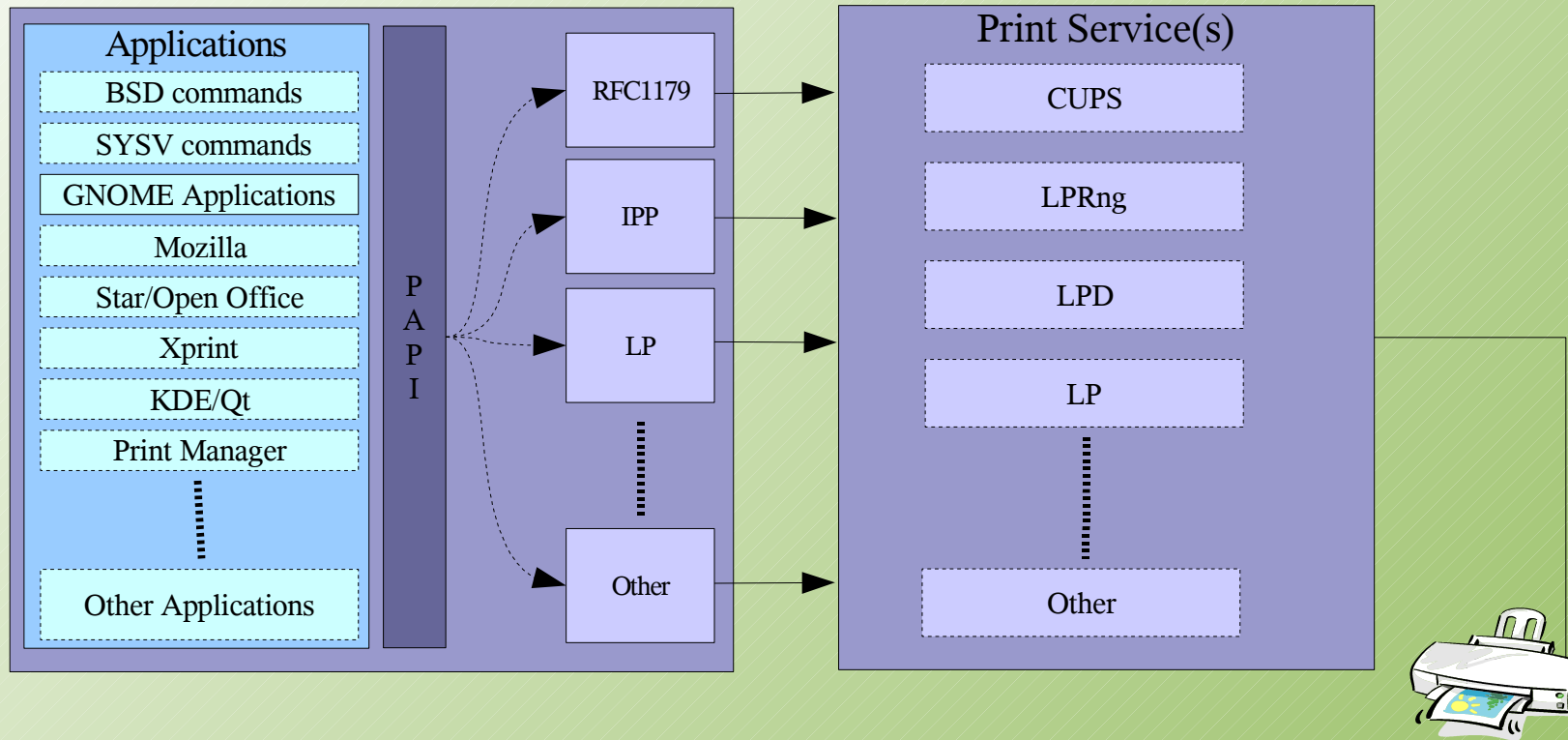




# PAPI Implementation Overview





# PAPI Implementations

## ■ SourceForge OpenPrinting Project

✗ URL: <http://sf.net/projects/openprinting>

✗ Uses POSIX interfaces (mostly)

✗ Dynamic print service selection

✗ Naming support

✗ Rfc-1179 client support (lpd, LPRng, CUPS, LP, ...)

✗ IPP client support (CUPS, LP, Windows XP, ...)

✗ IPP listening service

✗ BSD/SYSV commands

## ■ OpenSolaris LP support

✗ URL: <http://opensolaris.org/os/community/printing/>

✗ LP client support (local LP)





# PAPI SourceForge Modules

## BSD Commands

lpr, lpq, lprm, lpc.

## SysV Commands

lp, lpstat, cancel, lpmove,  
accept, reject, enable, disable

## mod\_ipp.so

(Apache glue module)

## libipp-listener.so

(IPP operations (server side))

## libpapi.so

(PAPI Interface)

Dynamically loads “backend” support modules

Provides naming support

NIS, printcap, printers.conf on Linux

LDAP, NIS+, NIS, printers.conf, \${HOME}/.printers on Solaris

## libpapi-common.so

PAPI Shared fuctions

Attributes, URIs, lists, ...

## psm-ipp.so

(PAPI IPP backend support)

## psm-lpd.so

(PAPI rfc1179 support)

lpd-port

(rfc1179 “helper”)

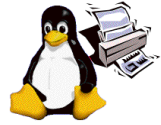
## libhttp-core.so

(HTTP transport code  
taken from libcups)

## libipp-core.so

(IPP marshalling/unmarshalling)





# SourceForge OpenPrinting: libpapi-common

## ■ Shared interface implementations

✗ papiAttribute\*()

✗ papiStatusString()

## ■ Additional useful functions

✗ copy\_attributes()

✗ split\_and\_copy\_attributes()

✗ papiAttributeListPrint()

✗ uri\_\*()

✗ List\_\*()

## ■ “Unsupported” functions

✗ Common implementation for others to filter





# SourceForge OpenPrinting: libpapi-dynamic

## ■ Naming support

- ✗ Linux: NIS, printcap, printers.conf

- ✗ Solaris: LDAP, NIS+, NIS, printers.conf, \${HOME}/.printers

- ✗ Destinations (queues/classes/printers) in URI form

## ■ Dynamic print service “resolution”

- ✗ Uses “printer-uri-supported”

- ✗ Redirects papi\*() calls to print service support library





# SourceForge OpenPrinting: libpapi-lpd

## ■ RFC-1179 (LPD) client support

## ■ Limited operations

papiPrinterQuery(), papiPrinterPurgeJobs(), papiPrinterListJobs(),  
papiJobSubmit(), papiJobSubmitByReference(), papiJobStreamOpen(),  
papiJobStreamWrite(), papiJobStreamClose(), papiJobQuery(),  
papiJobCancel()

## ■ Lpd-port (SUID “helper” application)

✗ Eliminates need for applications to run privileged

✗ Performs minimal RFC-1179 protocol support

✗ Allocates sequential job-ids for protocol operations

✗ Uses privilege up front and drops them when no longer needed

◆ privileges(5) on Solaris and setreuid() on other platforms

✗ Passes server connection back to library (application)

◆ Uses ioctl(I\_SENDFD/I\_RECVFD) or sndmsg()/recvmsg()





# SourceForge OpenPrinting: libpapi-ipp

- IPP client support
- Implements all PAPI operations
  - ✗ IPP standard operations are preferred to vendor extensions
  - ✗ Uses CUPS extensions where no standard operation exists
- Links with CUPS HTTP Transport, but could use any HTTP transport
- Uses common IPP marshalling code (libipp-core)





# SourceForge OpenPrinting: ipp

## SourceForge OpenPrinting: libipp-core

- ✗ IPP protocol Marshalling/Unmarshalling

- ✗ Produces/Consumes structured PAPI attribute lists

## SourceForge OpenPrinting: libipp-listener

- ✗ IPP operation dispatcher

- ✗ IPP operations implemented

print-job, print-uri, validate-job, create-job, get-jobs, get-printer-attributes, pause-printer, resume-printer, purge-jobs, set-printer-attributes, set-job-attributes, enable-printer, disable-printer, send-document, send-uri, cancel-job, get-job-attributes, hold-job, release-job, restart-job, cups-get-default, cups-get-printers, cups-get-classes, cups-accept-jobs, cups-reject-jobs, cups-move-job

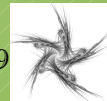






# SourceForge OpenPrinting: `mod_ipp`

- ■ Apache IPP service module
  - ✗ Handles Apache configuration
  - ✗ Passes request to ipp-listener library



# SourceForge OpenPrinting: bsd-sysv-commands



## ■ BSD Commands

✘lpr, lpq, lprm, lpc

## ■ SysV Commands

✘lp, lpstat, cancel, lpmove,

✘accept, reject, enable, disable

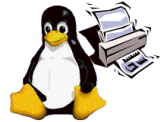




# OpenSolaris LP Support: *psm-lpsched*

- URL: <http://opensolaris.org/os/community/printing/wherebits/#lpsched>
- local lpsched support
  - ✗ Uses local named pipe
  - ✗ Uses local configuration database
  - ✗ Maps IPP/PAPI attributes to lpsched data structures
  - ✗ Invented lpsched attributes where required
- Currently, converts PPD data to Attributes





- ■ **psm-`{service}`.so** implement PAPI interface
  - ✗ **`LD_PRELOAD=.../psm-{service}.so`**  
bypasses libpapi for debugging
  - ✗ **Can be installed as libpapi.so instead**
- ■ **Lp, lpr** include “-D” option to dump submitted job
- ■ **Lpstat** includes “-l 2” option to dump job/printer object.
- ■ **Commands** can take printer-uri form for destinations
  - ✗ **`lpstat -p ipp://server/printers/queue -l 2`**
  - ✗ **`lpstat -p lpd://server/printers/queue -l 2`**
- ■ **Examples:**
  - ✗ **In CVS under `papi/source/examples`**

