The Print Service

Student Guide

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Contents

The Print Service 1

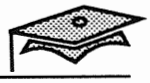
Objectives

Upon completion of this lesson, you will be able to:

- Describe the five functions of the LP print service.
- Recall the function of a print server and a print client.
- Verify that a printer type exists in the `terminfo` database.
- Turn off banner-page printing.
- Diagram local and remote print models.

References

SunOS 5.1 Setting Up User Accounts, Printers, and Mail,
Chapter 3, "Setting Up Printers," and Chapter 4, "Routine Printer Administration"

Introduction

This lesson introduces the features of the Solaris® 2.*x* print system and the terms and concepts needed to configure local and remote printers.

Configuring local and remote printers is done using Administration Tool's Printer Manager. (This is covered in the next lesson.)

The LP Print Service

Overview

The Solaris 2.*x* environment uses the System V-based LP print service which consists of several daemons that monitor print requests, a hierarchy of configuration files in the `/etc/lp` directory and set of `lp` commands.

Features

- Interoperates with SunOS™ 4.1.x-based printers which uses the BSD-based print service)
- Includes bundled PostScript® filters
- Supports printing forms
- Supports print wheels and alternate character sets
- Provides flexible printer management, including:
  - Print job priorities
  - Printer classes
  - Selected printer access

Configuring Printer Services

Configuring printer services in the Solaris 2.*x* environment involves essentially three main tasks:

- Set up the printer
  - Physically connect the printer to the system.
  - Set the printer switches and other settings.
- Set up the print server
  - A *print server* is a system with a printer connected to it.
  - A print server is configured to provide access to the local printer using Administration Tool.
- Set up the print client
  - A *print client* is a system that uses a print server for printing.
  - A print client is configured to provide access to the remote printer using Administration Tool.

Print Service Functions

- Queuing

  When print requests are spooled, the jobs are lined up with other jobs waiting to be printed. This process of lining up jobs is called *queuing*.

- Tracking

  The print service tracks the status of every job to allow users to remove jobs and system administrators to manage jobs. For the same reason, jobs that were interrupted by something like a system crash will be resumed when the system reboots.

- Fault Notification

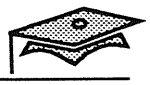
  When problems occur in the print service, error messages are displayed on the system console or mailed to the system administrator.

- Initialization

  The print service initializes a printer before sending it a print job to ensure it is in a known state.

- Filtering

  Certain complex print jobs, such as CAD documents, are converted into descriptions the printer can understand. Conversions are performed by programs called *filters*.

Print Service Terminology

Print Forms

A pre-printed form with text and graphics such as an invoice, blank check, or letterhead that users want to print on rather than blank paper

Print Wheel and Alternate Character Sets

Print wheels (or print balls) and font cartridges are referred to as hardware character sets and require operator invention to mount them when needed.

Software characters sets that come pre-programmed with the printer, such as a non-Postscript printer, must be pre-defined by the administrator as a specific font style. Then the user prints a file with the font style as an option.

Selectable character sets may be available with a supported printer type, and would be listed in the `terminfo` database.

The `terminfo` database consists of a series of files that describe control sequences for initializing printers and terminals.

The following section identifies printer concepts and models that are needed to set up the printing environment.

- Printer types
- File content types
- Filters
- Interface programs
- Local and remote print models

Printer Types

The printer type is used to identify the `terminfo` database entry containing the control sequences to initialize the printer. This database contains a large number of entries, which for most cases means there is no need to create additional printer entries.

Supported printer types include `PS` (for PostScript), `PSR` (for PostScript Reverse), and non-PostScript types such as `daisy`, `datagraphix`, and `diablO`.

To check if an printer entry exists in the `terminfo` database, turn to the *Accounts, Printers, and Mail* guide to verify that your printer is listed in the Frequently Used PostScript and Non-PostScript printers tables.

Or, list the contents of the `/usr/share/lib/terminfo` subdirectories.

```
# ls /usr/share/lib/terminfo/e
... epson2500 epson2500-80 epson2500-h espson2500-hi80
...
```

The `terminfo` entry has a name with the same initial letter or digit as the abbreviation of the printer.

Check if the printer can emulate another printer type if there is no entry in the `terminfo` database following the instructions listed on page 114 of the above mentioned guide

See pages 135-138 for a listing of frequently-used printers and their associated printer types in the *SunOS 5.1 Setting Up User Accounts, Printers, and Mail* guide.

Content Types

Every print request consists of at least one file containing information with a particular format, called a *content type.*

Every printer must be defined with a printer type and at least one content type. The print service uses this configuration information to match a print request to a printer that accepts that type of print request.

This is how it works:

If you have a PostScript printer, specify that the content type is PostScript. This way, users can print PostScript and other supported content types to this printer without specifying the content type.

The only time a user needs to specify a content type when printing a file is if it needs special filtering so the printer know what filtering needs to be done.

Some of the supported content types are:

- `PS` (PostScript)
- `simple`
- `raster`
- `troff`
- `any`

The most important point to remember about content types is to associate your printers with the appropriate content types. This is easily handled using the Printer Manager because you can select the content type from a menu.

Print Filters

Print filters are programs used by the print service to convert the content of requests to the content accepted by the destination printer.

A PostScript filter is used to handle printing special cases on PostScript printers. For example, the `posttek` filter is used to convert Tektronix graphic files into PostScript.

The Solaris 2.*x* release provides a default set of PostScript filters that are automatically installed when a PostScript printer is configured using the Printer Manager (part of Administration Tool).

PostScript filter information is stored in several places.

- The default PostScript filters are stored in the `/usr/lib/lp/postscript` directory.
- A set of print filter descriptor files are stored in the `/etc/lp/fd` directory.
- A print filter lookup table of these downloaded filters is stored in the `/etc/lp/filter.table` file.

Interface Programs

Interface programs are usually shell scripts used by the print service to set certain default printer settings.

For example, to turn off banner page printing over the network, modify the `/etc/lp/interfaces/`*printer_name* script by changing line 332 from:

```
nobanner="no"
to
nobanner="yes"
```

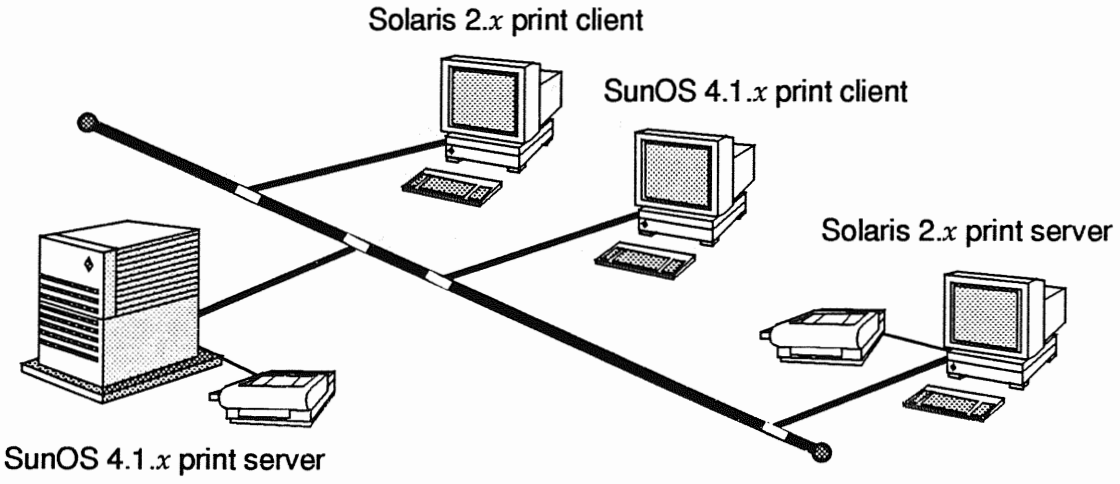
This script is a copy of standard initialization script, `/usr/lib/lp/model/standard` script, which takes the initialization information from the printer type entry in the `terminfo` database.

The default printer settings are described on page 392 of the *SunOS 5.1 Setting Up User Accounts, Printers, and Mail* Guide.

The Printing Environment

The Solaris 2.*x* release provides a heterogeneous printing environment.

- Solaris 2.*x* print clients served by a Solaris 2.*x* print server.
- Solaris 2.*x* and SunOS 4.1.*x* print clients served by a Solaris 2.*x* print server.
- Solaris 2.*x* and SunOS 4.1.*x* print clients served by a SunOS 4.1.*x* print server.



The diagram above illustrates a heterogeneous printing environment with local and remote printers configured.

The Local Printing Model

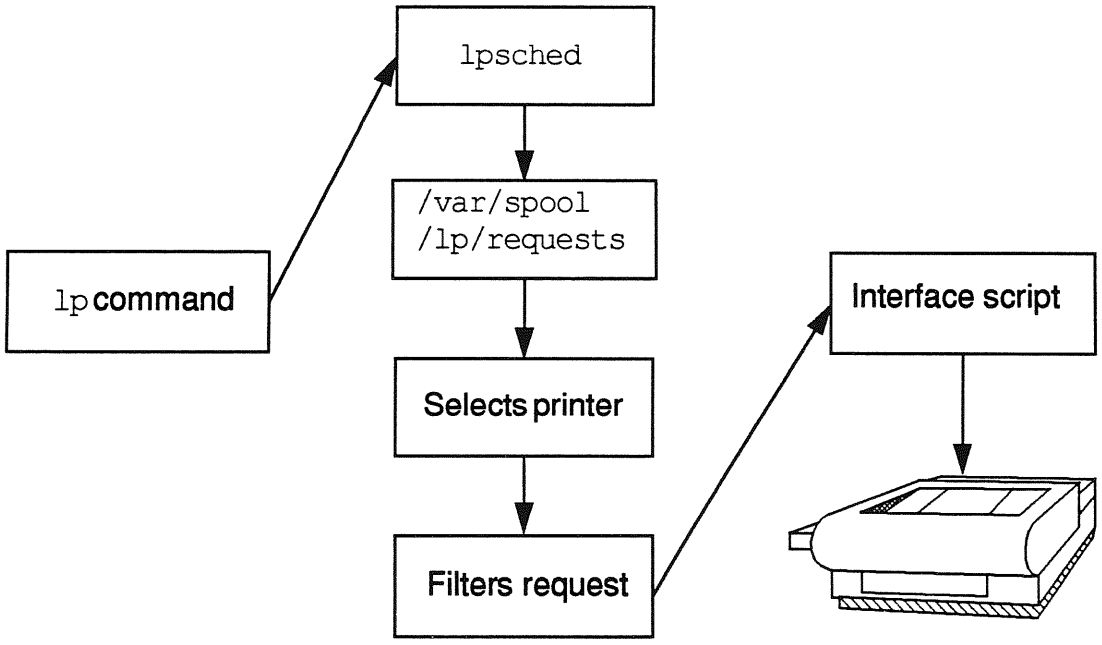
Overview

The printing model for local printing in the Solaris 2.*x* environment is illustrated below.

The `lpsched` daemon, the print service scheduler, is responsible for tracking all local print requests and updating the `lp` database with printer information.

When a print job is submitted via the `lp` command, the scheduler places a copy of the request in the `/var/spool/lp/requests` directory.

Next, the `lpsched` daemon matches the request contents to the printer contents and identifies a filter if a conversion is necessary. When filtering is complete, the scheduler waits for the printer to become available; then it runs the interface program to initialize the printer and downloads the request to the port to which the printer is attached.



The Remote Printing Model

Print Servers

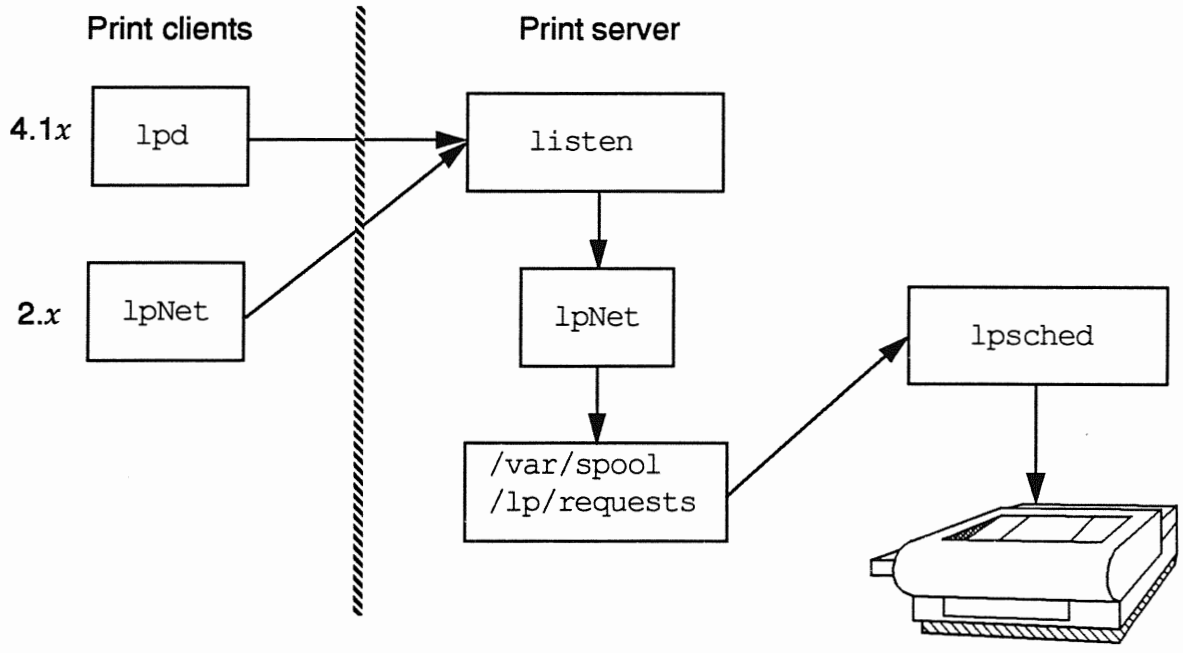
The diagram below represents the remote printing model for Solaris 2.*x* print servers.

Both SunOS 4.1.*x* (Berkeley Software Distribution, or BSD) and Solaris 2.*x* (System V) clients can print to a Solaris 2.*x* server.

Each print client and server has at least one `lpNet` daemon that schedules network print requests.

In the case of a Solaris 2.*x* (System V) print client, the `lpNet` process connects to the server' `listen` port monitor, which connects the incoming `lpNet` request to a local `lpNet` process. Once the request has been queued by the local `lpNet` process, it is sent to the printer by the `lpsched` daemon.

In the case of a SunOS 4.1.*x* (BSD) client, the `lpd` daemon connects to the server's `listen` port monitor, which in turn connects the incoming request to a local `lpNet` daemon. The queuing and printing of the request is the same as with a Solaris 2.*x* (System V) client.



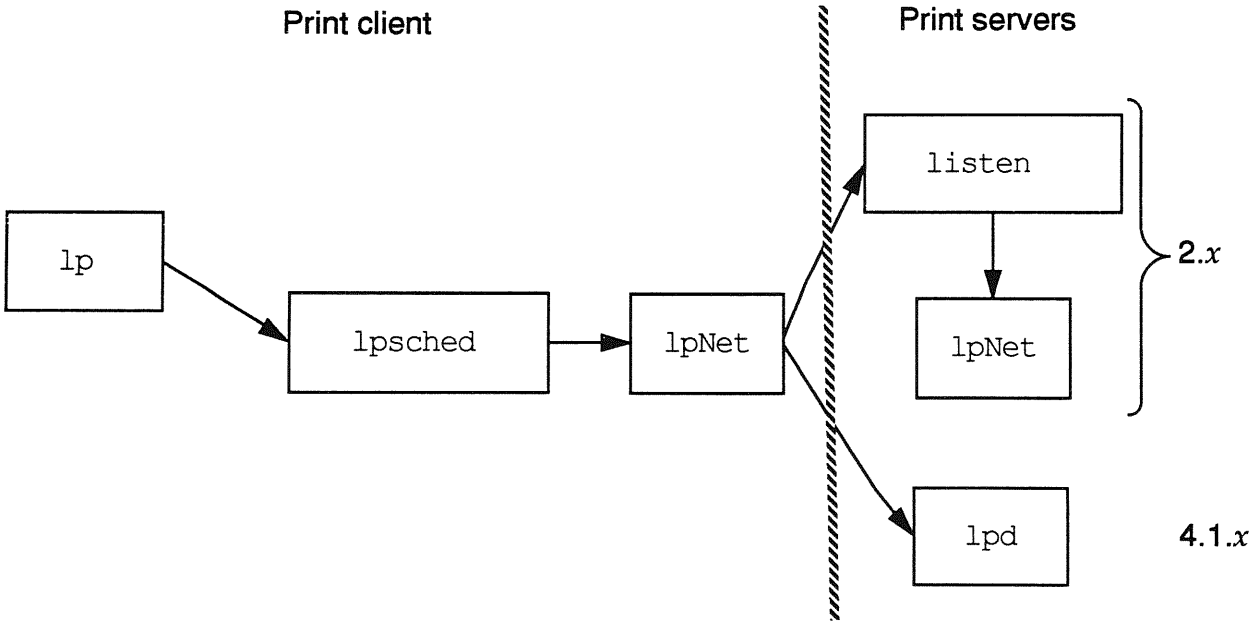
The Remote Printing Model

Print Clients

The diagram below represents the remote printing model for Solaris 2.*x* print clients.

It is possible for Solaris 2.*x* print clients to interact with SunOS 4.1.*x* (BSD) and Solaris 2.0 (System V) print servers.

The processing of print requests on the print client is almost identical to the one described for local printing. The main difference is that the `lpsched` daemon hands the print request to the `lpNet` daemon rather than downloading it to a local printer. The `lpNet` daemon is capable of establishing a connection with a `listen` or `lpd` process running on the print server.



Summary

In this lesson, you learned that:

- The Solaris 2.*x* print service is based on the System V LP print service and interoperates with the SunOS 4.1.*x* environment.
- The print service matches a print request's content type to a printer that can print that type of content.
- It is not necessary to specify the content of a print request going to a remote SunOS 4.1.*x* printer because the SunOS 4.1.*x* print server performs any conversion that is necessary.
- The Solaris 2.*x* release provides a default set of PostScript filters and they are automatically installed when a PostScript printer is defined using the Printer Manager.
- The Solaris 2.*x* release supports a heterogeneous printing environment.
- The `lpsched` daemon schedules `lp` print requests.
- The `lpNet` daemon handles network printer requests.

Exercise 1-1

Write down your answers to the following questions.

1. Describe the five functions of the LP print service.

2. What is a printer filter?

3. Describe the three scenarios for printing in the Solaris 2.*x* environment.

4. What processes are involved in passing remote print requests from a Solaris 2.*x* client to a Solaris 2.*x* server?

The Printer Manager

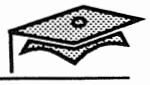
Objectives

Upon completion of this lesson, you will be able to:

- Use Administration Tool's Printer Manager to add a local and remote printer to a system.
- Modify a printer's configuration using Printer Manager.
- Delete a printer using Printer Manager.

References

SunOS 5.1 Setting Up User Accounts, Printers, and Mail,
Chapter 3, "Setting Up Printers,"

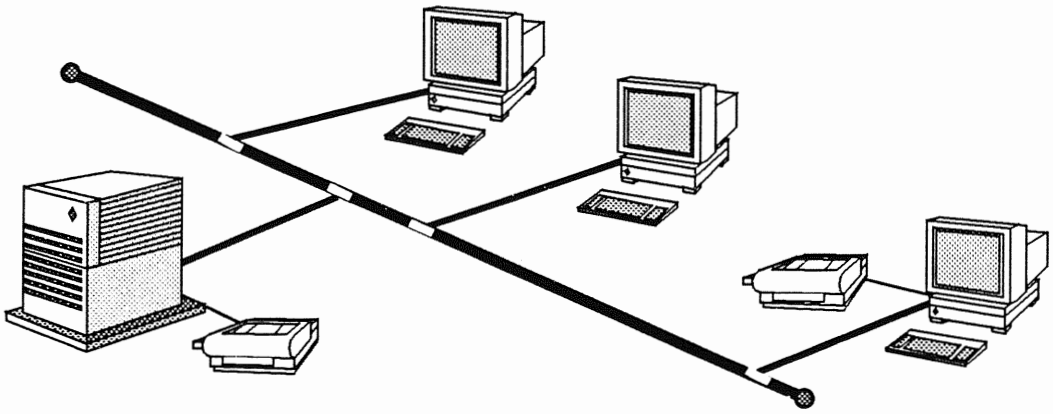


Introduction

This lesson describes the procedures for configuring local and remote printers using Printer Manager from Administration Tool.

Configuring local and remote printers manually is covered in Appendix B of this module.

Setting Up Printing



Network Access

If your network of systems is not running Network Information Services Plus (NIS+) or the Network Information Services (NIS) product, each print client's system name and Internet address must be in the print server's `/etc/inet/hosts` file before setting up the print servers and print clients. Also, the print server's system name and Internet address must be in the `/etc/inet/hosts` file of each print client system.

Setting Up Print Servers

Two main steps are needed to set up Solaris 2.*x* print servers, which is done using Administration Tool.

1. Identify printer characteristics

   Printer characteristics include printer name, printer type, and file content type.

2. Configure the port monitor and register the network listen service

   These steps are done automatically by the Printer Manager.

Setting Up Print Clients

The Printer Manager on the Solaris 2.*x* print client is used to do several tasks.

- Identifies the printer and server system to which the printer is connected
- Defines characteristics of the printer
- Configures the port monitor and registers the `listen` service with the port monitor

A `listen` port monitor is used to pass remote print requests between the print client's and print server's `lpNet` daemons. Once again, Printer Manager will do these steps for you automatically.

Local Printing Configuration

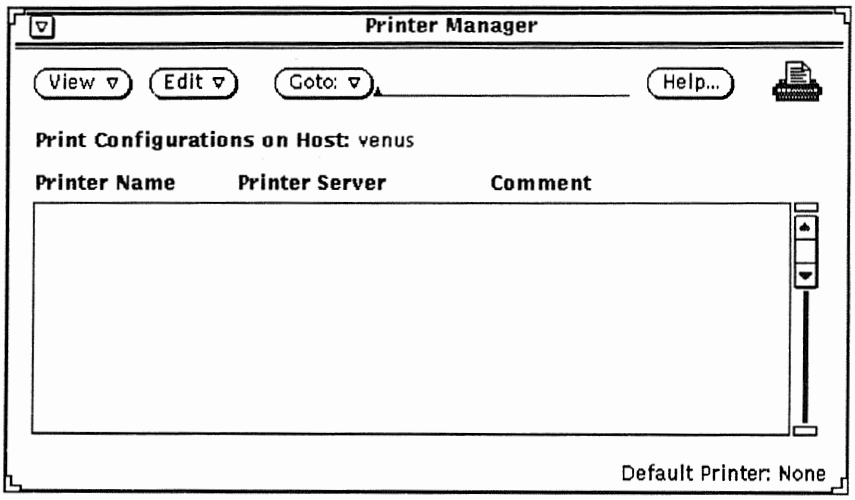
The following steps are used to connect a local printer to the system.

1. Physically connect the printer to the system.
2. Set the printer switches and/or configure baud rate, if necessary.
3. Plug the printer into a power outlet and turn it on.
4. Define the following printer characteristics with the LP print service using the Printer Manager (this is covered on the following page).

Using Printer Manager

1. Invoke OpenWindows™, if necessary.
2. Start Administration Tool and click once on the Printer Manager icon.

   The Printer Manager from Administration Tool has three top-level menus:



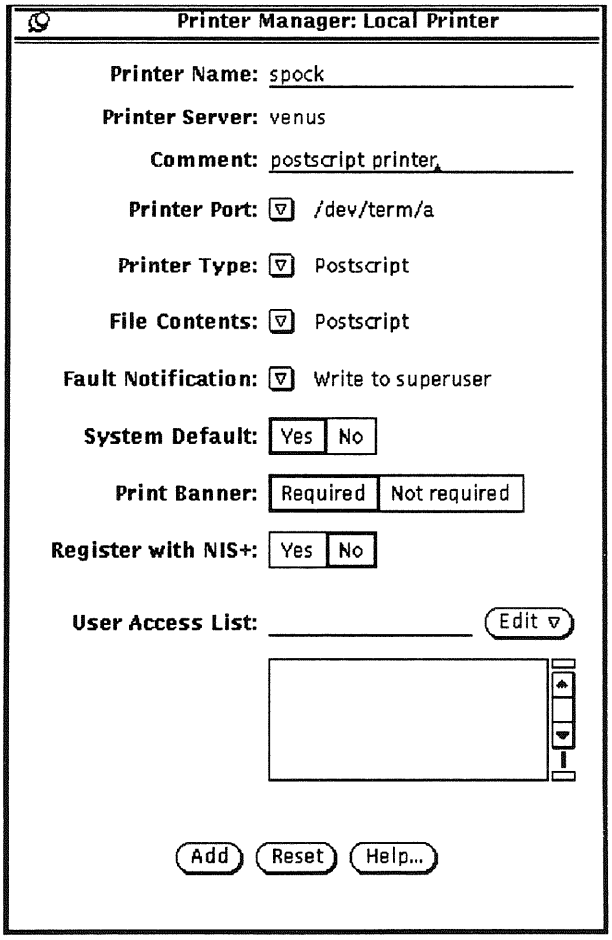
   - View, which is used to show and find printers
   - Edit, which is used to add, modify, and delete printers
   - Goto, which is used to change the system on which to view or edit printers

The steps for adding support for local and remote printers are described on the following pages. (Both procedures will be used to complete the exercise at the end of this module.)

Adding a Local Printer

Select the Add Local Printer option from the Edit menu. Fill out the Local Printer form specifying the following information:

1. A unique printer name (14 character maximum).
2. An optional comment that helps users identify the printer.
3. The printer port name (which is `/dev/term/a` or `/dev/term/b`).
4. The printer type and file content type. (The PostScript filters are loaded automatically when a PostScript printer is added.)
5. Choose the Write to superuser from the Fault Notification menu, which is the default setting. The other options are Mail to superuser or None.

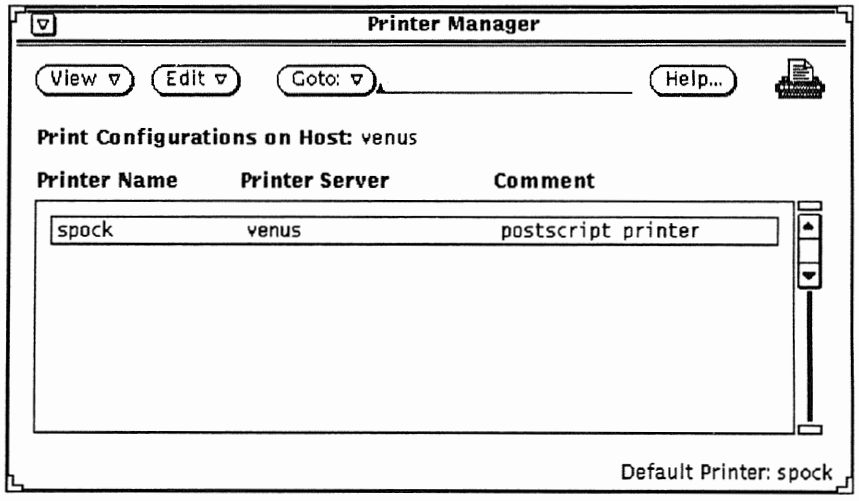


Adding a Local Printer

6. Set the system default (printer) at Yes, which is the default setting.
7. Set the print banner setting default to Required, which is the default setting.
8. The Register with NIS+ option allows you to enter the printer name in the NIS+ name service database. Leave this option at No, which is the default setting.
9. The User Access List option allows you to deny or allow access to the printer on a per-user basis. The default setting is that all users can access the printer.
10. Click on Add when you have completed the form.

Dismiss the Local Printer form and return to the Printer Manager window.

The newly added printer is displayed in the Printer Manager window.

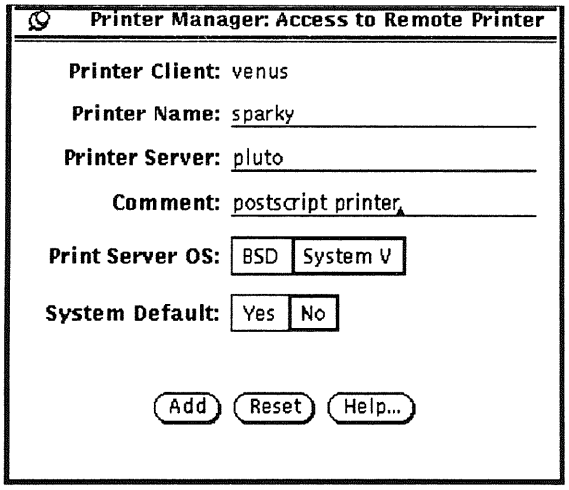


Adding Access to a Remote Printer

Select the Add Access to Remote Printer option from the Edit menu. Fill out the Access to Remote Printer form specifying the following information:

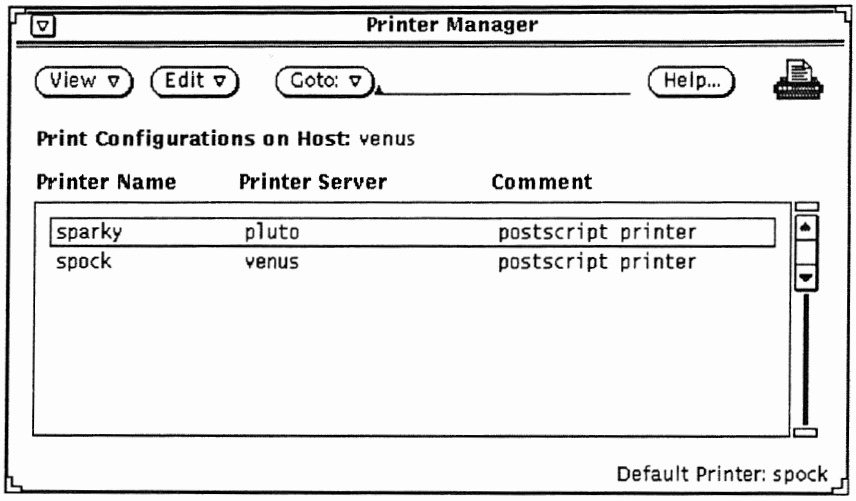
1. The printer name.
2. The printer server name.
3. An optional comment that helps users identify the printer.
4. Specify the appropriate printer server operating system: BSD or System V.

   (*This will depend on the server's operating system in the lab environment.*)
5. Specify whether this printer is the default printer.
6. Click on Add.
7. Dismiss the Access to Remote Printer form.



Adding Access to a Remote Printer

Verify that access to the remote printer has been added.



Managing Printer Queues

In the Solaris 2.*x* printer environment, system administrators can toggle a printer's ability to accept or reject print requests. Printers can also be enabled or disabled from printing print requests.

When a local or remote printer is added using the Printer Manager, the printers are automatically configured to accept print requests and can begin printing requests.

These two features provide a system administrator flexibility in managing printer queues. For example, if one printer is overloaded, you can have it reject all new print requests but continue to finish existing queued requests.

You can also disable a printer from printing any requests if it needs to be taken off-line for any reason.

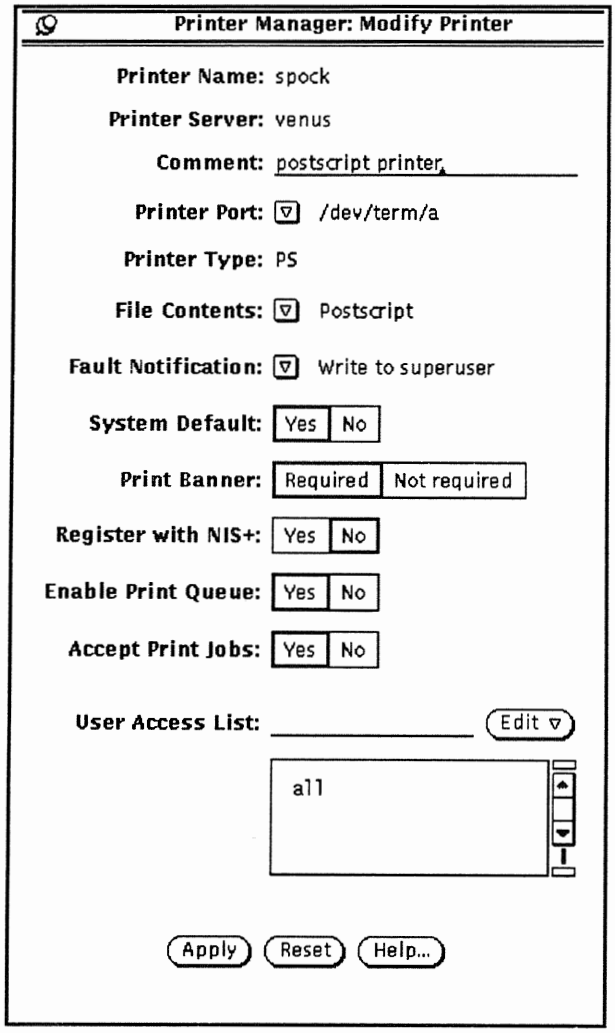
Both of these features can be controlled with the Printer Manager or with the `accept/reject` commands or the `enable/disable` commands. These commands are covered in the next lesson.

Managing Printer Entries

Modifying a Printer Entry

Use the Modify Printer option from the Edit menu to change an existing printer's configuration.

Focus on the Enable Print Queue and Accept Print Jobs settings. These two settings allow you to change a printer's ability to print and/or queue print requests.



Click on Apply after making a selection.

Managing Printer Entries

Deleting a Printer Entry

Printer entries can be deleted by using the Delete Printer option from the Printer Manager's Edit menu.

All currently queued print requests to this printer must be removed with the `cancel` or `lpmove` commands before the printer entry can be successfully removed.

It is sometimes necessary to remove a printer entry manually. (This procedure is covered in the next lesson.)

Finding a Printer Entry

Use the Find option from the Print Manager's View menu if a system has a long listing of printers and scrolls off the Printer Manager window.

Once the printer entry is highlighted, you can modify or delete the entry.

Summary

In this lesson, you learned that:

- If your network of systems is not using a name service product, then system names and Internet addresses must be added to the print server's and print client's `/etc/inet/hosts` files before setting up print servers and print clients.
- System administrators use the Printer Manager to define printer characteristics, such as printer name, printer and file content types, and whether the printer is local or remote.
- The Printer Manager configures the port monitor and registers the `listen` network service automatically.
- The Printer Manager is also used to modify, delete, and find printer entries.

Exercise 2-1

The purpose of this lab is to use the Printer Manage to add a local or remote printer.

Procedure

The instructor will let you know whether this lab exercise will be a group demonstration or whether you should work in teams of two or three students, if printers are available for this exercise.

The instructor will also identify the following information:

- Whether a remote SunOS 4.1.*x* or Solaris 2.*x* printer is available.
- The printer name, if a printer is available.

It is possible to print to ASCII terminals if they are available from a previous lab exercise.

1. Connect the printer to be configured and ensure it is turned on.
2. Use the Printer Manager to add a local printer.
3. Use the Printer Manager to add a remote printer. Ensure remote print server and Internet address are added to the `/etc/inet/hosts` file.
4. Look at the Printer Manager window to verify that the printer has been added.
5. Send a file to the printer.

Using LP Commands 3

Objectives

Upon completion of this lesson, you will be able to:

- Given a case study, write the commands used to set up a printer class.
- Recall how to remove queued print requests.
- Write the commands used to take a printer out of service and then make it available.
- Manually designate a default printer destination using the `lpadmin` command.
- Manually designate a default printer destination using environment variables.
- Write the command to move a queued print request to the top of the queue.
- Write the commands used to hold a queued print request and then resume it.

References

SunOS 5.1 Setting Up User Accounts, Printers and Mail,
Chapter 4, "Routine Printer Administration," and
Chapter 6, "Setting Printer Policies"

Introduction

Not all printer management tasks can be done using the Printer Manager.

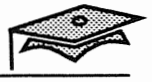
This lesson describes the LP commands needed to manage printer administration tasks, such as:

- Creating printer classes
- Managing print queues and printer availability
- Stopping and starting the LP print service

Basic LP Command Introduction

The following LP commands are needed to perform the printer management tasks described on the following pages.

Command Name	Description
`lp`	Send file to a printer
`lpstat`	Display print service status
`cancel`	Cancel print requests
`accept`	Enable queuing of print requests
`reject`	Prevent queuing of further print requests
`enable`	Allow printer to print requests
`disable`	Disable printer from printing requests
`lpmove`	Move print requests
`lpadmin`	Perform various administrator tasks



Printer Terminology

The Solaris 2.*x* print service provides two different ways to specify the destination of a print request, which is the target for print jobs.

- Printer

  Print requests can be sent to a printer by its printer name, which is assigned by the system administrator.

- Class

  Print requests can be sent to a group of printers called a *class*, which is a name assigned to a group of printers by the system administrator.

Using Printer Classes

A *class* is a named group of printers created with the `lpadmin` command. Once created, a `class` can be used as the destination of print requests allowing the print service to automatically select an available printer within the `class` that has a matching content type.

Printer classes can be defined using different criteria:

- Based on printer type (all PostScript printers)
- Based on location (first floor, tenth floor, Building 7)
- Based on work group or department (Accounting or Engineering)

You can create a class of printers to ensure the printers are accessed in a particular order, because the print service always checks for printer availability, using the order in which the printers were added to the class. For example, if you have a high-speed printer, add it to the class first so it can handle as many print requests as possible. These rules also apply to printer usage order:

- Print requests are balanced between printers in a class for local printers only.
- When a print client attempts to print to a class of printers defined on a print server, only the first printer defined in the class is used.

A `class` is created the first time a printer is added to it. Once a class has been created, use the `accept` command to allow the class to queue jobs.

Classes do not have to be enabled with the `enable` command.

Using Printer Classes

Example:

1. Add printers to a `class` named `groundfloor`. Then issue the `accept` command to allow the printer class to accept print requests.

```
# lpadmin -p spock -c groundfloor
# lpadmin -p sparky -c groundfloor
# accept groundfloor
destination "groundfloor" now accepting requests
#
```

2. Check the status of the printer class.

```
# lpstat -t
scheduler is running
system default destination: spock
members of class groundf loor:
 spock
 sparky
system for spock: venus
system for sparky: pluto
groundfloor accepting requests since Tue Jun 8 11:26:21 PDT
1993
spock accepting requests since Tue Jun 8 09:42:50 PDT 1993
sparky accepting requests since Tue Jun 8 09:43:27 PDT 1993
printer spock is idle. enabled since Tue Jun 8 09:42:50 PDT
1993. available.
printer sparky is idle. enabled since Tue Jun 8 09:43:28 PDT
1993. available.
#
```

3. Send a request to the printer class.

```
$ lp -d groundfloor worldmap.ps
request id is groundfloor-30 (1 file(s))
$
```

Designating a Default Destination

A system administrator can designate a printer or class of printers as the system-wide default destination for print requests using the `lpadmin` command.

```
# lpadmin -d sparky
# lpstat -d
system default destination: sparky
#
```

This can also be done using the Printer Manager when adding a local or remote printer by setting System Default (printer) to `yes`.

Individual users can set their own default printer by setting the `LPDEST` environment variable with the name of that printer or class.

Bourne or Korn shell users use:

```
$ LPDEST=spock
$ export LPDEST
$
```

C shell users use:

```
venus% setenv LPDEST spock
venus%
```

Cancelling Print Requests

Use the `cancel` command to cancel a print request. Note that users are only allowed to cancel their own requests. Only the superuser can cancel any request.

Examples:

List print requests queued for a specific destination:

```
# lpstat -o
spock-76      root          575      Jun 8 11:28
spock-77      root         4601      Jun 8 11:28
spock-78      root         1697      Jun 8 11:28
spock-79      rimmer        575      Jun 8 11:30
spock-80      rimmer       4601      Jun 8 11:30
spock-81      rimmer       1697      Jun 8 11:30
#
```

Cancel specific print requests.

```
# cancel spock-77 spock-78
request "spock-77" cancelled
request "spock-78" cancelled
#
```

Cancel all print requests submitted by a user.

```
# cancel -u rimmer
request "spock-79" cancelled
request "spock-80" cancelled
request "spock-81" cancelled
#
```

Taking a Printer out of Service

Moving Requests

The Solaris 2.*x* print service allows requests to be moved between different queues. It does not move requests if their content type does not match the content type of the new destination.

If you decide to take a printer out of service:

- Reject additional print requests on the printer to be made unavailable.
- Move or cancel any requests that are currently queued to the printer.

Requests for a specific printer or form type are not automatically moved. If you do not move or cancel them specifically, the print service cancels them when the `lpmove` command is issued.

When you move requests, the print request IDs remain unchanged, so users can still identify their requests.

Moving Requests

Use the `lpmove` command to move selected print requests or all print requests from one printer or printer class to another.

1. Become superuser on the print server system.

2. Use the `reject` command to prevent any further print requests from being sent to the print queue while you are moving print requests. This step notifies users why the printer is not accepting requests.

```
# reject -r "spock is down for repairs" spock
#
```

3. List the print queue to see how many print requests are to be moved. This step is needed to identify print request IDs if you are going to move selected print requests.

```
# lpstat -o
spock-10      lister    241666      Jun 8 11:42
spock-11      lister     45133      Jun 8 11:42
spock-12      lister     50574      Jun 8 11:43
#
```

4. Verify that the destination printer is accepting print requests.

```
# lpstat -p spock
printer spock is idle. enabled since Wed Jun 8 09:31:26 PDT 1993.
available.
#
```

5. Move specific or all print requests.

```
# lpmove spock sparky
#
```

or

```
# lpmove spock-11 spock-12 sparky
#
```

Moving Requests

6. Use the `accept` command once the unavailable printer is available again.

```
# accept spock
destination "spock" now accepting requests
#
```

Managing the Queue

The print service also allows a job to be placed on hold, in order, perhaps, to give way to a more urgent one. The suspended job can be resumed at any time.

The `lp` command used with these options performs all these tasks, followed by one of the following keywords:

`lp -i` *print-request* `-H` *keyword*

`hold` Hold the specified job.

`resume` Resume a job previously held.

`immediate`
Move the specified job to the top of the queue.

Users can hold and resume their own print requests. Only the superuser can use the `immediate` keyword for *jumping the queue.*

1. Place requests on hold.

```
$ lp -i spock-18 -H hold
$ lp -i spock-19 -H hold
$ lpstat -o spock
spock-18   rimmer   72008  Jun 8 14:57    being held
spock-19   rimmer   88494  Jun 8 14:58    being held
$
```

2. Resume a previously held request.

```
$ lp -i spock-19 -H resume
```

3. Become superuser.

4. Place a request at the top of the queue.

```
# lp -i spock-18 -H immediate
```

Setting Printing Priorities

The Solaris 2.*x* environment allows users to submit print requests at higher or lower priorities. Priorities range from 0 (high) to 39 (low). The default priority for all users is 20.

Examples:

1. Place an important job at a high priority.

```
$ lp -d sparky -q 0 fastfile
request id is sparky-86 (1 file(s))
$ lpstat -o
sparky-86    rimmer    19379     Jun 8 11:45
spock-84     root      45133     Jun 8 11:45
spock-85     root      13306     Jun 8 11:45
$
```

2. Place an unimportant job at a low priority.

```
$ lp -d sparky -q 30 bigfile
request id is sparky-87 (1 file(s))
$
```

Starting and Stopping the Print Service

The print service scheduler is automatically started by the `/etc/init.d/lp` script when the system enters run level 2. However, if the scheduler is not running, it can be started from the command line by entering the following command:

```
# /etc/init.d/lp start
Print services started.
#
```

It is advisable to first check that no scheduler is currently running by using the `lpstat` command with the `-r` option.

```
# lpstat -r
scheduler is running
#
```

To stop the print service, use `stop` as an argument to the `/etc/init.d/lp` script.

```
# /bin/sh /etc/init.d/lp stop
Print services stopped.
#
```

Summary

In this lesson, you learned that:

- Printers can be grouped into a class, which can then be used as a destination for print requests.
- Default printer destinations can be set using the `lpadmin` command and shell environment variables.
- Queued print requests may be moved to another printer, using the `lpmove` command.
- Queued print requests can be held, resumed, or printed immediately, using the `lp` command with the `-H` option.
- Users can set high and low printing priorities using the `lp` command with the `-q` option.
- The print scheduler can be restarted, if necessary, using the `/etc/init.d/lp` script.

Exercise 3-1

Write down the commands used to perform the specified tasks.

1. Identify the steps used to create a printer class called `lab`.

   _____

   _____

   _____

   _____

2. Identify the command format for moving specific print requests to another printer.

   _____

3. Identify the command to define a system-wide default printer.

   _____

4. Name the user environmental variable used to define a default printer.

   _____

Answer Key

Lesson 1: The Print Service

Exercise 1-1

1.

   a. Queuing--The process of lining up jobs.

   b. Tracking--The print service tracks the status of every job to allow users to remove jobs and system administrators to manage jobs.

   c. Fault Notification--When problems occur in the print service, error messages are displayed on the system console or mailed to the system administrator.

   d. Initialization--The print service initializes a printer before sending it a print job to ensure it is in a known state.

   e. Filtering--Certain complex print jobs, such as CAD documents, are converted into descriptions the printer can understand.

2. Printer filters are programs used by the print service to convert the content of a request to the content accepted by the destination printer.

3.

   a. Solaris 2.*x* print clients served by Solaris 2.*x* print servers

   b. Solaris 2.*x* and SunOS 4.1.*x* print clients served by a Solaris 2.*x* print server

   c. Solaris 2.*x* and SunOS 4.1.*x* print clients served by a SunOS 4.1.*x* print server

4. The `lpNet` process connects to the `listen` port monitor on the server, which connects the incoming `lpNet` request to a local `lpNet` process. Once the request has been queued by the local `lpNet` process, it is sent to the printer by the `lpsched` daemon.

Lesson 2: The Printer Manager

Exercise 2-1

1. Connect the printer accordingly and turn it on.
2. Follow the steps as describe in the "Adding a Local Printer" section of this module.
3. Follow the steps as described in the "Adding Access to a Remote Printer" section of this module.
4. Look at the Printer Manager window to verify that the printer has been added.
5. Use the `lp` command to send a file to the printer.

Lesson 3: Using LP Commands

Exercise 3-1

1.

   a. Add printers to the class by using the command:

      # **lpadmin -p** *printer_name* **-c** *class_name*

   b. Issue the accept command to allow the printer class to accept print requests:

      # **accept** *class_name*

   c. Check the status of the class by entering the command:

      # **lpstat -t**

2. `lpmove` *printername–ID other_printername*

3. `lpadmin -d` *printername*

4. `LPDEST`

Configuring Printers Manually

The following section provides steps for configurating printers manually, and LP command reference tables.

Configuring a Local Printer

1. Become superuser. Ensure the `/usr/lib` directory is in your command search path.

```
# PATH=$PATH:/usr/lib
```

2. Change ownership and set permissions on the printer's serial port.

```
# chown lp /dev/term/a
# chmod 600 /dev/term/a
```

3. Use the `lpadmin` command to add the printer and associate it with a printer port.

```
# lpadmin -p dotty -v /dev/term/a
```

`-p` Indicates the printer name.
`-v` Indicates the device used by the printer.

This command also registers the printer name with the print service. From now on, use this name is to identify this printer.

4. Associate the printer with a content type.

```
# lpadmin -p dotty -I simple
```

`-I` Indicates the content type.

If the content type is not specified, the system uses the `simple` type, which means the printer can only handle ASCII contents.

5. Set the line parameters appropriate for the printer.

```
# lpadmin -p dotty -o "stty='1200 evenp'"
```

6. Associate the printer with a printer type, if necessary. This enables the interface program to perform a better initialization of the printer before downloading every request.

```
# lpadmin -p dotty -T proprinter
```

7. Allow the printer to accept requests and enable the printer.

```
# accept dotty
# enable dotty
```

Configuring a Local PostScript Printer

This configuration procedure is very similar to the one for dot-matrix printers, with two exceptions. One is the content and printer types are specified as `PS`. The other is the installation of PostScript filters.

The `lpfilters` command installs filters on the system by updating the filter table with the filter name and description file.

1. Become superuser. Ensure the `/usr/lib` directory is in your command search path.

2. Change ownership and set permissions on the printer's serial port.

```
# chown lp /dev/term/a
# chmod 600 /dev/term/a
```

3. Add the printer and associate it with a printer port.

```
# lpadmin -p lasey -v /dev/term/a
```

4. Associate the printer with a content and printer types.

```
# lpadmin -p lasey -I PS
# lpadmin -p lasey -T PS
```

5. Use the `lpfilter` command to register the PostScript filters.

```
# cd /etc/lp/fd
# lpfilter -f download -F download.fd
# lpfilter -f dpost -F dpost.fd
# lpfilter -f postdaisy -F postdaisy.fd
# lpfilter -f postdmd -F postdmd.fd
# lpfilter -f postio -F postio.fd
# lpfilter -f postior -F postior.fd
# lpfilter -f postmd -F postmd.fd
# lpfilter -f postplot -F postplot.fd
# lpfilter -f postprint -F postprint.fd
# lpfilter -f postreverse -F postreverse.fd
# lpfilter -f posttek -F posttek.fd
```

6. Allow the printer to accept requests and enable the printer.

```
# accept lasey
# enable lasey
```

Removing a Local Printer

1. Suspend the queuing of further requests with the `reject` command.

   ```
   # reject -r "printer dotty is down" dotty
   ```

   Options:

   `r` Indicates a reason message. This message is displayed when users issue the `lpstat` command.

   `dotty` The name of the printer to suspend queuing.

2. Use the `disable` command to disable the printer or to stop printing.

   ```
   # disable -W -r "printer dotty is down" dotty
   ```

   Options:

   `-W` Wait until the request currently printing is finished before disabling the printer. This option is ignored for remote printers.

   `-c` Cancel the currently printing request (not used in the example). This request is restarted when the printer is enabled again. The request is ignored when applied to remote printers.

   `-r` Indicates a reason message to be shown when status is displayed by `lpstat` command.

   `dotty` The name of the printer to be disabled.

3. The `lpadmin -x` command removes the printer from the print service.

   ```
   # lpadmin -x dotty
   ```

Configuring a 2.*x* Print Server

For SunOS 4.1.*x*/BSD Clients

1. Use the `lpsystem` command to register all print clients with the print service.

   ```
   # lpsystem -t bsd bear
   ```

   Options:

   `-t` Indicates the remote system type—`s5` or `bsd`.

   `bear` The remote system name.

2. Identify the `listen` port monitor version number.

   ```
   # nlsadmin -V
   4
   ```

3. Use the `sacadm` command to create an instance of the `listen` port monitor.

   ```
   # sacadm -a -p tcp -t listen \
   -c "/usr/lib/saf/listen tcp" -v 4
   ```

4. Use the `lpsystem -A` command to obtain the printer server's universal address in hexadecimal format.

   ```
   # lpsystem -A
   00020203819d52180000000000000000
   ```

   (See the Universal Address explanation on the following page.)

5. Use the `pmadm` command to configure the `listenBSD` service, which listens for print requests coming from SunOS 4.1.*x*/BSD clients.

   ```
   # pmadm -a -p tcp -s lpd -i root -v 4 \
   -m `nlsadmin -o /var/spool/lp/fifos/listenBSD \
   -A "\x00020203819d52180000000000000000"`
   ```

   The universal address of the print server is required when configuring this service.

Configuring a 2.*x* Print Server

For Solaris 2.*x*/System V Clients

The process of configuring a print server for Solaris/System V clients is very similar to the one for SunOS 4.1.*x*/BSD clients.

The main differences are the way in which the client systems are registered with the print service and the type of services provided by the `listen` port monitor.

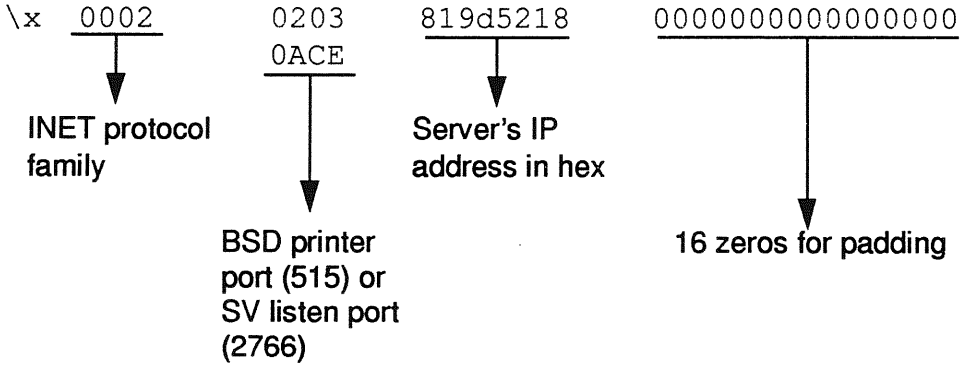
The `listen` port monitor provides two services:

`listenS5` Handles Solaris 2.*x*/System V print requests.

`service 0` Handles network requests between Solaris 2.*x* systems. When a print request is detected, it hands control over to the `listenS5` service.

Universal Address

The Universal Address represents a protocol-independent code that includes the print server's IP address and the printer port numbers:



SunOS 4.1.*x* print requests are connected to a SunOS 5.1 print server via a TCP/IP connection on port number `515`. SunOS 5.1 print requests are connected to a SunOS 5.1 print server through port number `2766`.

Configuring a 2.*x* Print Server

Universal Address (continued)

The addresses returned from the `lpsystem -A` command are used with the `pmadm` command to identify the print server's IP address plus port numbers `515` and `2766`. These addresses are used by the `listen` port monitor to route both print request types to the print service.

Configuring a 2.*x* Print Server

For Solaris 2.*x*/System V Clients

1. Use the `lpsystem` command to register the `s5` clients with the print service.

```
# lpsystem -t s5 eagle
```

2. Use the `sacadm` command to configure the network `listen` port monitor, if necessary. (This step might have been done in the previous procedure).

```
# sacadm -a -p tcp -t listen \
-c "/usr/lib/saf/listen tcp" -v 4
```

3. Use the `pmadm` command to add a service that identifies the STREAM used by the `lp` print service to receive print request connections.

```
# pmadm -a -p tcp -s lp -i root -v 4 \
-m `nlsadmin -o /var/spool/lp/fifos/listenS5`
```

4. Use the `pmadm` command to add a service `0`, which is the `nlps` server, using the listening address for System V print requests.

```
# pmadm -a -p tcp -s 0 -i root -v 4 \
-m "`nlsadmin -c /usr/lib/saf/nlps_server \
-A '\x00020ACE819d52180000000000000000'`"
```

Note that the universal address used in this case is slightly different than the one specified for the listener of SunOS 4.1.*x* clients. The port number changed from `0203` to `0ACE`, which represents the decimal port number `2766`, the System V listener port.

Configuring a 2.*x* Print Client

Of a SunOS 4.1.*x*/BSD Server

When Solaris 2.*x* print clients send files to a remote SunOS 4.1.*x* PostScript printer, they do not have to specify a PostScript content or printer type; nor do they have to register any filters.

Issue the following commands on the print client:

1. Use the `lpsystem` command to register the printer server name with the print service.

   ```
   # lpsystem -t bsd earth
   ```

2. Use the `lpadmin` command to add the printer to the system and create a local name for the printer.

   ```
   # lpadmin -p sparc -s earth
   ```

   `-p` Indicates local printer name.
   `-s system`
   Indicates remote system.

3. Specify the printer's content and type.

   ```
   # lpadmin -p sparc -T unknown -I any
   ```

4. Allow the queuing of requests, and enable the printer.

   ```
   # accept sparc
   # enable sparc
   ```

Configuring a 2.*x* Print Client

Of a Solaris 2.*x*/System V Server

Note that the process of configuring print clients of a Solaris 2.*x*/System V server is very similar to the one shown for SunOS 4.1.*x*/BSD servers. The only difference is the value of the `-t` option supplied to the `lpsystem` command.

Issue the following commands on the print client:

1. Register the print server with the print service.

```
# lpsystem -t s5 pluto
```

2. Create a local name for the remote printer.

```
# lpadmin -p spock -s pluto
```

3. Set the print type and contents.

```
# lpadmin -p spock -T PS -I PS
```

4. Register bundled PostScript filters using the `lpfilter` command. (See this procedure under Configuring a Local PostScript Printer.)

5. Allow the printer to accept requests, and enable the printer.

```
# accept spock
# enable spock
```

User Commands

The user commands of the Solaris 2.*x* print service are listed below. They are located in the `/usr/bin` directory.

Command Name	Description
`lp`	Send file to a printer
`lpstat`	Display print service status
`cancel`	Cancel a print request

Administration Commands

All LP administration commands are in the `/usr/lib` directory.

Command Name	Description
`accept(1M)`	Enable queuing of print requests
`reject(1M)`	Prevent queuing of further print requests
`lpadmin(1M)`	Configure and administer print service
`lpsystem(1M)`	Register remote systems with print service
`lpmove(1M)`	Move requests between destinations
`lpusers(1M)`	Change user print priority settings
`lpfilter(1M)`	Register filter definitions with print service

Configuration Files

The print service's configuration files are in the `/etc/lp` directory. The `/var/spool/lp` directory is the spooling directory.

File Name	Type	Description
`/etc/lp/Systems`	file	List of remote hosts registered with print service
`/etc/lp/default`	file	Contains name of system-wide default destination
`/usr/lib/lp/postscript`	directory	Contains filter description files
`/etc/lp/filter.table`	file	Printer filter lookup table
`/etc/lp/logs`	symlink	Symbolic link to `/var/lp/logs`
`/etc/lp/printers`	directory	Contains one sub-directory for each configured printer
`/etc/lp/printers/`*pname*`/configuration`	file	Configuration file for printer *pname*
`/var/lp/logs`	directory	Print service log files
`/var/spool/lp/SCHEDLOCK`	file	The `lpsched` lock file prevents more than one instance of the `lpsched` process
`/var/spool/lp/system/pstatus`	file	Contains the current status of print system
`/var/spool/lp/tmp`	directory	The spooling directory