LPI 108.3 - Manage printers and printing

Curs 2021 - 2022

ASIX M01-ISO 108 Essential System Services

Manage printers and printing

Description

Key concepts:

- ❏ Basic CUPS configuration (for local and remote printers).
- ❏ Manage user print queues.
- ❏ Troubleshoot general printing problems.
- ❏ Add and remove jobs from configured printer queues.

Commands and files:

- ❏ CUPS configuration files, tools and utilities
- ❏ /etc/cups/
- ❏ lpd legacy interface (lpr, lprm, lpq)

Manage printers and printing

Two of the most common Linux printing systems, the Common UNIX Printing System (CUPS) and the LPD Printing System, with emphasis on the setup and configuration of CUPS. A printer is most often used as a shared resource on the network. The printing service is a central service that accepts print requests from multiple users, queues each print job for the actual printing, tracks the status of every print job, and notifies users of printer and print job status.

CUPS

CUPS is an open source printing system developed by Apple Inc. and available for many operating systems such as Windows, Linux, and OS X. CUPS is the standard for printing services on Linux. CUPS implements the Internet Printing Protocol (IPP) to send jobs from clients to print servers; IPP is a network protocol for managing remote printing.

The printer can be connected directly to the computer, or it could be on the network.

Here is a very simplified outline of how a file is printed in Linux using CUPS:

1. A user submits a file to be printed.

2. The CUPS daemon, cupsd, then spools the print job. This print job is given a job number by CUPS, along with information about which print queue holds the job as well as the name of the document to print.
3. CUPS utilizes filters that are installed on the system to generate a formatted file that the printer can use.
4. CUPS then sends the re-formatted file to the printer for printing.

Files and configurations:

- /etc/cups/
- /etc/cups/cupsd.conf
- /etc/cups/printers.conf
- /etc/cups/classes.conf
- [/etc/printcap] legacy lpd

The /etc/cups directory contains the configuration files for CUPS. The key configuration files for CUPS are as follows

cupsd.conf	Server configuration file
printers.conf	Configuration file for individual printers
classes.conf	Configuration file for printer classes (groups of printers)
snmp.conf	Configuration file to regulate remote browse access
ppd/	Directory for printer drivers for the printers configured on the server
ssl/	Directory for SSL encryption keys for remote access

```
[root@localhost pue]# ls /etc/cups
classes.conf  cups-browsed.conf  cupsd.conf.default  cups-files.conf.default  ppd
snmp.conf          ssl                subscriptions.conf.O
client.conf   cupsd.conf         cups-files.conf     lpoptions
printers.conf  snmp.conf.default  subscriptions.conf
```

```
root@localhost pue]# systemctl status cups
● cups.service - CUPS Scheduler
   Loaded: loaded (/usr/lib/systemd/system/cups.service; enabled; vendor preset: enabled)
   Active: active (running) since Tue 2021-11-09 13:58:43 CET; 6h ago
     Docs: man:cupsd(8)
 Main PID: 998 (cupsd)
   Status: "Scheduler is running..."
    Tasks: 1 (limit: 23548)
   Memory: 4.4M
   CGroup: /system.slice/cups.service
           └─998 /usr/sbin/cupsd -l

nov 09 13:58:43 localhost.localdomain systemd[1]: Starting CUPS Scheduler...
nov 09 13:58:43 localhost.localdomain systemd[1]: Started CUPS Scheduler.
```

The /etc/cups/cupsd.conf file is used for configuring the CUPS server. Some of the commonly used directives in this file are as follows:

Allow
: Allow access from the specified hostnames/addresses

Listen
: Listen to the specified hostname/address

AccessLog
: Access log file name

AuthType
: Authentication type; valid values are: None (default value), Basic or Digest

DataDir
: Directory for the data files

DefaultCharSet
: Default charset for text

DefaultLanguage
: Default language to be used for web and text content (e.g., If the default language is English, then a web page with Japanese characters though displayed correctly in the web browser, may have junk characters in the printed version.)

Deny
: Deny access to the specified hostnames/addresses

MaxCopies
: Maximum number of copies that a user can print per job (default is 9999)

Browsing
: Enables or disables browsing for locating remote printers (enabled by default)

BrowseOrder
: Specify the order of access control (Deny,Allow or Allow,Deny)

BrowseAllow
: Allow incoming printer information packets from the specified hostnames/addresses

BrowsePort
: Port to listen to for printer information packets

A default configuration file is provided with the CUPS package. By default, this configuration file will allow local access to its printers and show printers shared on the network. A typical /etc/cups/cupsd.conf file will contain directives similar to the following:

```
SystemGroup admin

# Default authentication type
DefaultAuthType Basic

# Restrict access to the server...
<Location />
  Order deny,allow
</Location>

# Restrict access to configuration files...
<Location /admin/conf>
  AuthType None
#  Require user @SYSTEM
  Order deny,allow
</Location>

# Listen for connections from the local machine.
Listen localhost:631
Listen /var/run/cups/cups.sock

# Show shared printers on the local network.
Browsing On
BrowseOrder allow,deny
BrowseAllow all

# Log general information in error_log
LogLevel info

# MaxClients: controls the maximum number of simultaneous clients that
# will be handled. Defaults to 100.
MaxClients 100
```

```
DataDir /usr/share/cups

DefaultCharset utf-8

DefaultLanguage en

# Set the default printer/job policies...
<Policy default>
  # Job-related operations must be done by the owner or an administrator...
  <Limit Send-Document Send-URI Hold-Job Release-Job Restart-Job Purge-Jobs
Set-Job-Attributes Create-Job-Subscription Renew-Subscription Cancel-Subscription
Get-Notifications Reprocess-Job Cancel-Current-Job Suspend-Current-Job Resume-Job
CUPS-Move-Job>
#    Require user @OWNER @SYSTEM
    Order deny,allow
  </Limit>


  # Only the owner or an administrator can cancel or authenticate a job...
  <Limit Cancel-Job CUPS-Authenticate-Job>
#    Require user @OWNER @SYSTEM
    Order deny,allow
  </Limit>

  <Limit All>
    Order deny,allow
  </Limit>
</Policy>
```

Example allow/deny directive

```
Order Allow,Deny
Allow netdevgroup.com
Deny uk.netdevgroup.com
```

The /etc/cups/printers.conf file is used by the cupsd daemon to store the list of available local printers. This is a plain text file, which can be updated using the web interface or the lpadmin command. A sample printers.conf file would look like the following:

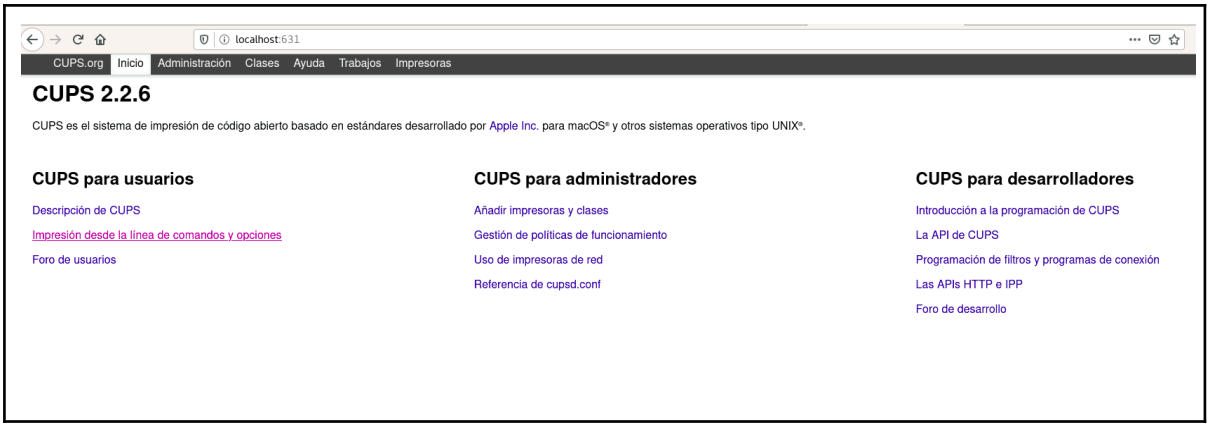
```
<DefaultPrinter Office-ES800>
DeviceURI parallel:/dev/lp0
Location Epson Stylus 800
State Idle
Accepting Yes
JobSheets none none
QuotaPeriod 0
PageLimit 0
KLimit 0
</Printer>
```

The /etc/cups/classes.conf file is used by the cupsd daemon to store the list of available local classes. Print classes are a set of printers that have been assigned a single name, so when a print job is sent to a print class, it will be printed by the first printer available in that class.

```

```

The CUPS Web Interface is the easiest way to configure and manage local and network printers and can be accessed through any web browser using the URL: http://localhost:631.



The lpadmin command

The command line alternative to the CUPS Web Interface program for adding CUPS printers and classes is the lpadmin command.

Examples to create/enable, make default and delete testprinter:

```
# lpadmin -p testprinter -E -v parallel:/dev/lp

# lpadmin -d testprinter

# lpadmin -x testprinter
```

```
$ lpoptions -d ENVY-4510

$ lpstat -p -d
```

```
$ sudo lpadmin -p FRONT-DESK -o printer-is-shared=true

$ sudo lpadmin -p FRONT-DESK -u allow:carol,frank,grace

$ sudo lpadmin -p FRONT-DESK -u deny:@sales,@marketing

$ sudo lpadmin -p FRONT-DESK -o printer-error-policy=abort-job
```

CUPS scheduler

The scheduler for CUPS is cupsd and by default, it runs as a daemon. It implements all the operations and attributes specified by IPP. The scheduler runs as a single-threaded server process and uses other processes for printing, monitoring, and providing web interfaces.

The scheduler stores job files in the /var/spool/cups directory. Every print job scheduled will have one control file containing IPP message data and one or more data files.

Some of the key options of cupsd are:

-c config_file

Use the specified configuration file instead of the default (/etc/cups/cupsd.conf)

-f Run as a foreground process

-F Run as a foreground process but detach from the controlling terminal

-t Verify the syntax of the configuration file

CUPS printing queues

Print queues manage the scheduling of print jobs on a specific printer. The queues can be added in CUPS by either using the lpadmin command or by using the CUPS Web Interface. The queues can be of the following types:

- Locally-connected printer.
- Networked IPP (CUPS) – Refers to the queue of another CUPS printer server on the network.
- Networked UNIX LPD – Refers to the queue of an LPD server on the network.
- Networked Windows (SMB) – Refers to the queue of a Windows-based print server on the network.
- Networked Novell – Refers to the queue of a printer connected to the Novell Netware server on the network.
- Networked JetDirect – Refers to the queue of a network-connected Hewlett-Packard printer that prints data received on a TCP/IP port.

Manage queues:

- cupsenable
- cupsdisable
- cupsaccept
- cupsreject

```
# lpadmin -p news -h localhost -v /dev/npp0

# cupsenable sales_dept
# cupsaccept sales_dept

# cupsreject news
```

Troubleshooting

The first thing to do when an error occurs in the CUPS service is to review the log files in the /var/log/cups directory. The different log files that are created:

Access Log – The access_log file contains the list of HTTP resources accessed by the clients or through any web browser. It uses a log format, which is identical to that used by web servers.

Page Log – The page_log file contains the accounting data for print jobs. This file will show information such as the printer name, user name, job number, date and time, current page number, and the number of copies.

Error Log – The error_log file contains error and warning messages from the scheduler. The data captured in this file depends on the setting of the LogLevel directive in the cupsd.conf file.

LPD Line Printer Daemon

The BSD LPD (Line Printer Daemon) originated from the Berkeley flavor of UNIX and is the standard printing system on several UNIX flavors. CUPS supports LPD as well as IPP.

The lpd daemon, which is typically started at boot time, handles the spooling of jobs. The lpd daemon uses the /etc/printcap (print capabilities) file to discover the list of available printers.

- /usr/sbin/lpd
- lpr
- lprm
- lpq
- lpc

The lpr command (line printer) is used to send print jobs the printer. If a file name is specified, then it will be sent to the printer; otherwise, the data from standard input will be sent to the printer.

```
$ lpr info.txt
$ lpr -P floor1 info.txt
$ lpr -# 3 info.txt
```

```
$ lprm
$ lprm -a all
$ lprm -P floor1 3
$ lprm -
```

```
$ lpq
$ lpq -P colorpr
$ lpq a
```

The lpd commands, such as lpr, lprm, and lpq, are supported in newer printing systems such as CUPS and allow users to send jobs to the printers and control the print queues using the command line.

Practical Example

Create local serial printers:

- pr-local
- pr-local2 (shared)
- pr-local3

Create class pr-local-class

- pr-local2
- pr-local3

[config files]

```
[root@localhost pue]# cat /etc/cups/printers.conf
# Printer configuration file for CUPS v2.2.6
# Written by cupsd on 2021-11-09 23:50
# DO NOT EDIT THIS FILE WHEN CUPSD IS RUNNING
<Printer pr-local-2>
UUID urn:uuid:060fbcf1-56a3-3c41-7fa0-acc45faebac0
Info printer local serie 2
Location local
MakeModel Generic Text-Only Printer
DeviceURI serial:/dev/ttyS0?baud=1200+bits=8+parity=none+flow=none
State Idle
StateTime 1636497996
ConfigTime 1636498000
Type 12292
Accepting Yes
Shared Yes
JobSheets none none
QuotaPeriod 0
PageLimit 0
KLimit 0
OpPolicy default
ErrorPolicy stop-printer
</Printer>
<Printer pr-local3>
UUID urn:uuid:98c4680c-75b4-3e09-552c-0e56917e35f5
Info printer local serial 3 test
Location local
MakeModel Generic PostScript Printer
DeviceURI serial:/dev/ttyS0?baud=1200+bits=8+parity=none+flow=none
State Idle
StateTime 1636498222
ConfigTime 1636498228
Type 8400972
Accepting Yes
Shared No
JobSheets none none
QuotaPeriod 0
PageLimit 0
KLimit 0
OpPolicy default
ErrorPolicy stop-printer
</Printer>
<Printer pr-serial>
UUID urn:uuid:705a2fe0-34f6-3c9b-59c6-de7aa1f1fa17
Info printer serial
Location local
MakeModel Generic PDF Printer
DeviceURI serial:/dev/ttyS0?baud=1200+bits=8+parity=none+flow=none
State Idle
StateTime 1636497676
ConfigTime 1636497691
Type 4124
Accepting Yes
```

```
Shared No
JobSheets none none
QuotaPeriod 0
PageLimit 0
KLimit 0
OpPolicy default
ErrorPolicy stop-printer
</Printer>
```

```
[root@localhost pue]# cat /etc/cups/classes.conf
# Class configuration file for CUPS v2.2.6
# Written by cupsd on 2021-11-09 23:51
# DO NOT EDIT THIS FILE WHEN CUPSD IS RUNNING
<Class local-pr-class>
UUID urn:uuid:c9f77c80-b903-3e81-71ca-7d071aa8c537
Info local printers class (2,3)
Location local
State Idle
StateTime 1636498288
Accepting Yes
Shared Yes
JobSheets none none
Printer pr-local-2
Printer pr-local3
QuotaPeriod 0
PageLimit 0
KLimit 0
OpPolicy default
ErrorPolicy retry-current-job
</Class>
```

[lpadmin lpstat lpoptions lpr]

```
[root@localhost pue]# lpstat -v
dispositivo para local-pr-class: ///dev/null
dispositivo para pr-local-2: serial:/dev/ttyS0?baud=1200+bits=8+parity=none+flow=none
dispositivo para pr-local3: serial:/dev/ttyS0?baud=1200+bits=8+parity=none+flow=none
dispositivo para pr-serial: serial:/dev/ttyS0?baud=1200+bits=8+parity=none+flow=none

[root@localhost pue]# lpstat -p
la impresora local-pr-class está inactiva.  activada desde mar 09 nov 2021 23:51:28 CET
la impresora pr-local-2 está inactiva.  activada desde mar 09 nov 2021 23:46:36 CET
la impresora pr-local3 está inactiva.  activada desde mar 09 nov 2021 23:50:22 CET
la impresora pr-serial está inactiva.  activada desde mar 09 nov 2021 23:41:16 CET

[root@localhost pue]# lpstat -s
no hay un destino predeterminado del sistema
miembros de la clase local-pr-class:
       pr-local-2
       pr-local3
dispositivo para local-pr-class: ///dev/null
dispositivo para pr-local-2: serial:/dev/ttyS0?baud=1200+bits=8+parity=none+flow=none
dispositivo para pr-local3: serial:/dev/ttyS0?baud=1200+bits=8+parity=none+flow=none
dispositivo para pr-serial: serial:/dev/ttyS0?baud=1200+bits=8+parity=none+flow=none
```

```
[root@localhost pue]# lpadmin -d pr-serial

[root@localhost pue]# lpstat -d
destino predeterminado del sistema: pr-serial

[root@localhost pue]# lpadmin  -d local-pr-class

[root@localhost pue]# lpstat -d
destino predeterminado del sistema: local-pr-class


[root@localhost pue]# lpoptions -p pr-serial
copies=1 device-uri=serial:/dev/ttyS0?baud=1200+bits=8+parity=none+flow=none
```

```
finishings=3 job-cancel-after=10800 job-hold-until=no-hold job-priority=50
job-sheets=none,none marker-change-time=0 number-up=1 printer-commands=none
printer-info='printer serial' printer-is-accepting-jobs=true printer-is-shared=false
printer-is-temporary=false printer-location=local printer-make-and-model='Generic PDF
Printer' printer-state=3 printer-state-change-time=1636497676 printer-state-reasons=none
printer-type=2101276 printer-uri-supported=ipp://localhost/printers/pr-serial
[root@localhost pue]# find /usr/share/doc -name "*.pdf" -ls
 67201760    432 -rw-r--r--   1  root     root       439545 ene  3  2015 /usr/share/doc/speexdsp/manual.pdf
 33751671     12 -rw-r--r--   1  root     root        10732 dic 27  2017 /usr/share/doc/pigz/pigz.pdf
 67938548    232 -rw-r--r--   1  root     root       234575 feb  2  2016 /usr/share/doc/libsrtp/libsrtp.pdf
  1419557    360 -rw-r--r--   1  root     root       368198 abr 15  2013
/usr/share/doc/paktype-naskh-basic-fonts/PakTypeNaskhBasicFeatures.pdf
  1419566     80 -rw-r--r--   1  root     root        80373 dic  2  2010 /usr/share/doc/sil-abyssinica-fonts/AbyssinicaSILFontFeatures.pdf
  1419567    232 -rw-r--r--   1  root     root       236337 dic  1  2010 /usr/share/doc/sil-abyssinica-fonts/AbyssinicaSILTypeSample.pdf
  1419573    188 -rw-r--r--   1  root     root       189656 abr 17  2006
/usr/share/doc/sil-abyssinica-fonts/SILEthiopicPrivateUseAreaBlock.pdf
 36078995    232 -rw-r--r--   1  root     root       235941 mar  9  2017 /usr/share/doc/sil-padauk-fonts/documentation/Padauk-features.pdf
 36078997    364 -rw-r--r--   1  root     root       371473 mar  9  2017
/usr/share/doc/sil-padauk-fonts/documentation/Padauk-typesample.pdf
102001392    380 -rw-r--r--   1  root     root       386650 may 28  2010 /usr/share/doc/stix-fonts/STIX\ Font\ License\ 2010.pdf
102001393    504 -rw-r--r--   1  root     root       515761 ago  3  2012 /usr/share/doc/stix-fonts/STIXv1.1.0.pdf
 36079004    676 -rw-r--r--   1  root     root       691531 mar 29  2018 /usr/share/doc/gutenprint-doc/gutenprint-users-manual.pdf


[root@localhost pue]# lpr /usr/share/doc/speexdsp/manual.pdf
[root@localhost pue]# lpr /usr/share/doc/pigz/pigz.pdf
[root@localhost pue]# lpr /usr/share/doc/libsrtp/libsrtp.pdf

[root@localhost pue]# lpq -a
Rango  Propiet. Trabajo Archivo(s)                      Tamaño total
active  root    3       libsrtp.pdf                     235520 bytes

[root@localhost pue]# lpq -a
no hay entradas
```

[lpq lprm]

```
[root@localhost pue]# lpstat -d
destino predeterminado del sistema: local-pr-class

[root@localhost pue]# cupsreject local-pr-class

[root@localhost pue]# lpstat -p local-pr-class
la impresora local-pr-class está inactiva.  activada desde mar 09 nov 2021 23:51:28 CET
        Rejecting Jobs

[root@localhost pue]# lpr /usr/share/doc/speexdsp/manual.pdf
lpr: El destino local-pr-class no acepta trabajos.

[root@localhost pue]# lpstat -p local-pr-class
la impresora local-pr-class está deshabilitada desde mié 10 nov 2021 18:03:19 CET -
        Paused

[root@localhost pue]# cupsaccept local-pr-class

[root@localhost pue]# lpstat -p local-pr-class
la impresora local-pr-class está deshabilitada desde mié 10 nov 2021 18:03:19 CET -
        razón desconocida

[root@localhost pue]# lpr /usr/share/doc/speexdsp/manual.pdf

[root@localhost pue]# lpq -a
Rango  Propiet. Trabajo Archivo(s)                      Tamaño total
1st     root    4       manual.pdf                      440320 bytes

[root@localhost pue]# lpr /usr/share/doc/pigz/pigz.pdf
[root@localhost pue]# lpr /usr/share/doc/libsrtp/libsrtp.pdf

[root@localhost pue]# lpq
local-pr-class no está preparada
Rango  Propiet. Trabajo Archivo(s)                      Tamaño total
1st     root    4       manual.pdf                      440320 bytes
2nd     root    5       pigz.pdf                        11264 bytes
3rd     root    6       libsrtp.pdf                     235520 bytes

[root@localhost pue]# lpq
local-pr-class no está preparada
Rango  Propiet. Trabajo Archivo(s)                      Tamaño total
```

```
1st     root    4       manual.pdf                      440320 bytes
2nd     root    5       pigz.pdf                        11264 bytes
3rd     root    6       libsrtp.pdf                     235520 bytes

[root@localhost pue]# lprm 5

[root@localhost pue]# lpq
local-pr-class no está preparada
Rango  Propiet. Trabajo Archivo(s)                      Tamaño total
1st     root    4       manual.pdf                      440320 bytes
2nd     root    6       libsrtp.pdf                     235520 bytes
[root@localhost pue]# lprm -

[root@localhost pue]# lpq
local-pr-class no está preparada
no hay entradas
```

[Spool & Logs]

```
[root@localhost pue]# ls /var/spool/cups/
c00001  c00002  c00003  c00004  c00005  c00006  d00001-001  d00002-001  d00003-001
d00004-001  d00005-001  d00006-001  tmp

[root@localhost pue]# ls /var/log/cups/
access_log  access_log-20210929  error_log  error_log-20210929  page_log
page_log-20210929

[root@localhost cups]# head access_log-20210929
This CUPS log has been moved into journal by default unless changes have been made in /etc/cups/cups-files.conf. Log
messages can be got by "$ journalctl -u cups -e"
This CUPS log has been moved into journal by default unless changes have been made in /etc/cups/cups-files.conf. Log
messages can be got by "$ journalctl -u cups -e"

[root@localhost cups]# journalctl -r -u cups -n 20
-- Logs begin at Wed 2021-11-10 17:54:05 CET, end at Wed 2021-11-10 18:13:10 CET. --
nov 10 18:06:42 localhost.localdomain cupsd[3758]: File of type application/pdf queued by "root".
nov 10 18:06:42 localhost.localdomain cupsd[3758]: Request file type is application/pdf.
nov 10 18:06:42 localhost.localdomain cupsd[3758]: Auto-typing file...
nov 10 18:06:42 localhost.localdomain cupsd[3758]: REQUEST localhost - - "POST /classes/local-pr-class HTTP/1.1" 200 316
Create-Job successful-ok
nov 10 18:06:42 localhost.localdomain cupsd[3758]: Queued on "local-pr-class" by "root".
nov 10 18:06:42 localhost.localdomain cupsd[3758]: Adding start banner page "none".
nov 10 18:06:42 localhost.localdomain cupsd[3758]: Applying default options...
nov 10 18:06:17 localhost.localdomain cupsd[3758]: REQUEST localhost - - "POST /printers/local-pr-class HTTP/1.1" 200
10999 Send-Document successful-ok
nov 10 18:06:17 localhost.localdomain cupsd[3758]: Adding end banner page "none".
nov 10 18:06:17 localhost.localdomain cupsd[3758]: File of type application/pdf queued by "root".
nov 10 18:06:17 localhost.localdomain cupsd[3758]: Request file type is application/pdf.
nov 10 18:06:17 localhost.localdomain cupsd[3758]: Auto-typing file...
nov 10 18:06:17 localhost.localdomain cupsd[3758]: REQUEST localhost - - "POST /classes/local-pr-class HTTP/1.1" 200 313
Create-Job successful-ok
nov 10 18:06:17 localhost.localdomain cupsd[3758]: Queued on "local-pr-class" by "root".
nov 10 18:06:17 localhost.localdomain cupsd[3758]: Adding start banner page "none".
nov 10 18:06:17 localhost.localdomain cupsd[3758]: Applying default options...
nov 10 18:04:23 localhost.localdomain cupsd[3758]: REQUEST localhost - - "POST /printers/local-pr-class HTTP/1.1" 200
439814 Send-Document successful-ok
nov 10 18:04:23 localhost.localdomain cupsd[3758]: Adding end banner page "none".
nov 10 18:04:23 localhost.localdomain cupsd[3758]: File of type application/pdf queued by "root".
nov 10 18:04:23 localhost.localdomain cupsd[3758]: Request file type is application/pdf.
```

Example Exercises

1. Which is the CUPS daemon file configuration?
2. Which is the CUPS printers file description?
3. Which is the LPD printers file configuration?
4. Which is the CUPS spool directory?
5. Which is the URL to access the CUPS admin web interface?
6. List the cups printers

7. Which two commands enable a printer and make it ready to accept jobs?
8. How to remove a printer?
9. Which command can be used to set the default printer?
10. Which LPD command removes all the jobs?
11. Which LPD command sends a file to print?
12. Which LPD command show all the print jobs?

13. Realitza els exercicis indicats a: 108.4 Manage printers and printing
14. Realitza els exercicis del Question-Topics 108.4