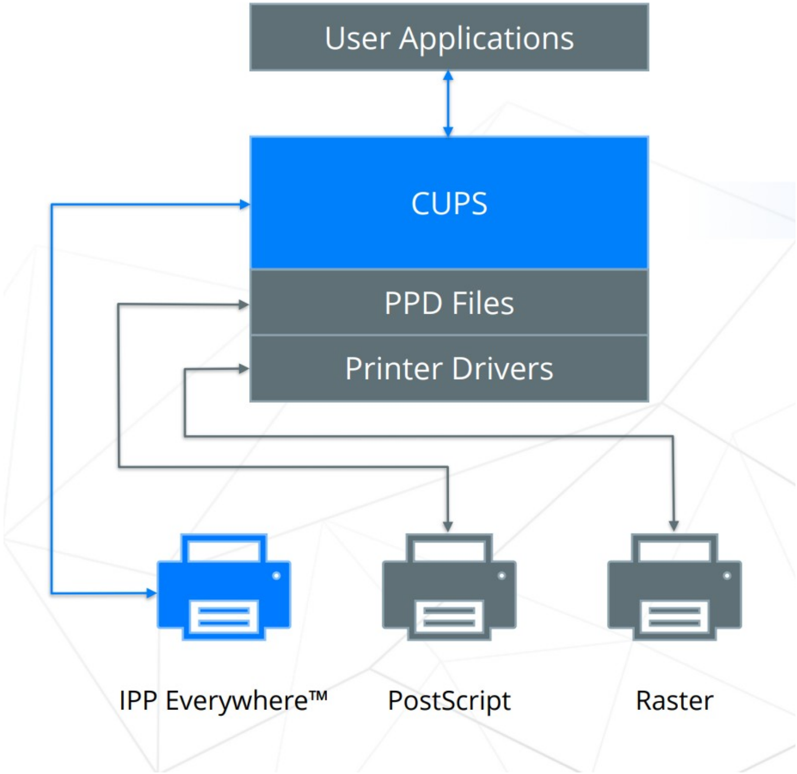
- Why do we want to do away with PPD files?
  - **In 1984 Adobe stopped development on PPD format**, so we started with an obsolete (but useful) format right away
  - In 2006 we **abolished PostScript** as print job format and **replaced it by PDF**
  - PPD files can represent user-settable options only as **enumerated choice or boolean**. Ugly workarounds for things like passwords or color adjustment

The New Architecture

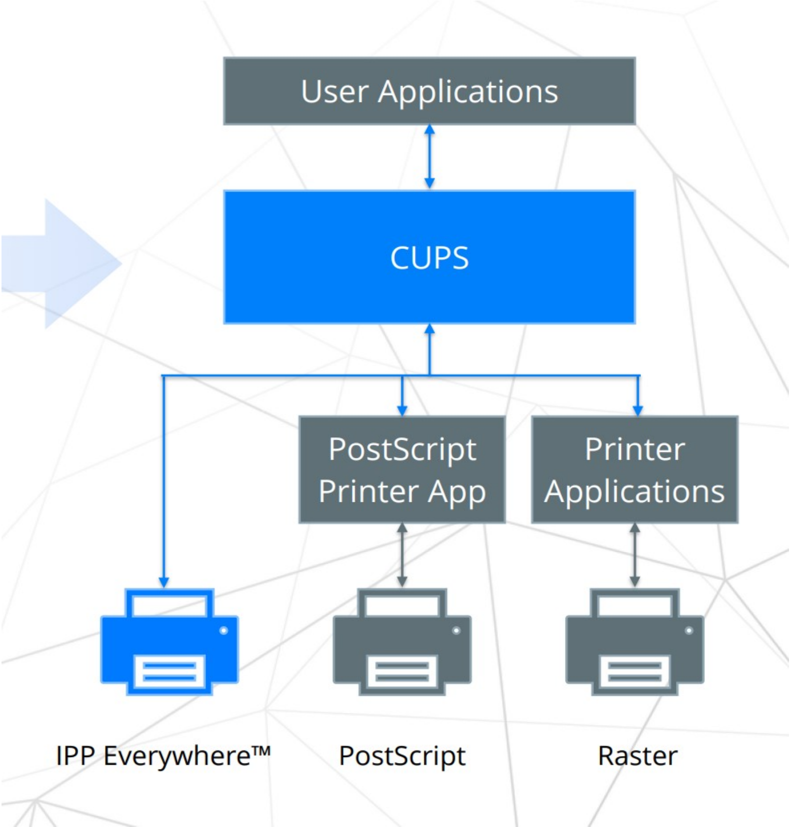
- **PPD-less CUPS – We are all-IPP now**
  - **CUPS 3.0.x will not support PPD files** from the ground up
  - The CUPS Snap does not allow adding PPDs and filters
  - Now **only driverless IPP printers** (IPP Everywhere, AirPrint, Mopria) are supported
  - **No manually created CUPS queues**: IPP printer discovered, temporary queue automatically created
  - Filtering only for driverless standard formats: PDF, PWG Raster, Apple Raster, PCLm output, no need to add filters
  - Legacy/specialty printers which need driver → **Printer Application** emulates IPP printer

The New Architecture

Old CUPS architecture



New CUPS architecture



Printer Setup Tool: How it works currently

- **Printer setup tools**
  - CUPS web admin interface `http://localhost:631/`
  - CUPS command line tools: `lpadmin`, `lpinfo`, `lpstat`
  - `system-config-printer` – GUI
  - GNOME Control Center – Print module – GUI
  - `cups-browsed` – daemon – Automation of setup
- Tools **control CUPS**, the running **cupsd**
  - List available printers and drivers and create print queues
  - List queues and jobs
  - Modify queues
  - Server settings: Owner/everyone can cancel jobs, debug mode, ...

Printer management in the New Architecture

- We assume any form of the New Architecture
  - The **CUPS Snap** - OR -
  - **CUPS 3.x** or newer
- **All Printers are driverless IPP printers**, native or Printer Applications
- CUPS auto-creates virtual queue for each IPP printer → **No manual queue creation required**
- CUPS fully automatic → **Admin action moves to the IPP printers**
- **Tasks**
  - **List IPP services**
    - Buttons to web admin interfaces, IPP System Service, …
  - **Discover non-driverless printers**
    - Find Printer Applications, local and in Snap Store

Printer Setup Tool: GUI Design

- **Similarities** between old and new
  - **Main Window**
    - Old: List CUPS queues, buttons/pop-up to modify
    - New: List IPP devices, buttons to web IF/IPP System Service
  - **Add-Printer Window**
    - Old: List printer devices and drivers, create CUPS queue
    - New: List non-driverless printers, install Printer Application, open Printer Application’s web interface

Printer Setup Tool: GNOME Control Center

- **Support for classic CUPS AND New Architecture**
  - No hard dependency between GNOME and CUPS versions
  - Current CUPS already supports IPP services, Printer Applications, …
- **Main view**
  - CUPS queues with “Set options”, “Change driver”, “Remove queue”, …
  - IPP service with “Open web admin interface”
  - IPP: Group entries of same hardware device/Printer Application
- **“Add Printer” dialog**
  - Discover non-driverless printers
  - Search for both classic drivers and Printer Applications

Print Dialogs: Direct adaptation

- Print queues are usually **temporary**, for **discovered IPP services** (IPP printers or Printer Applications)
  - Some print dialogs still use **stone-old CUPS APIs**, not supporting temporary queues, and temporary queues exist for years
  - **GTK dialog** has this fixed
  - But applications with **too old GTK versions** still around
  - **cups-browsed** used as workaround, making all queues permanent, so be careful, some dialogs do well due to cups-browsed
- On CUPS 3.x there are **no PPD files at all**
  - Dialogs should not try to download the printer's PPD from CUPS. The APIs or URLs will go away with CUPS 3.x
  - Use **modern CUPS convenience APIs** or **IPP** to get capabilities/options

Print Dialogs: The problem

- To control printing, GUI applications use **print dialogs**
- **Many different print dialogs**, usually from the GUI toolkit used (GTK, Qt, ...), but also LibreOffice, Chrome, ...
- Each one has **its own implementation** to connect to CUPS, Print-to-File, and other print technologies
- Print dialog **development does not keep up** with changes, like temporary queues in CUPS, or addition of a new print technology (cloud service, ...)
  - Printing not considered very important
  - Newly introduced print technology not considered worthwhile
  - Developers do not have time
  - Long release cycles of GUI toolkit projects vs. fast pace in printing development

Print Dialogs: The idea → CPDB

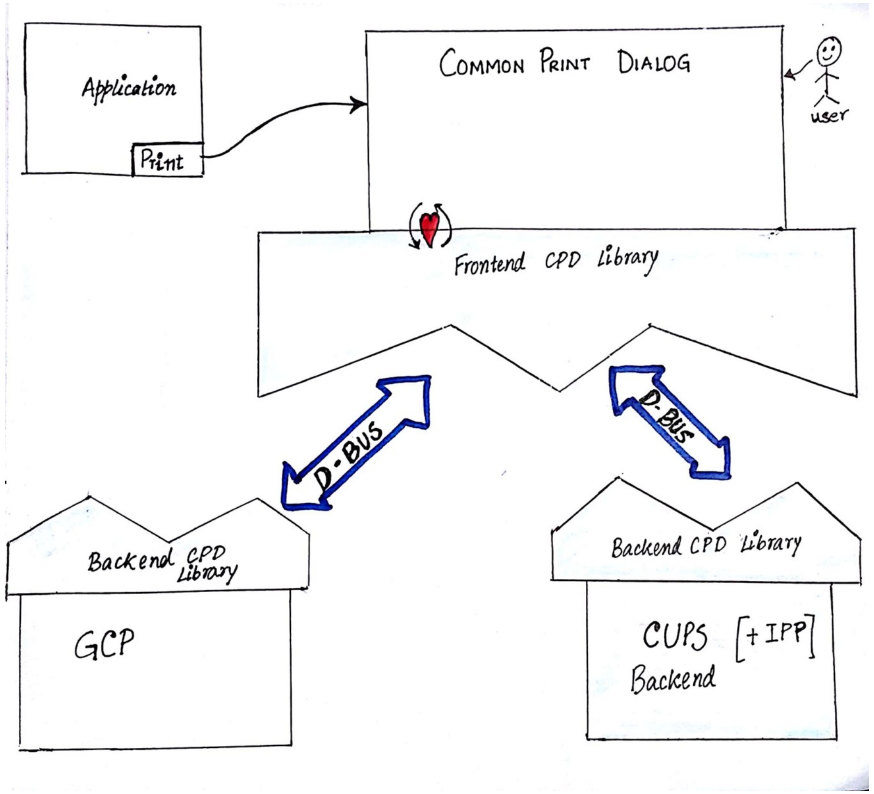
- Long time ago we tried a **Common Print Dialog**, but **failed** due to lack of human resources and/or funding (Flatpak did it finally)
- Later Aveek Basu remembered this project and **suggested a revival**, but I was unsure.
- Fixing a CUPS-related bug in the **GTK print dialog** I discovered that it uses **backends** for different print technologies
- All this brought up the idea of **Common Print Dialog Backends** in me:
  - Dialog itself still from the GUI toolkits (GTK, Qt, LibreOffice, ...)
  - GUI-independent backends for each print technology (CUPS, Print to file, ...)
  - Connection Dialog -- Backend: **D-Bus** (separately sandboxable)
  - Backend and frontend libraries

Print Dialogs: The idea → CPDB

- Backends maintained by **maintainer of print technology**
  - CUPS backend: OpenPrinting
  - GlobalCloud Print backend: GlobalCloud
  - …
- **Print dialog detects installed backends** and shows the printers of the respective print technologies
- **User sees always the same printers** with the same user-settable options in all print dialogs (GTK, Qt, LibreOffice, …)
- Print service provider can **supply backend via Snap Store**
- Maintainer of print technology changes something → He issues backend update and all print dialogs are up-to-date

Print Dialogs: CPDB - The implementation

- I posted this as a project idea in the **Google Summer of Code 2017** …
- … and **Nilanjana Lodh** picked it up and implemented it (her original drawing):



Print Dialogs: CPDB - The Implementation

- Libraries are on the **OpenPrinting GitHub**
  - Frontend/Backend libraries: **`cpdb-libs`**
  - CUPS backend: **`cpdb-backend-cups`**
  - Print to file backend: **`cpdb-backend-file`**
- There are also **packages in Ubuntu**, actually used from 23.10 on.

Print Dialogs: CPDB

- This saves us from problems like
  - CUPS added the new `cupsEnumDests()` API to **support its temporary queues** many years ago, GTK switched to it last year, **Qt (and perhaps others) did not switch yet** (needs checking).
  - The architecture of CUPS will significantly change with version 3.0 …
- In **GSoC 2022** Gaurav Guleria has added CPDB support to the **GTK** dialog and to the **Qt** dialog, merge request already **accepted in GTK**
- In **GSoC 2023** a contributor is working on the dialogs of **LibreOffice**, **Mozilla** (Firefox, Thunderbird), **Chromium Browser**
- **Modified GTK** in the **New Architecture PPA**:
  `https://launchpad.net/~till-kamppeter/+archive/ubuntu/new-arch-dev`

Demo: Classic CUPS, GNOME Control Center, Print dialogs, CPDB

- **Ubuntu Desktop 23.04** Lunar Lobster on amd64, arm64, or armhf
- Stop **cups-browsed**: `sudo systemctl stop cups-browsed`
- Install **GNOME Control Center**, **GTK**, **Qt 6**, **cpdb-backend-…** from the **New Architecture PPA**:
  https://launchpad.net/~till-kamppeter/+archive/ubuntu/new-arch-dev
- Install a suitable **Printer Application** from the **Snap Store** to support a non-driverless printer (ex.: PostScript):
  ```
  sudo snap install ps-printer-app
  ```
- Install **focuswriter** as example for a Qt 6 app, Other options:
  ```
  apt rdepends libqt6printsupport6
  ```

Demo: Classic CUPS, GNOME Control Center, Print dialogs, CPDB

- Activate ipp-usb: **Driverless IPP**

  ```
  sudo systemctl start ipp-usb; sudo systemctl enable ipp-usb
  ```

  - Access web admin interface on `http://localhost:60000/`
  - Printer should just appear in dialogs

- Deactivate ipp-usb: **Classic PostScript**, **PCL**, ...

  ```
  sudo systemctl stop ipp-usb; sudo systemctl disable ipp-usb
  ```

  - Create **2 print queues** via the web interface of the **PostScript Printer Application**: `https://localhost:8000/`

Demo: Classic CUPS, GNOME Control Center, Print dialogs, CPDB

- **Emulate** a driverless IPP printer via **ippeveprinter** (no hardware required):

  ```
  ippeveprinter -s 10,10 -2 -f "image/urf,application/pdf" -d
  SPOOLDIR -k QUEUE
  ```

- The activities above **do not create any permanent CUPS queue**
- Printers show in **GNOME Control Center**
  - Button to open **web administration interface**
  - Queues of **PostScript Printer Application** grouped
- Printers show in **print dialogs**
  - **Job IPP attributes** (not PPD options) can be controlled via the options, so no PPD file data gets polled by the dialog/CPDB.

Demo: CUPS Snap, GNOME Control Center, Print dialogs, CPDB

- **Ubuntu Desktop 23.04 Lunar Lobster** on amd64, arm64, or armhf

- Stop/deactivate classically installed daemons

```
sudo systemctl stop cups-browsed
sudo systemctl disable cups-browsed
sudo systemctl stop cups
sudo systemctl disable cups
sudo systemctl stop ipp-usb
sudo systemctl disable ipp-usb
```

- Install the CUPS and ipp-usb Snaps (check with **snap list** whether needed)

```
sudo snap install --edge cups
sudo snap install ipp-usb
```

Demo: CUPS Snap, GNOME Control Center, Print dialogs, CPDB

- If the CUPS Snap was already installed, update to Edge channel:

```
sudo snap refresh --edge cups
```

- Force CUPS Snap into “standalone” mode

```
sudo touch /var/snap/cups/common/no-proxy
sudo snap stop cups
sudo snap start cups
```

- Check whether all is OK (URIs should not start with `proxy:`)

```
lpstat -v
lpstat -l -e
```

- Do not try to create queues the classic way any more

  ~~`lpadmin`~~, ~~`system-config-printer`~~, ...

Demo: CUPS Snap, GNOME Control Center, Print dialogs, CPDB

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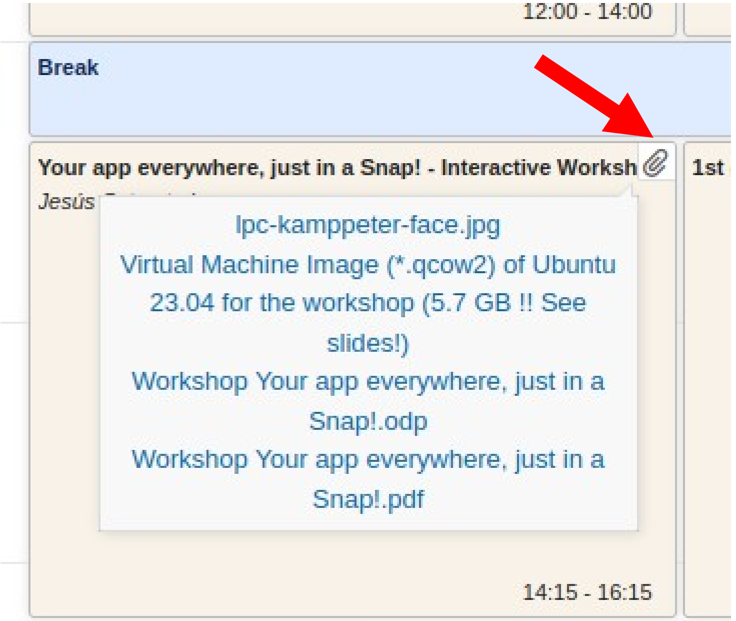
Questions / Discussion / Ask me Anything

Your app everywhere, just in a Snap!

- I have talked a lot about **Snap** here.
- Do you want to **learn how to distribute your application in the Snap Store**!
- Then come to the **interactive workshop** about **snapping**!

On **Saturday, July 29, 14:15**



12:00 - 14:00

Break

Your app everywhere, just in a Snap! - Interactive Worksh

1st

Jesús

lpc-kamppeter-face.jpg

Virtual Machine Image (*.qcow2) of Ubuntu 23.04 for the workshop (5.7 GB !! See slides!)

Workshop Your app everywhere, just in a Snap!.odp

Workshop Your app everywhere, just in a Snap!.pdf

14:15 - 16:15

- Please **download the slides** and **follow the setup instructions** on **your laptop**, for the link click on the **paper clip in the corner of the timetable entry** of Sat, 14:15, room 1
- If you want to use the **virtual machine image**, download well before the workshop, it is **5.7 GB**! But we have it also on **USB sticks** (come to me at any time).