



# 2020's Ubuntu Desktop Printing Technology

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# Who am I

Naruhiko Ogasawara (小笠原 徳彦)

Desktop FLOSS enthusiast from Chiba, Japan  
(Printing, LibreOffice, ...)

former member of OpenPrinting Japan

former an employee of a Japanese printer vendor

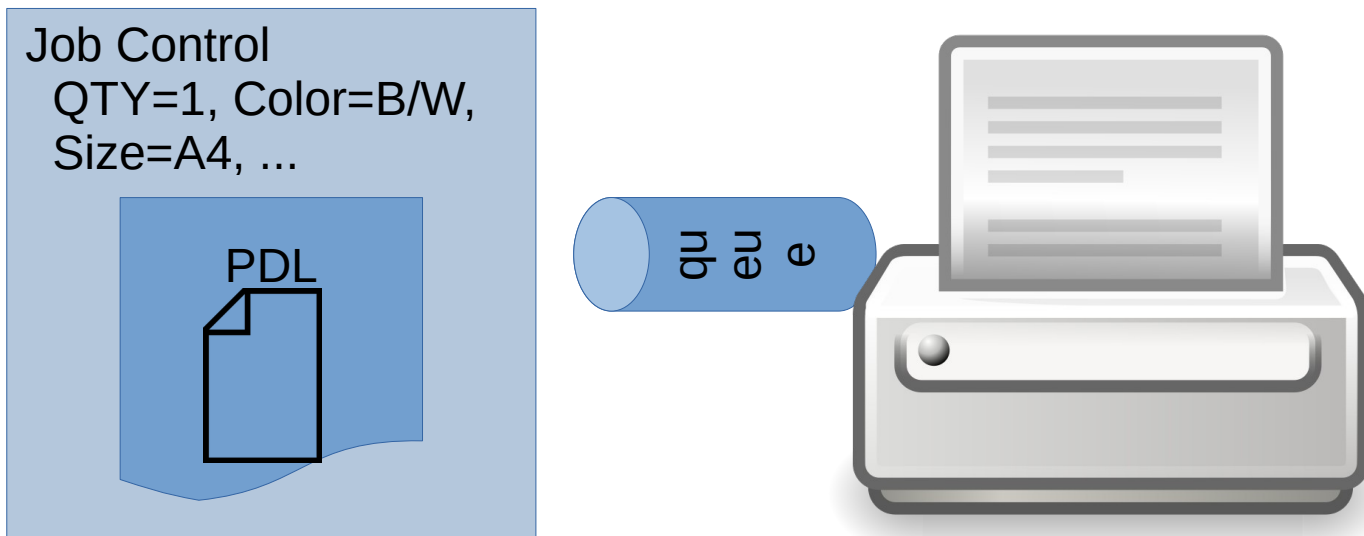
Amature kayaker





# How printers “driven”

Printer is quite different from other peripherals



PDL = Page (or Printer) Description Language



# CUPS

~~Common Unix Printing System~~

The core module of Linux printing system

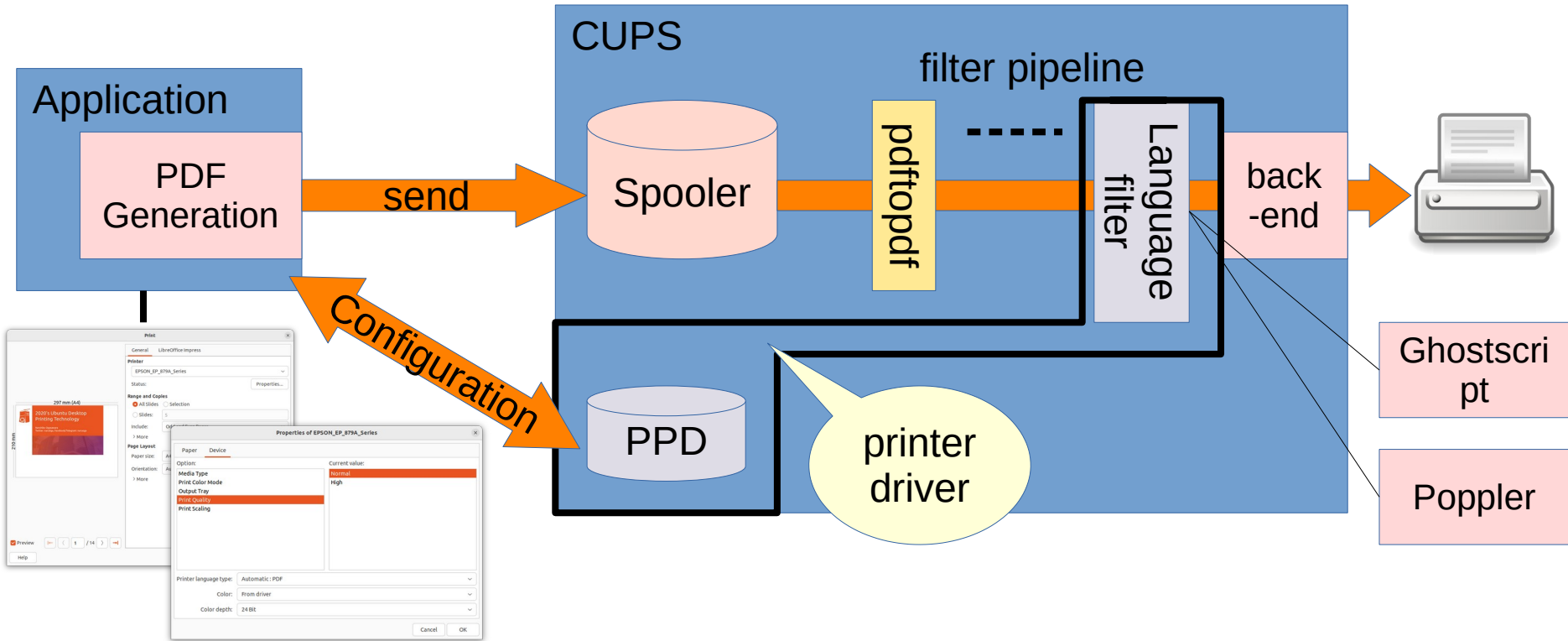
It handles:

- \* Job control user interface
- \* Data filter pipeline to create PDL

No “kernel-land” modules



# CUPS





# Job control: PPD

PPD: Postscript Printer Description

The name is came from historical reason, not limited to Postscript

Describe printer capabilities

- \* Color/Monochrome
- \* Supported media size
- \* Supported media type
- \* Finishing feature (duplex, stapling, ...)



# Job control: PPD

```
*PPD-Adobe: "4.3"  
*FormatVersion: "4.3"  
*FileVersion: "1.28.15"  
...  
*OpenUI *PageSize/Media Size: PickOne  
*OrderDependency: 10 AnySetup *PageSize  
*DefaultPageSize: A4  
...  
*PageSize A4/A4: "<</PageSize[595.275590551181  
841.889763779528]>>setpagedevice"  
*PageSize A4.Borderless/A4 (Borderless):  
"<</PageSize[595.275590551181  
841.889763779528]>>setpagedevice"  
...  
*CloseUI
```

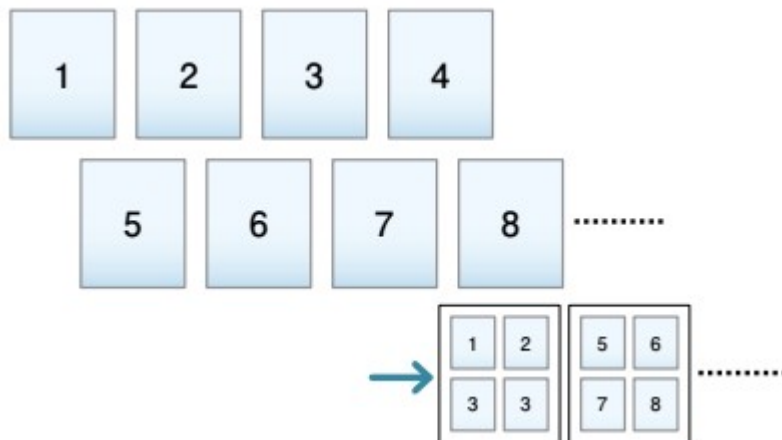




# pdftopdf

CUPS semi-builtin filter (in the package “cups-filters”)

Used for page layout of PDF (like N-in-one or N-up)







# Language filter

The “Last” filter of the filter pipeline

To generate the printer-specific data format (PDL; Printer or Page Description Language)

Which draws pictures onto papers

Vector / Raster



## This was a painful era...

Who provides the “printer driver” for a particular printer?

According to the market share of desktop OSES, do printer vendors want to develop their printers’ drivers for Linux?

Can printer vendors support continuously?  
(Linux desktop, like Ubuntu, evolves so fast)

Many of PDLs are proprietary, so development of fully-open-sourced drivers is difficult (except PostScript, PCL5e/PCL6)



# Driverless Printing!

Now we don't need to install "Printer Drivers"

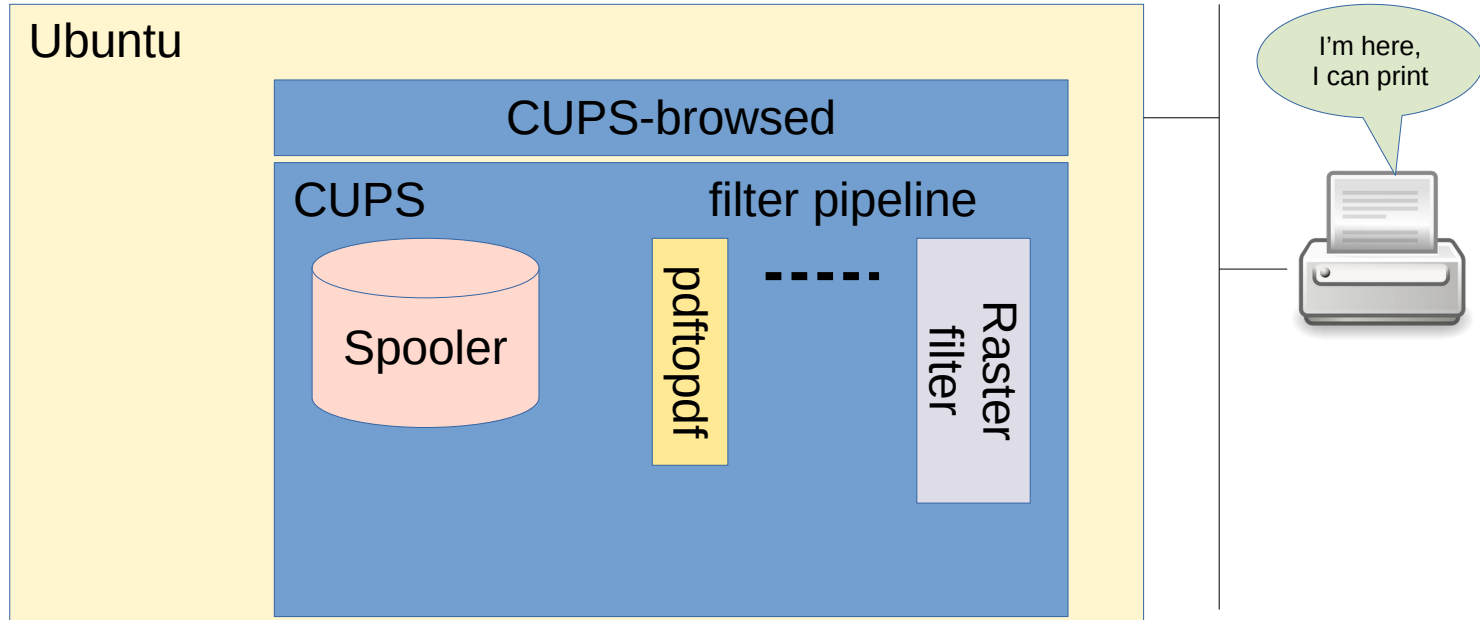
Instead, connect via Wi-Fi or USB then just work

If the printer support "Apple AirPrint" (or "IPP Everywhere")



# How it works

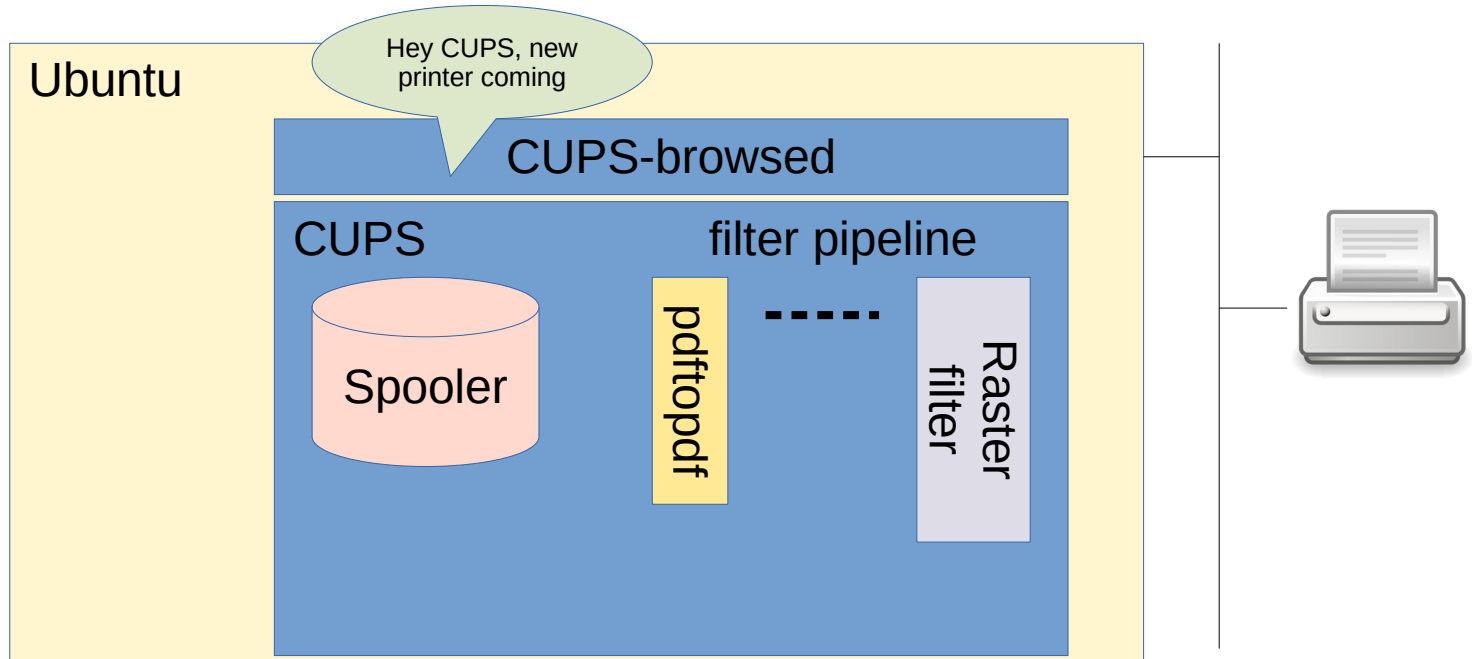
When a printer turns on, it let same networks devices know “I’m here, I can print” via mDDNS (Avahi)





# How it works

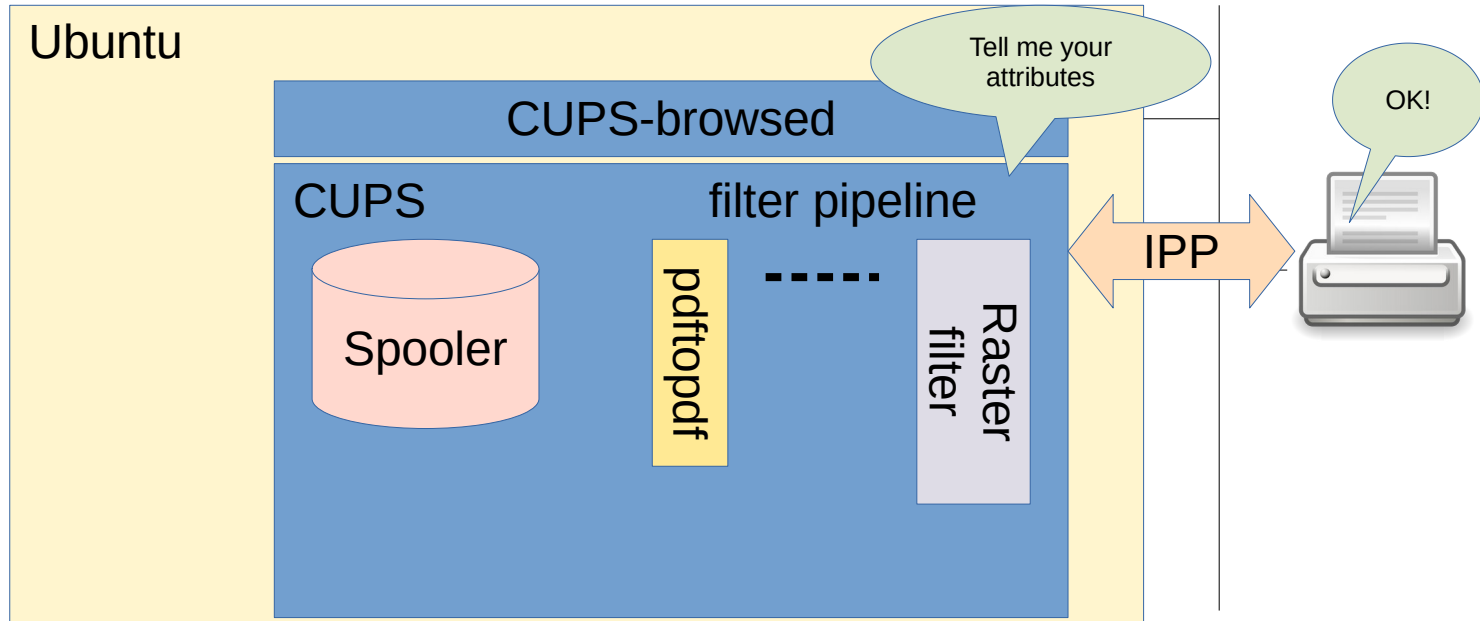
CUPS-browsed receive the message, then let CUPS know new printer coming





# How it works

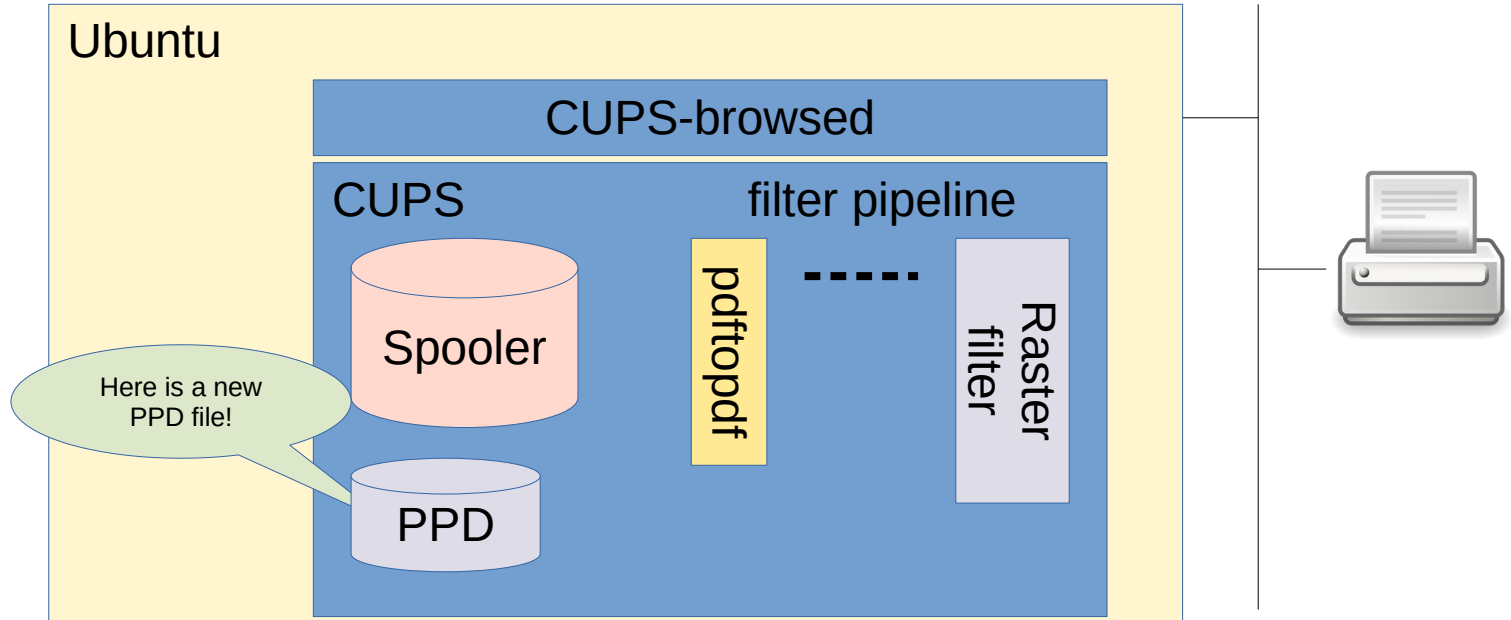
CUPS asks to the printer it's attributes (capabilities) via IPP





# How it works

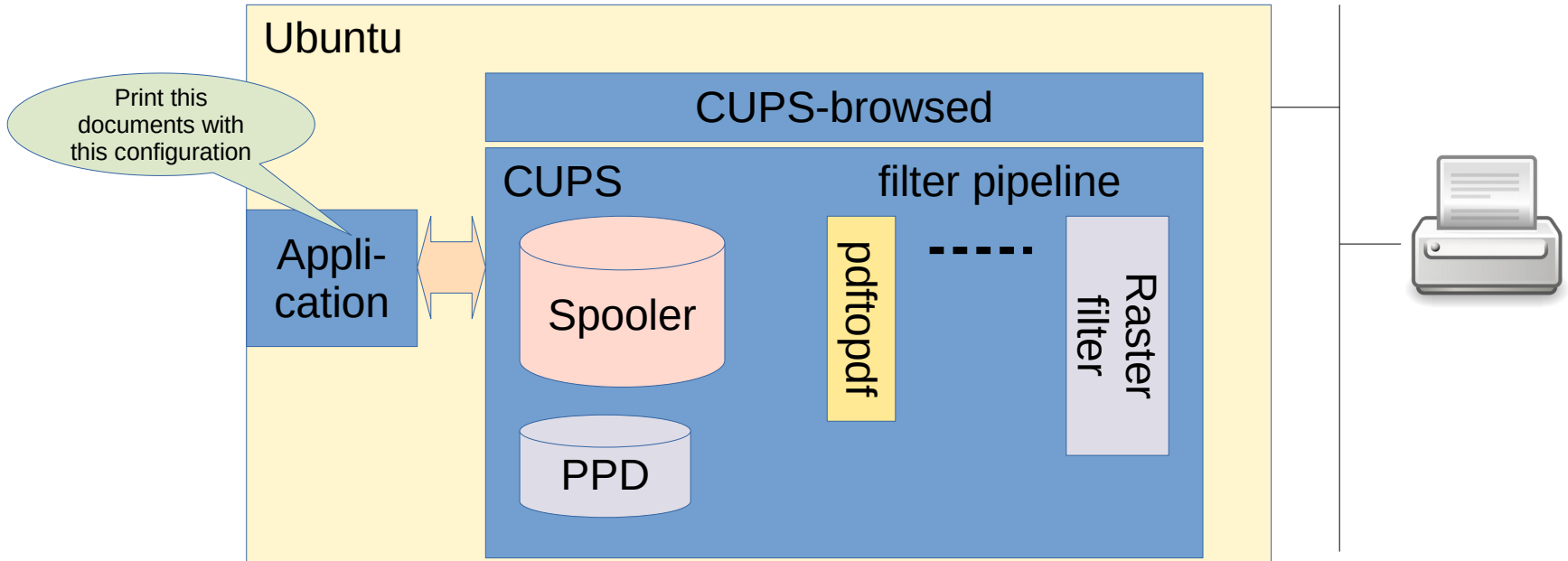
CUPS generate PPD file from received printer attributes





# How it works

An application can use the PPD to control jobs, and send PDF of page images

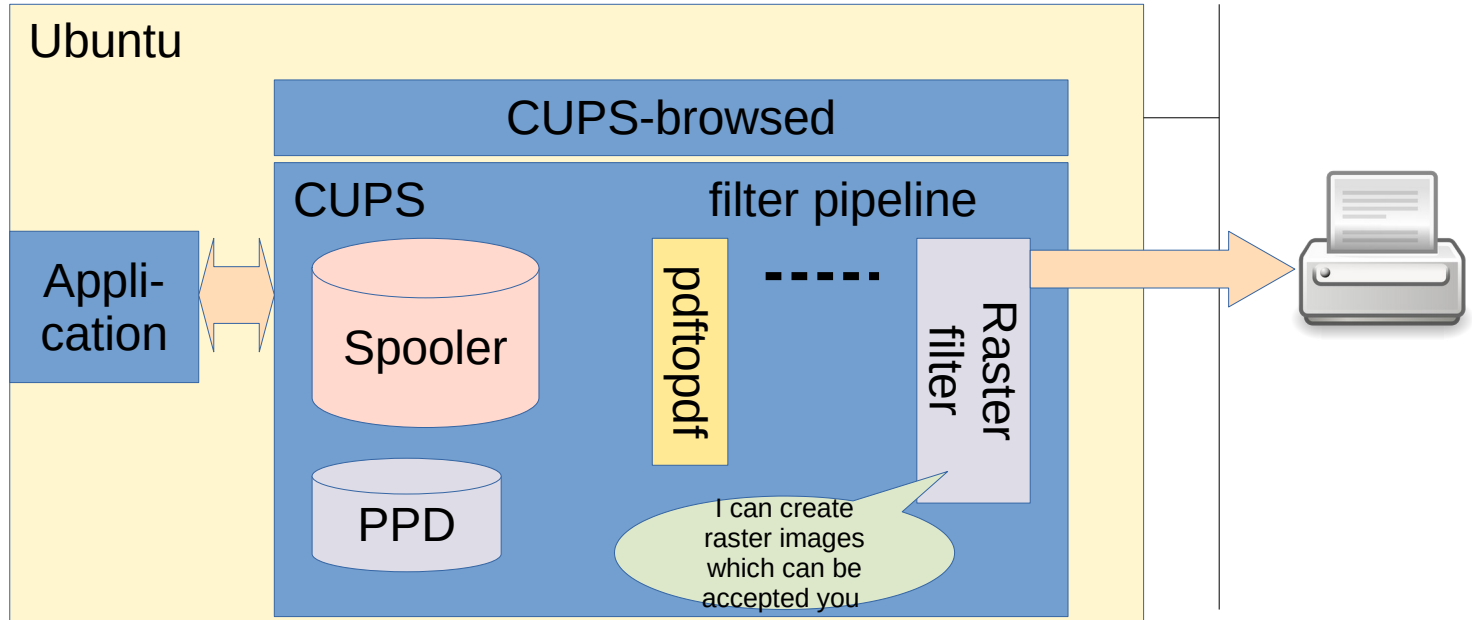






# How it works

The filter pipeline has a raster filter to create raster images from PDF which can be accepted the printer. It is sent via IPP with job control commands





# IPP: Internet Printing Protocol

A printing protocol over HTTP

RFC 2911 <https://datatracker.ietf.org/doc/html/rfc2911>

Bi-directional

- \* Get printer status / capabilities / configurations
- \* Post printing job with job control commands



# IPP: GetPrinterAttribute and PPD

```
$ ipptool -tv ipp://EPSON%20EP-879A
%20Series.ipp.tcp.local/ get-attributes.test
| tee out.txt
...
    media-default (keyword) =
iso_a4_210x297mm
    media-supported (1setOf keyword) =
iso_a4_210x297mm,na_index-
4x6_4x6in,na_5x7_5x7in,na_govt-
letter_8x10in,om_hivision_101.6x180.6mm,iso_a5_
148x210mm,iso_a6_105x148mm,na_letter_8.5x11in,n
a_legal_8.5x14in,oe_photo-
l_3.5x5in,jpn_hagaki_100x148mm,jis_b5_182x257mm
,jpn_chou3_120x235mm,jpn_chou4_90x205mm,om_you1
_120x176mm,om_you3_98x148mm,jpn_you4_105x235mm,
iso_c6_114x162mm,om_cardsize_55x91mm,om_crediti
ardsize_54x86mm,custom_min_89x127mm,custom_max_
215.9x1117.6mm
```

```
*PPD-Adobe: "4.3"
*FormatVersion: "4.3"
*FileVersion: "1.28.15"
...
*OpenUI *PageSize/Media Size: PickOne
*OrderDependency: 10 AnySetup *PageSize
*DefaultPageSize: A4
...
*PageSize A4/A4: "<</PageSize[595.275590551181
841.889763779528]>>setpagedevice"
*PageSize A4.Borderless/A4 (Borderless):
"<</PageSize[595.275590551181
841.889763779528]>>setpagedevice"
...
*CloseUI
```





# Raster filter(s)

```
document-format-supported (1setOf mimeType) =  
application/octet-stream, image/pwg-raster, image/urf, image/jpeg
```

Printer accepts some raster format: e.g. RAW (application/octet-stream),  
PWG Raster, URF (Apple Raster) and JPEG

And you can see the filter pipeline definitions in  
`/usr/share/cups/mime/*.conv` files

```
application/pdf          application/vnd.cups-pdf          66      pdftopdf  
# if using Ghostscript  
application/vnd.cups-pdf  image/pwg-raster                99      gstoraster  
# if using Poppler  
application/vnd.cups-pdf  application/vnd.cups-raster      100     pdftoraster  
application/vnd.cups-raster  image/pwg-raster                100     rastertopwg
```



# Conclusion

Printer drivers are user-land modules within CUPS

The pair of (a) PPD and (b) Language filter

Some time ago, using printers in Ubuntu required support from the printer vendor

But now we have a driverless printing feature

This allows Ubuntu users to print Apple AirPrint available printers without vendors' drivers



# Thank you!

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