Red Hat Enterprise Linux 9

Configuring and using a CUPS printing server

Configure your system to operate as a CUPS server and manage printers, print queues and your printing environment
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Abstract

Install, configure, and manage your CUPS printing server. Add printers or modify existing ones, manage print queues, and integrate CUPS with the RHEL environment. Manage printing in the CUPS web UI from any device with a web browser and a network access. Configure driverless printing to use printers or remote CUPS queues without any special software. Install certificates on your printers for added security. Connect to a Windows print server by using Samba. Monitor your CUPS printing server with CUPS logs to get information for troubleshooting issues, track and audit print job activity, or surveil the performance of printers.
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CHAPTER 1. CONFIGURING PRINTING

Printing on Red Hat Enterprise Linux 8 is based on the Common Unix Printing System (CUPS).

This documentation describes how to configure your system to be able to operate as a CUPS server.

1. ACTIVATING THE CUPS SERVICE

This section describes how to activate the **cups** service on your system.

Prerequisites

- The **cups** package, which is available in the Appstream repository, must be installed on your system:

  ```
  # dnf install cups
  ```

Procedure

1. Start the **cups** service:

  ```
  # systemctl start cups
  ```

2. Configure the **cups** service to be automatically started at boot time:

  ```
  # systemctl enable cups
  ```

3. Optionally, check the status of the **cups** service:

  ```
  systemctl status cups
  ```

1.2. PRINT SETTINGS TOOLS

To achieve various tasks related to printing, you can choose one of the following tools:

- CUPS web user interface (UI)
- GNOME Control center

**WARNING**

The **Print Settings** configuration tool, which was used in Red Hat Enterprise Linux 7, is no longer available.

Tasks that you can achieve by using tools mentioned above include:

- Adding and configuring a new printer
Note that this documentation covers only printing in CUPS web user interface (UI). If you want to print using GNOME Control center, you need to have a GUI available. For more information about printing using GNOME Control center, see Handling printing using GNOME.

1.3. ACCESSING AND CONFIGURING THE CUPS WEB UI

This section describes accessing the CUPS web user interface (web UI) and configuring it to be able to manage printing through this interface.

Procedure

1. Allow the CUPS server to listen to connections from the network by setting Port 631 in the /etc/cups/cupsd.conf file:

```plaintext
#Listen localhost:631
Port 631
```

**WARNING**

Enabling the CUPS server to listen on port 631 opens this port for any address accessible by the server. Therefore, use this setting only in local networks that are unreachable from an external network. Red Hat doesn’t recommend configuring CUPS server on a publicly accessible server.

2. Allow your system to access the CUPS server by including the following directive in the /etc/cups/cupsd.conf file:

```plaintext
<Location />
  Allow from <client_ip_address>
  Order allow,deny
</Location>
```

where `<client_ip_address>` is the IP address of the system you want to connect to CUPS Web UI. CUPS supports several types of values for the **Allow from** directive, such as subnets. For more information, see the `cupsd.conf(5)` man page.
WARNING

The CUPS configuration offers the Allow from all directive in the <Location> tags, but Red Hat recommends using this directive only in trusted networks. The setup Allow from all enables access for all users who can connect to the server through port 631. If you set the Port directive to 631, and the server is accessible from an outside network, anyone on the Internet can access the CUPS service on your system.

3. Enable incoming traffic for the Internet Printing Protocol (IPP) service:

   # firewall-cmd --zone=public --add-service=ipp --permanent
   # firewall-cmd --reload

4. Restart the cups.service:

   # systemctl restart cups

5. Open your browser, and go to http://<IP_address_of_the_CUPS_server>:631/.

   All menus except for the Administration menu are now available.

   If you click on the Administration menu, you receive the Forbidden message:

   To acquire the access to the Administration menu, follow the instructions in Acquiring administration access to the CUPS web UI.

1.4. ACQUIRING ADMINISTRATION ACCESS TO THE CUPS WEB UI

This section describes how to acquire administration access to the CUPS web UI.
Procedure

1. To be able to access the Administration menu in the CUPS web UI, include the following lines in the /etc/cups/cupsd.conf file:

   ```
   <Location /admin>
   Allow from <your_ip_address>
   Order allow,deny
   </Location>
   
   NOTE
   Replace <your_ip_address> with the real IP address of your system.
   ```

2. To be able to access configuration files in the CUPS web UI, include the following in the /etc/cups/cupsd.conf file:

   ```
   <Location /admin/conf>
   AuthType Default
   Require user @SYSTEM
   Allow from <your_ip_address>
   Order allow,deny
   </Location>
   
   NOTE
   Replace <your_ip_address> with the real IP address of your system.
   ```

3. To be able to access log files in the CUPS web UI, include the following in the /etc/cups/cupsd.conf file:

   ```
   <Location /admin/log>
   AuthType Default
   Require user @SYSTEM
   Allow from <your_ip_address>
   Order allow,deny
   </Location>
   
   NOTE
   Replace <your_ip_address> with the real IP address of your system.
   ```

4. To specify the use of encryption for authenticated requests in the CUPS web UI, include DefaultEncryption in the /etc/cups/cupsd.conf file:

   ```
   DefaultEncryption IfRequested
   ```

   With this setting, you will receive an authentication window to enter the username of a user allowed to add printers when you attempt to access the Administration menu. However, there are also other options on how to set DefaultEncryption. For more details, see the cupsd.conf man page.
5. Restart the **cups** service:

```
# systemctl restart cups
```

**WARNING**

If you do not restart the **cups** service, the changes in `/etc/cups/cupsd.conf` will not be applied. Consequently, you will not be able to obtain administration access to the CUPS web UI.

---

**Additional resources**

- The `cupsd.conf` man page

---

### 1.5. CONFIGURING DRIVERLESS PRINTING

As an administrator, you can configure driverless printing to use printers or remote CUPS queues without any special software.

RHEL 9 provides driverless printing support for following driverless standards:

- **IPP Everywhere model** in CUPS supports AirPrint, IPP Everywhere and Wi-Fi Direct standards.
- **Driverless model** in cups-filters supports the same standards as CUPS and in addition also PCLm document format.

These standards use the Internet Printing Protocol (IPP) 2.0 or higher to communicate the printer setup, and eliminate the need to install specific drivers for specific printers. To use the printer without a specific driver, you need to have a printer, which supports one of the driverless standards. To determine if your printer supports a driverless standard, choose one of the following options:

- Refer to the printer specification, and search for a **driverless standard support** or ask your vendor.
- Search for **certified printers**.
- Determine the driverless support based on the attributes of a printer with the `ipptool` command.

To install a print queue on the client with IPP Everywhere model, which points to a queue on the print server, you need to have both your remote print server and your client with RHEL 8.6 installation or newer.

**NOTE**

You can verify the driverless support based on the attributes of a print server with the `ipptool` command.

### 1.5.1. Determining printer attributes using ipptool
To determine if your printer or print server supports a driverless standard, you can inspect your printer attributes using the `ipptool` command available in the `ipptool` package.

**Procedure**

- Display attributes of a printer or a print server:

  ```bash
  $ ipptool -tv <URI> get-printer-attributes.test
  
  NOTE
  Replace <URI> with the URI of your printer, for example `ipp://<hostname_or_IP_address>:631/ipp/print` for printers or `ipp://<hostname_or_IP_address>:631/printers/<remote_print_queue>` for remote print queues from print servers.
  
Your printer or print server supports driverless printing if:

- the `ipp-version-supported` attribute contains **2.0** or higher for IPP protocol 2.0, and
- the `document-format-supported` attribute contains one of the supported document formats listed in the driverless printing standards.

### 1.5.2. Adding a driverless printer in CUPS web UI

Since RHEL 8.6, you can add a driverless printer in the CUPS web UI and use it to print directly from an application to network printers or print servers using CUPS, without installing any specific drivers or software for specific printers.

**Prerequisites**

- You have administration access to the **CUPS web UI** as described in Acquiring administration access to CUPS web UI.
- Your printer or print server has the IPP Everywhere standard implementation.
- Open IPP port: port **631** for IPP, or port **443** for secure printing with IPPS.
- Enable the `ipp` and `ipp-client` communication in the firewall of the print server.
- If your destination is another CUPS server, allow remote access on the remote server, or if you are using a network printer, open the web user interface, search for IPP related settings: IPP or AirPrint, and enable those settings.

**Procedure**

1. Start the **CUPS web UI** as described in Accessing and configuring the CUPS.
2. In your browser, go to `localhost:631` and select the **Administration** tab.
3. Under **Printers** click **Add printer**.
4. Authenticate with your username and password:

5. In the Administrator tab, under Add Printer, select one of the options:
   - Internet Printing Protocol (ipp) or
   - Internet Printing Protocol (ipps) option, and click Continue.
6. In the **Connection** field, enter the URI of your device and click **Continue**.

```
Add Printer

Connection: ipp://<hostname_or_IP>:631/ipp/print

Examples:

http://hostname:631/ipp/
http://hostname:631/ipp/port1

ipp://hostname/ipp/
ipp://hostname/ipp/port1

lpd://hostname/queue

socket://hostname
socket://hostname:9100

See "Network Printers" for the correct URI to use with your printer.
```

**Add Printer**
NOTE

The URI consists of the following parts:

- protocol ipp:// or ipps:// if printer or print server supports encryption,
- hostname or IP address of the printer,
- port,
- resource part /ipp/print for printers, or /printers/<remote_queue_name> for remote CUPS queues.

7. Add details about the new printer: name, description and location. To set a printer to be shared over the network, check the **Share This Printer** checkbox.

<table>
<thead>
<tr>
<th>CUPS.org</th>
<th>Home</th>
<th>Administration</th>
<th>Classes</th>
<th>Help</th>
<th>Jobs</th>
<th>Printers</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Add Printer</th>
</tr>
</thead>
</table>

**Add Printer**

- **Name:** hp_laserjet
  (May contain any printable characters except "/", ",", and space)
- **Description:** HP LaserJet color
  (Human-readable description such as "HP LaserJet with Duplexer")
- **Location:** Lab 1
  (Human-readable location such as "Lab 1")
- **Connection:** ipp://<hostname_or_IP>:631/ipp/print
- **Sharing:** ✔ Share This Printer
  [Continue]

### NOTE

'Name' is the only required field, other fields are optional.

8. From the **Make** dropdown menu, select the printer manufacturer, and click **Continue**.
To proceed with the installation of a driverless printer, from the dropdown menu, select IPP Everywhere, and click Add Printer.
After adding the new printer, you can set the default print options of your choice.

The last window confirms that you set the driverless printer and it is ready to use.
1.5.3. Configuring permanent print queues using cups-browsed

As an administrator, you can use the `cups-browsed` service from the `cups-filters` package to browse queues on remote print server. The `cups-browsed` service creates local queues pointing to these remote queues. A print queue is an abstraction for a printer that represents a connection to the physical device.

1.5.3.1. Configuring permanent print queues for printers installed on remote print servers in a different network

To locally install CUPS queues from a remote server, edit the configuration for the `cups-browsed` service on the machine where you want the permanent queues pointing to the remote CUPS server.

**Prerequisites**

- Printers in a different network must be installed on a remote server.
- The IPP port in the firewall of the server is enabled.
- The server is configured for remote access from a machine where `cups-browsed` runs, and asks the server for queues.

**Procedure**

1. Edit the `/etc/cups/cups-browsed.conf` file and add a hostname or an IP address of the designated server to the `BrowsePoll` directive:

   ```
   BrowsePoll <hostname or IP-address>
   ```

2. Restart the `cups-browsed` service to apply the changes:
# systemctl restart cups-browsed

**Verification steps**

- Display the list of local printers that contains your local print queues:

```
$ lpstat -v
Device for <remote_queue_name>: implicitclass:<remote_queue_name>
```

**NOTE**

Your printer can take several minutes to appear on the local printers list, depending on how many queues the remote server contains. If the printer does not appear, modify the configuration in the `cups-browsed.conf` file. For example, set the value of the `BrowseTimeout` directive to a higher number. For more information, see the `cups-browsed.conf(5)` man page.

1.6. ADDING A PRINTER WITH A CLASSIC DRIVER IN THE CUPS WEB UI

This section describes how to add a new printer using the CUPS web user interface.

**Prerequisites**

- You have administration access to the CUPS web UI as described in Acquiring administration access to CUPS web UI.

**Procedure**

1. Start the CUPS web UI as described in Starting CUPS web UI.
2. In your browser, go to localhost:631 and select the Administration tab.
3. Under Printers click Add printer.

![Administration](image.png)

4. Authenticate by username and password:
IMPORTANT

To be able to add a new printer by using the CUPS web UI you must authenticate as a user who belongs to groups defined by the SystemGroup directive in /etc/cups/cups-files.

Default groups:
- root
- sys
- wheel

5. If a local printer is connected, or CUPS finds a network printer available, select the printer. If neither local printer nor network printer is available, select one of the printer types from Other Network Printers, for example APP Socket/HP Jet direct, enter the IP address of the printer, and then click Continue.

6. If you have selected for example APP Socket/HP Jet direct as shown above, enter the IP address of the printer, and then click Continue.
7. You can add more details about the new printer, such as the name, description and location. To set a printer to be shared over the network, check the **Share This Printer** checkbox.

8. Select the printer manufacturer, and then click **Continue**.
Alternatively, you can provide a postscript printer description (PPD) file to be used as a driver for the printer, by clicking the Browse... button at the bottom.

9. Select the model of the printer, and then click Add Printer.

![Add Printer interface](image)

10. After the printer has been added, the next window allows you to set the default print options.

![Set Printer Options interface](image)

After clicking Set Default Options, you will receive a confirmation that the new printer has been added successfully.

![Set Printer Options interface](image)

Verification steps

- Print a test page especially if you have set up a printer:
Go to Printers menu, and click Maintenance → Print Test Page.

1.7. CONFIGURING A PRINTER IN THE CUPS WEB UI

This section describes how to configure a new printer, and how to maintain a configuration of a printer using the CUPS web UI.

Prerequisites

- You have administration access to the CUPS web UI as described in Acquiring administration access to CUPS web UI.

Procedure

1. Click the Printers menu to see available printers that you can configure.

2. Choose one printer that you want to configure.
3. Perform your selected task by using one of the available menus:

- **Choose** **Maintenance** **from** **the** **first** **drop-down** **menu.**
  
  ![Maintenance Menu](image1)

- **Choose** **Administration** **from** **the** **second** **drop-down** **menu.**
  
  ![Administration Menu](image2)

- You can also check completed print jobs or all active print jobs by clicking the **Show Completed Jobs** or **Show All Jobs** buttons.

**Verification steps**

- Print a test page especially if you have changed a printer configuration:
  
  - Go to **Printers** menu, and click **Maintenance → Print Test Page.**
  
  ![Print Test Page](image3)
1.8. SETTING PRINT OPTIONS USING THE CUPS WEB UI

This section describes how to set common print options, such as the media size and type, print quality or the color mode, in the CUPS web UI.

Prerequisites

You have administration access to the CUPS web UI as described in Acquiring administration access to CUPS web UI.

Procedure

1. Go to Administration menu, and click Maintenance → Set Default Options.

2. Set the print options.

1.9. INSTALLING CERTIFICATES FOR A PRINT SERVER

To install certificates for a print server, you can choose one of the following options:

- Automatic installation using a self-signed certificate
- Manual installation using a certificate and a private key generated by a Certification Authority

Prerequisites
For the `cupsd` daemon on the server:

1. Set the following directive in the `/etc/cups/cupsd.conf` file to:
   
   ```
   Encryption Required
   ```

2. Restart the cups service:

   ```
   $ sudo systemctl restart cups
   ```

**Automatic installation using a self-signed certificate**

With this option, CUPS generates the certificate and the key automatically.

**NOTE**

The self-signed certificate does not provide as strong security as certificates generated by Identity Management (IdM), Active Directory (AD), or Red Hat Certificate System (RHCS) Certification Authorities, but it can be used for print servers located within a secure local network.

**Procedure**

1. To access the CUPS Web UI, open your browser and go to https://<server>:631 where `<server>` is either the server IP address or the server host name.

   **NOTE**

   When CUPS connects to a system for the first time, the browser shows a warning about the self-signed certificate being a potential security risk.

2. To confirm that it is safe to proceed, click the **Advanced...** button.

   **Warning: Potential Security Risk Ahead**

   Firefox detected a potential security threat and did not continue to localhost. If you visit this site, attackers could try to steal information like your passwords, emails, or credit card details.

   - Learn more...
   - Go Back (Recommended)
   - Advanced...
   - Report errors like this to help Mozilla identify and block malicious sites

3. Click **Accept the Risk and Continue** button.
CUPS now starts to use the self-generated certificate and the key.

**NOTE**

When you access the CUPS Web UI after an automatic installation, the browser displays a warning icon in the address bar. This is because you added the security exception by confirming the security risk warning. If you want to remove this warning icon permanently, perform the manual installation with a certificate and a private key generated by a Certification Authority.

### Manual installation using a certificate and a private key generated by a Certification Authority

For print servers located within a public network or to permanently remove the warning in the browser, import the certificate and the key manually.

**Prerequisites**

- You have certificate and private key files generated by IdM, AD, or by RHCS Certification Authorities.

**Procedure**

1. Copy the `.crt` and `.key` files into the `/etc/cups/ssl` directory of the system on which you want to use the CUPS Web UI.

2. Rename the copied files to `<hostname>.crt` and `<hostname>.key`.
   
   Replace `<hostname>` with the host name of the system to which you want to connect the CUPS Web UI.

3. Set the following permissions to the renamed files:

   - `chmod 644 /etc/cups/ssl/<hostname>.crt`
1. Install the samba-krb5-printing, samba-client, and krb5-workstation packages:

```bash
# dnf install samba-krb5-printing samba-client krb5-workstation
```

2. Optional: Authenticate as a domain administrator and display the list of printers that are shared on the Windows print server:

```bash
# smbclient -L win_print_srv.ad.example.com -U administrator@AD_KERBEROS_REALM --use-kerberos=required
```

<table>
<thead>
<tr>
<th>Sharename</th>
<th>Type</th>
<th>Comment</th>
</tr>
</thead>
</table>

NOTE: Red Hat only supports submitting print jobs to CUPS from your local system, and not to re-share a printer on a Samba print server.
3. Optional: Display the list of CUPS models to identify the PPD name of your printer:

```
lpinfo -m
```

```
samsung.ppd Samsung M267x 287x Series PXL
```

You require the name of the PPD file when you add the printer in the next step.

4. Add the printer to CUPS:

```
# lpadmin -p "example_printer" -v smb://win_print_srv.ad.example.com/Example -m samsung.ppd -o auth-info-required=negotiate -E
```

The command uses the following options:

- `-p printer_name` sets the name of the printer in CUPS.
- `-v URL_to_Windows_printer` sets the URI to the Windows printer. Use the following format: `smb://host_name/printer_share_name`.
- `-m PPD_file` sets the PPD file the printer uses.
- `-o auth-info-required=negotiate` configures CUPS to use Kerberos authentication when it forwards print jobs to the remote server.
- `-E` enables the printer and CUPS accepts jobs for the printer.

**Verification steps**

1. Log into the Red Hat Enterprise Linux host as an AD domain user.

2. Authenticate as an AD domain user:

```
# kinit domain_user_name@AD_KERBEROS_REALM
```

3. Print a file to the printer you added to the local CUPS print server:

```
# lp -d example_printer file
```

### 1.11. WORKING WITH CUPS LOGS

#### 1.11.1. Types of CUPS logs

CUPS provides three different kinds of logs:

- **Error log** - Stores error messages, warnings, and debugging messages.
- **Access log** - Stores messages about how many times CUPS clients and web UI have been accessed.
Page log - Stores messages about the total number of pages printed for each print job.

In Red Hat Enterprise Linux 9, all three types are logged centrally in `systemd-journald` together with logs from other programs.

1.11.2. Accessing all CUPS logs

You can list all CUPS logs available in `systemd-journald`.

**Procedure**

- Filter CUPS logs:
  
  $ journalctl -u cups

1.11.3. Accessing CUPS logs for a specific print job

If you need to find a CUPS log for a specific print job, you can do it by filtering the logs using the ID of a print job.

**Procedure**

- Filter logs for a specific print job:
  
  $ journalctl -u cups JID=N

  Where `N` is the ID of a print job.

1.11.4. Accessing CUPS logs by specific time frame

If you need to access CUPS logs during a certain time period, you can filter the logs in `systemd-journald`.

**Procedure**

- Filter logs within the specified time frame:
  
  $ journalctl -u cups --since=YYYY-MM-DD --until=YYYY-MM-DD

  Where `YYYY` is year, `MM` is month and `DD` is day.

**Additional resources**

- The `journalctl(1)` man page

1.11.5. Configuring the CUPS log location

In Red Hat Enterprise Linux 9, CUPS logs are by default logged into `systemd-journald` service. You can find the default configuration in the `/etc/cups/cups-files.conf` file:

- `ErrorLog syslog`
IMPORTANT

Red Hat recommends keeping the default location of CUPS logs.

Procedure

- To send the logs into a different location, change the `ErrorLog` entry in the `/etc/cups/cups-files.conf` to match your required location:

  ```
  ErrorLog <your_required_location>
  ```

WARNING

If you change the default location of CUPS log, you might experience SELinux issues.