Red Hat Enterprise Linux 8

Managing RHEL systems from your desktop

A guide to managing Red Hat Enterprise Linux 8 from your desktop

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Abstract

This documentation collection describes how to manage Red Hat Enterprise Linux 8 from the desktop. Basics of using GNOME Shell and displaying the graphics are given, as well as the instructions for system administrators on how to configure GNOME on a low level, or how to customize desktop environment for multiple users.

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- For submitting more complex feedback, create a Bugzilla ticket:

    1. Go to the Bugzilla website.

    2. As the Component, use **Documentation**.

    3. Fill in the **Description** field with your suggestion for improvement. Include a link to the relevant part(s) of documentation.

    4. Click **Submit Bug**.

CHAPTER 1. STARTING USING GNOME

1.1. WHAT GNOME 3 IS

Red Hat Enterprise Linux 8 is shipped with the default desktop environment GNOME 3.

GNOME 3 represents a presentation layer that provides a graphical user interface as well as the focused working environment, which enables you to access all your work from one place.

1.2. GNOME ENVIRONMENTS

GNOME 3 provides two essential environments:

- GNOME Standard
- GNOME Classic

Both environments can use two different protocols to build a graphical user interface:

- The **X11** protocol, which uses **X.Org** as the display server.
- The **Wayland** protocol, which uses **GNOME Shell** as the **Wayland** compositor and display server.
  This solution of display server is further referred as **GNOME Shell on Wayland**.

NOTE

Note that the graphics based on the **Wayland** protocol are not available for virtual machines that use the **qxl** driver.

You can find the current list of environments for which Wayland-based graphics are unavailable in the **/usr/lib/udev/rules.d/61-gdm.rules** file.

The default combination in Red Hat Enterprise Linux 8 is GNOME Standard environment using **GNOME Shell on Wayland** as the display server.

However, due to Section 2.2, "Current Wayland limitations" , you may want to switch the graphics protocol stack.

You may also want to swich from GNOME Standard to GNOME Classic.

For more information about graphics based on the **Wayland** protocol, see Section 2.1, "Key differences between the Wayland and X11 protocol".

For information on how to switch the environments, see Selecting GNOME environment.

1.2.1. GNOME Standard

GNOME Standard user interface includes these major components:

- **Top bar**
  The horizontal bar at the top of the screen provides access to some of the basic functions of GNOME Standard, such as the **Activities Overview**, clock and calendar, system status icons, and the **system menu**.

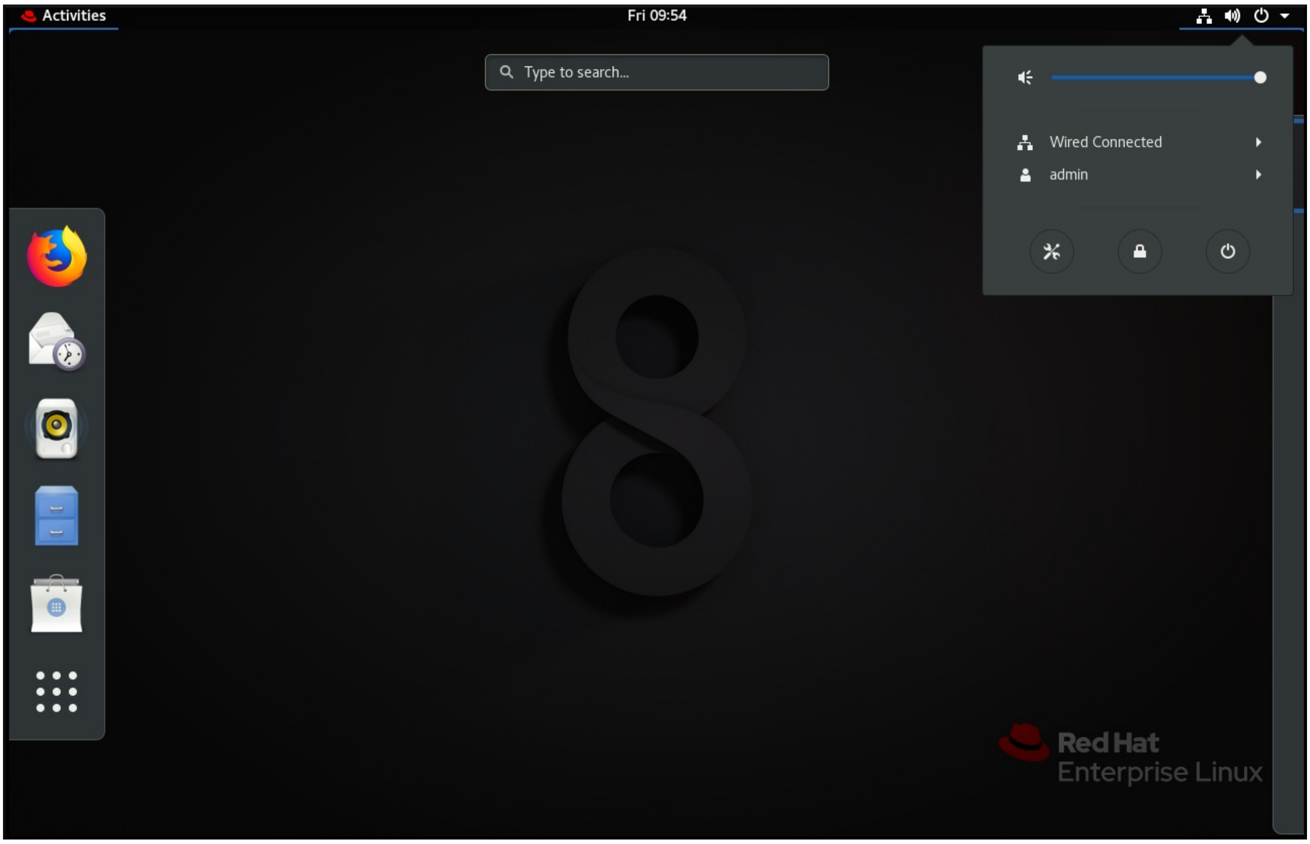
- **System menu**
  The **system menu** is located in the top right corner, and enables you:
  - Updating settings
  - Controlling the sound bar
  - Finding information about your Wi-Fi connection
  - Switching user
  - Logging out
  - Turning off the computer
- **Activities Overview**
  The **Activities Overview** features windows and applications views that let the user run applications and windows and switch between them.

  The **search entry** at the top allows for searching various items available on the desktop, including applications, documents, files, and configuration tools.

  The vertical bar on the left side contains a list of favorite and running applications. You can add or remove applications from the default list of favorites according to your needs.

  The workspace list displayed on the right side allows the user to switch between multiple workspaces, or move applications and windows from one workspace to another.
- **Message tray**
  The **message tray** provides access to pending notifications. The **message tray** shows when the user presses **Super+M**.

The GNOME 3 Standard Desktop



1.2.2. GNOME Classic

GNOME Classic represents a mode for users who prefer a more traditional desktop experience that is similar to GNOME 2 environment used with Red Hat Enterprise Linux 6. It is based on GNOME 3 technologies, and at the same time it includes multiple features similar to GNOME 2.

GNOME Classic user interface consists of these major components:

- **Applications and Places**
  The **Applications** menu is displayed at the top left of the screen. It gives the user access to applications organized into categories. The user can also open the **Activities Overview** from that menu.

  The **Places** menu is displayed next to the **Applications** menu on the top bar. It gives the user quick access to important folders, for example **Downloads** or **Pictures**.

- **Taskbar**
  The **taskbar** is displayed at the bottom of the screen, and features:
  - A window list
  - A notification icon displayed next to the window list
  - A short identifier for the current workspace and total number of available workspaces displayed next to the notification icon

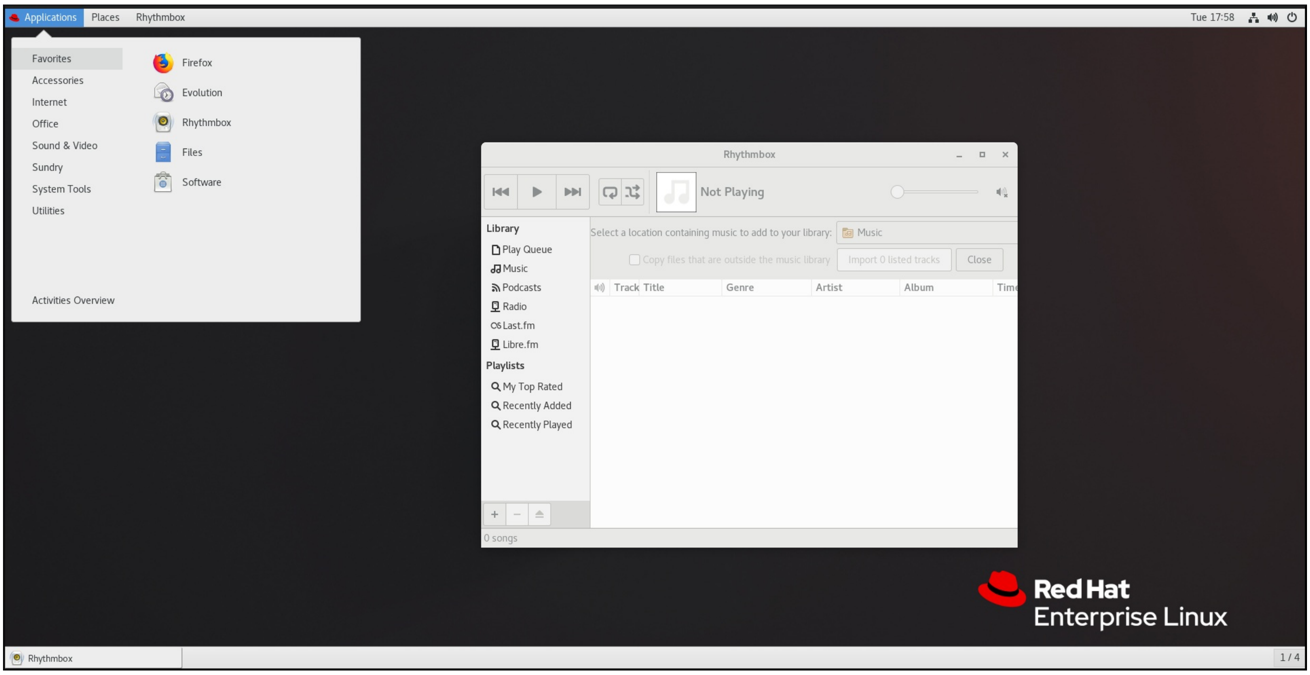
- Four available workspaces
  In GNOME Classic, the number of workspaces available to the user is by default set to 4.

- Minimize and maximize buttons
  Window titlebars in GNOME Classic feature the minimize and maximize buttons that let the user quickly minimize the windows to the window list, or maximize them to take up all of the space on the desktop.

- A traditional **Super+Tab** window switcher
  In GNOME Classic, windows in the **Super+Tab** window switcher are not grouped by application.

- **System menu**
  The **system menu** is located in the top right corner, and enables you:
  - Updating settings
  - Controlling the sound bar
  - Finding information about your Wi-Fi connection
  - Switching user
  - Logging out
  - Turning off the computer

The GNOME 3 Classic Desktop with the Rhythmbox application and the Favorites submenu of the Applications menu



1.3. SELECTING GNOME ENVIRONMENT AND DISPLAY PROTOCOL

The default desktop environment for Red Hat Enterprise Linux 8 is GNOME Standard with **GNOME Shell on Wayland** as the display server.

However, due to Section 2.2, “Current Wayland limitations” , you may want to switch the graphics protocol stack.

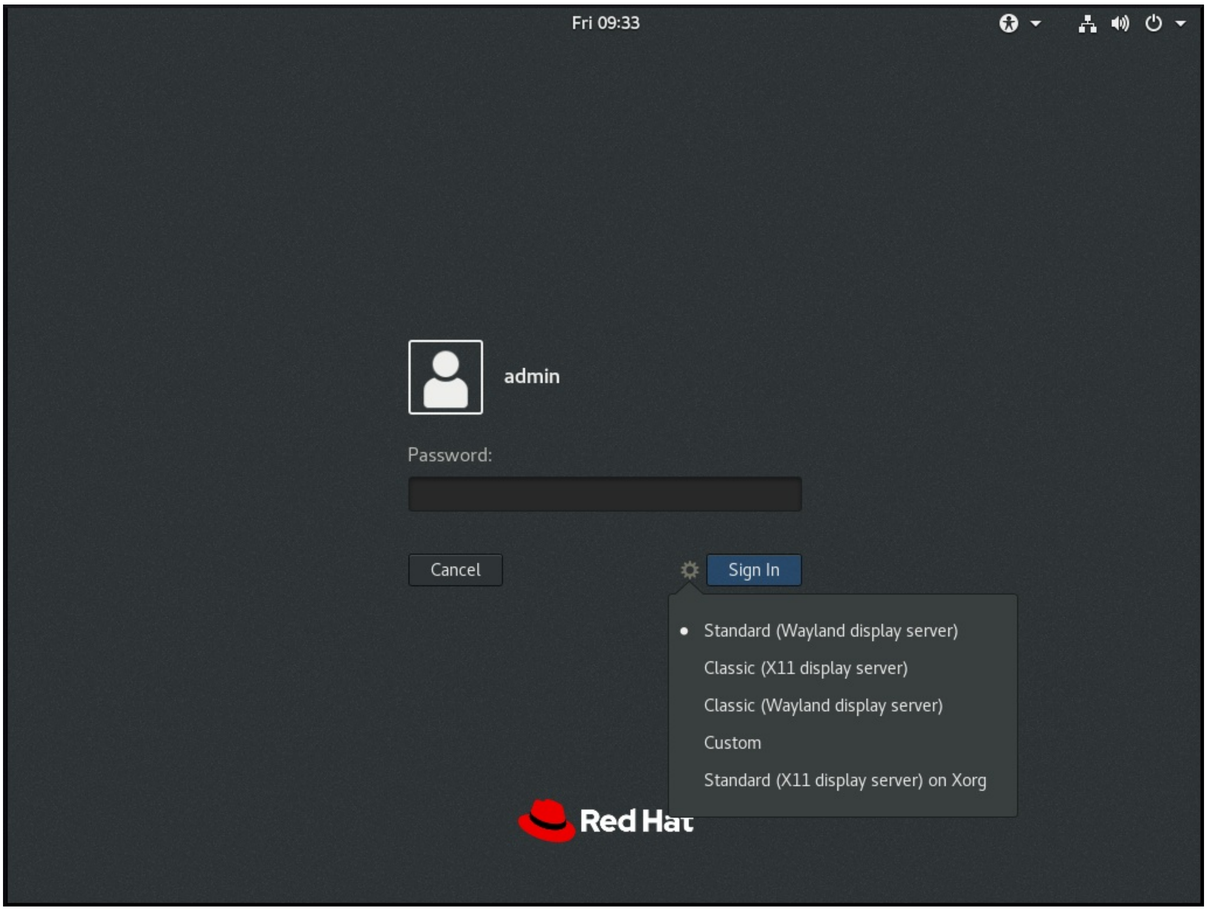
You may also want to swich from GNOME Standard to GNOME Classic. See Section 1.2, “GNOME environments” for differences between these two environments.

For switching between various combinations of GNOME environment and graphics protocol stacks, use the following procedure.

Procedure

1. From the login screen (GDM), click the cogwheel next to the **Sign In** button.

> **NOTE**
>
> You cannot access this option from the lock screen. The login screen appears when you first start Red Hat Enterprise Linux 8 or when you log out of your current session.


Fri 09:33
admin
Password:
Cancel
Sign In
● Standard (Wayland display server)
Classic (X11 display server)
Classic (Wayland display server)
Custom
Standard (X11 display server) on Xorg
Red Hat

2. From the drop-down menu that appears, select the option that you prefer.

NOTE

Note that in the menu that appears on the login screen, the **X.Org** display server is marked as **X11** display server.

IMPORTANT

The change of GNOME environment and graphics protocol stack resulting from the above procedure is persistent across user logouts, and also when powering off or rebooting the computer.

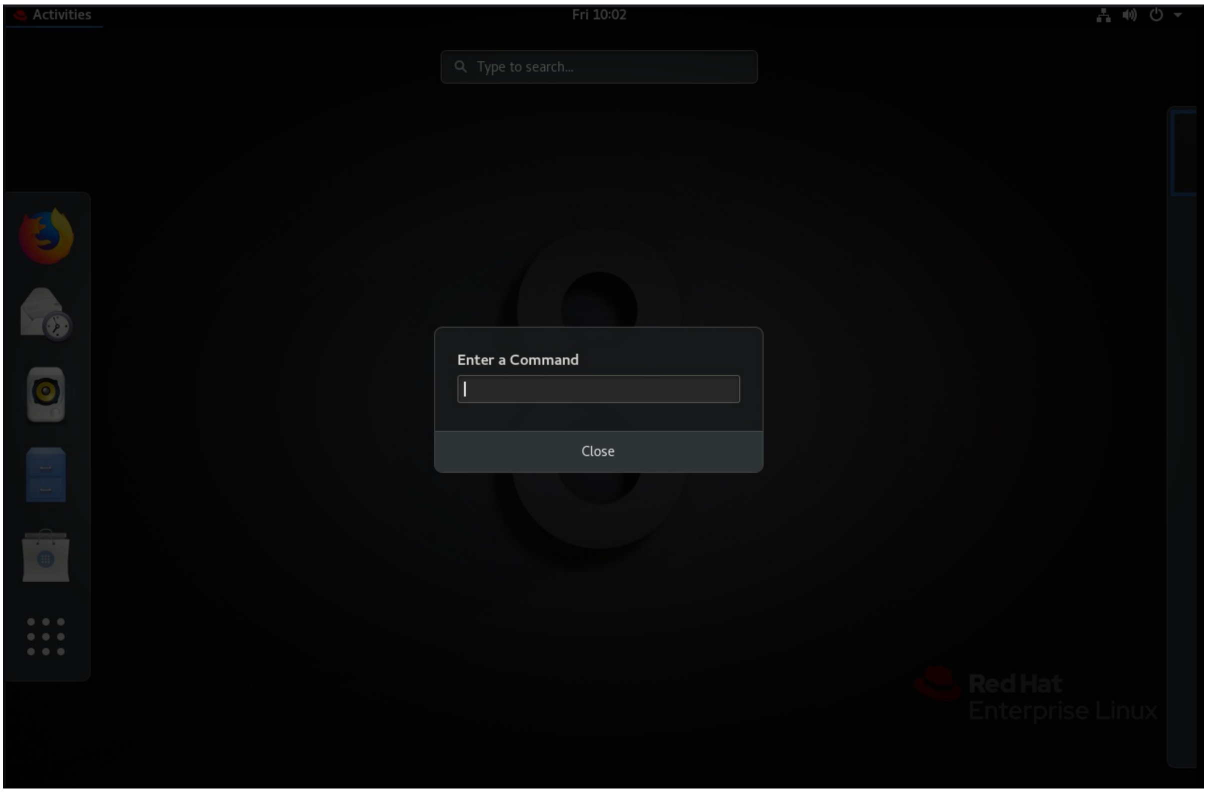
1.4. LAUNCHING APPLICATIONS

This section describes various approaches that you can use to launch available applications in GNOME 3.

Procedure

1. Press **Alt+F2** to make the **Enter a Command** screen appear.

2. Write the name of the executable into the **Enter a Command** screen:

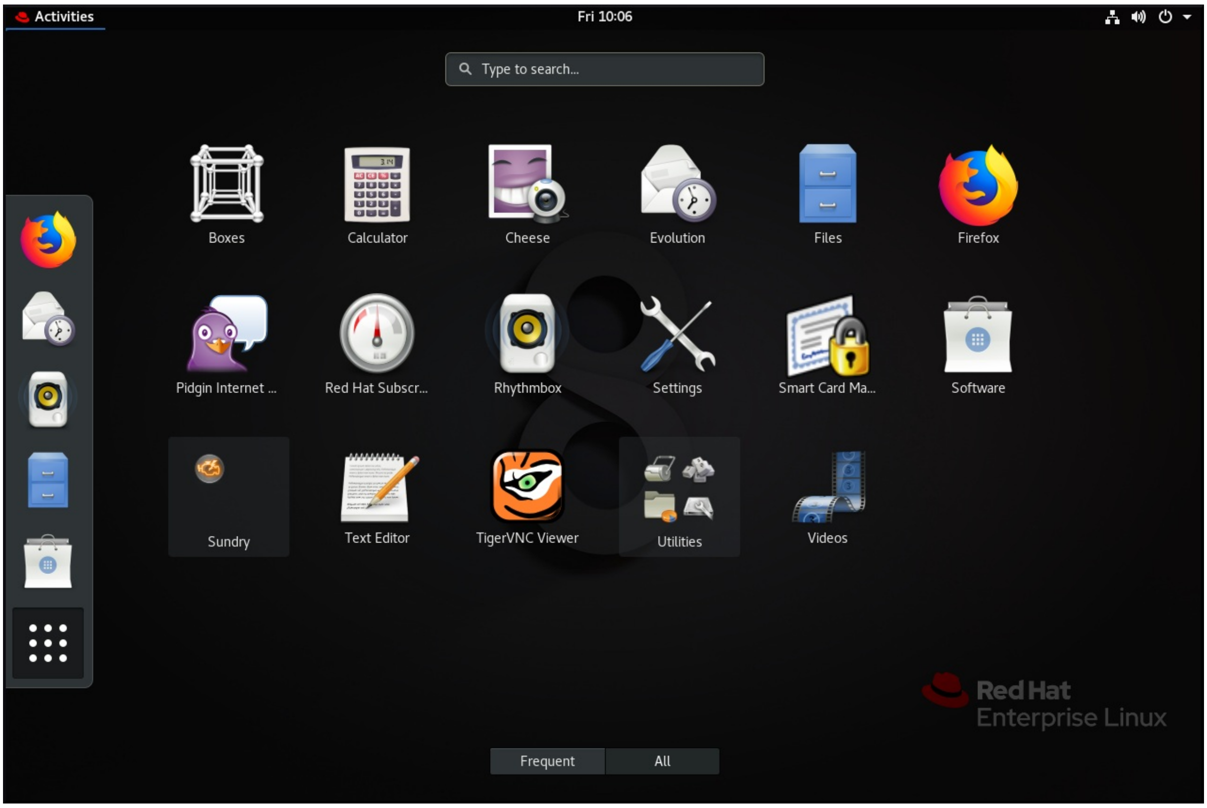


This approach works both in GNOME Standard and GNOME Classic environment.

Procedure

- In GNOME Standard, go to **Activities Overview** and click on the **Show Applications** icon in the vertical bar on the left side.
  Note that you can choose between displaying all or just the frequent applications by using the **Frequent**/**All** switch at the bottom of the screen.

  Alternatively, you can also start typing the name of the required application in the **search entry**.



Procedure

1. In GNOME Classic, go to **Applications** menu.
2. Choose the required application from one of the available categories.
   The available categories include:
   - Favorites
   - Accessories
   - Internet
   - Office
   - Sound & Video
   - Sundry
   - System Tools
   - Utilities

Procedure

1. Open a terminal.
2. Type the name of the required application on the command line.

This approach works both in GNOME Standard and GNOME Classic environment.

1.5. INSTALLING APPLICATIONS

This section describes various approaches that you can use to install a new application in GNOME 3.

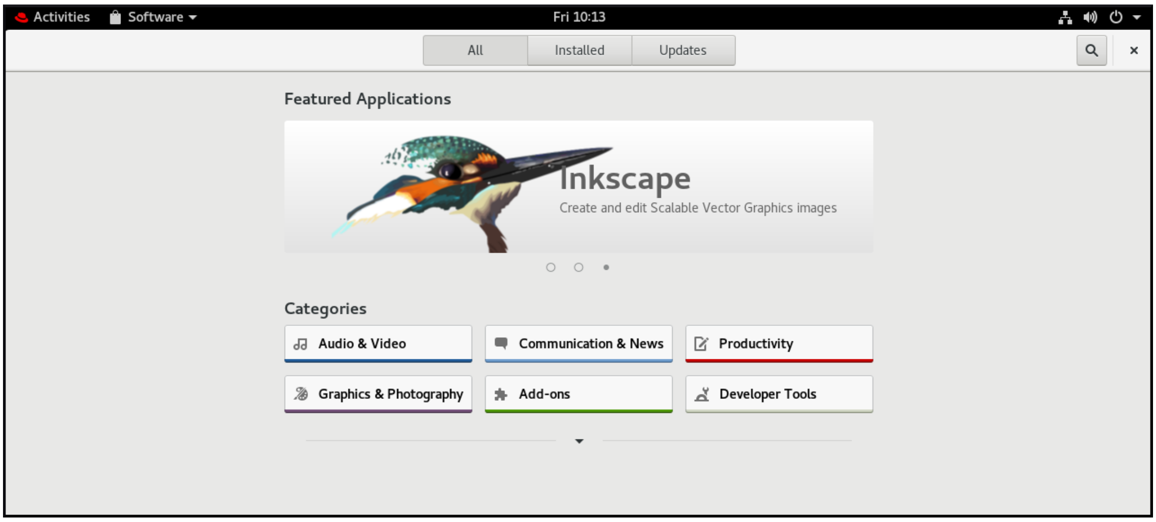
Procedure

1. Use one of the approaches described in Launching applications to launch GNOME Software.

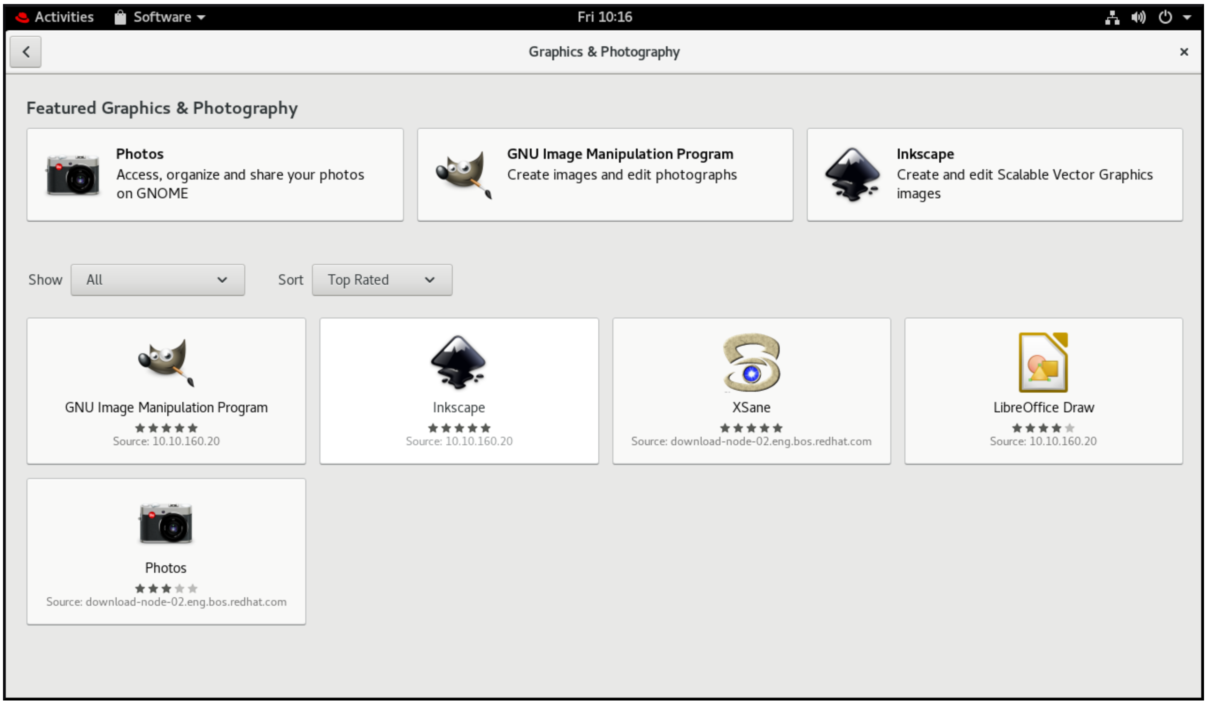
   > **NOTE**
   >
   > GNOME Software is a utility, which enables you to install and update applications and gnome-shell extensions through a graphical environment. This utility is based on the PackageKit technology, which serves as its back end. GNOME Software offers mainly the desktop applications, which are the applications that include the ***.desktop** file. The available applications are grouped into multiple categories according to their purpose.

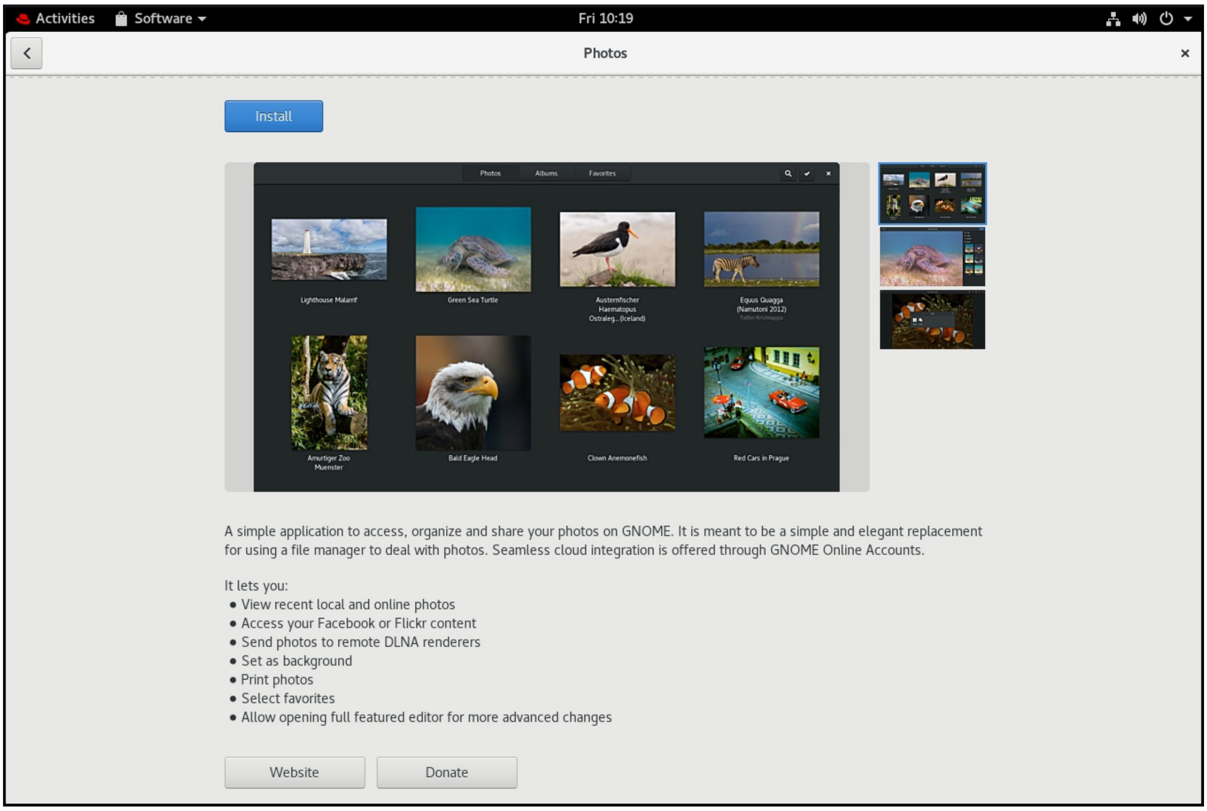
2. Choose the application to be installed from one of the available categories.
   - Audio & Video
   - Communication & News
   - Productivity

- Graphics & Photography
- Add-ons
- Developer Tools
- Utilities



3. Click the selected application, and then click the **Install** button.


Activities
Software
Fri 10:16
Graphics & Photography
Featured Graphics & Photography
Photos
Access, organize and share your photos on GNOME
GNU Image Manipulation Program
Create images and edit photographs
Inkscape
Create and edit Scalable Vector Graphics images
Show
All
Sort
Top Rated
GNU Image Manipulation Program
Source: 10.10.160.20
Inkscape
Source: 10.10.160.20
XSane
Source: download-node-02.eng.bos.redhat.com
LibreOffice Draw
Source: 10.10.160.20
Photos
Source: download-node-02.eng.bos.redhat.com



A simple application to access, organize and share your photos on GNOME. It is meant to be a simple and elegant replacement for using a file manager to deal with photos. Seamless cloud integration is offered through GNOME Online Accounts.

It lets you:

- View recent local and online photos
- Access your Facebook or Flickr content
- Send photos to remote DLNA renderers
- Set as background
- Print photos
- Select favorites
- Allow opening full featured editor for more advanced changes

NOTE

Add-ons include for example GNOME Shell extensions, codecs or fonts.

Procedure

1. Start opening a file that is associated with an application or applications that are currently not installed on your system.

2. GNOME will automatically identify suitable application in which the file can be opened, and will offer to download the application.

Procedure

1. Download the required rpm package.

2. Open the directory that includes the downloaded rpm in the Nautilus file manager.

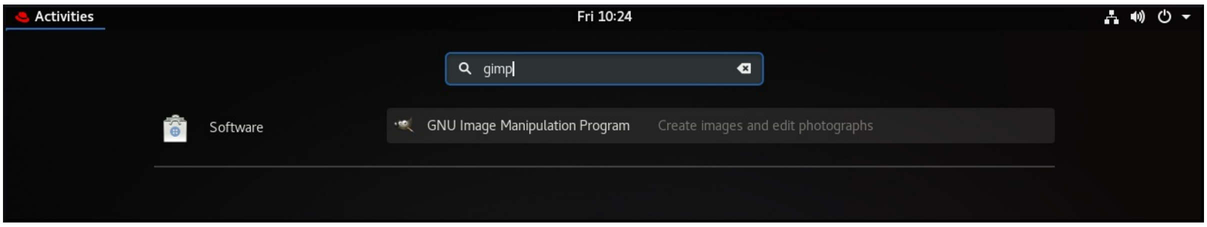
NOTE

The downloads are by default stored in the **/home/user/Downloads** directory.

3. Double-click the icon of the rpm to install it.

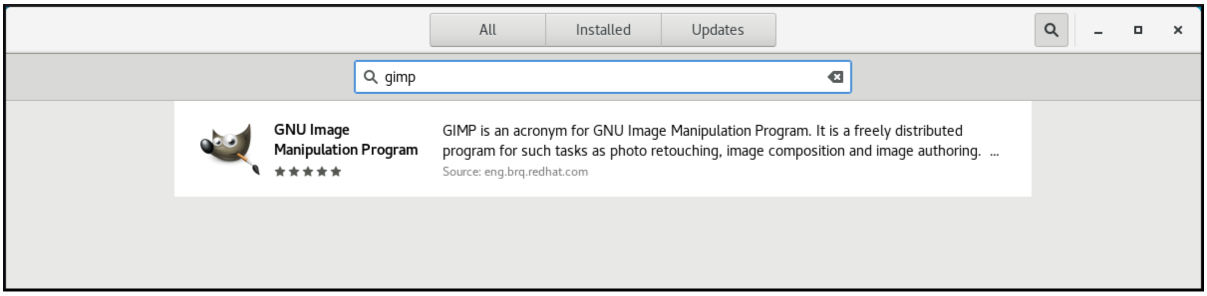
Procedure

1. Start typing the name of the required application in the **search entry**.


Activities
Fri 10:24
gimp
Software
GNU Image Manipulation Program
Create images and edit photographs

GNOME will automatically find the application in a respective repository, and will display the application’s icon.

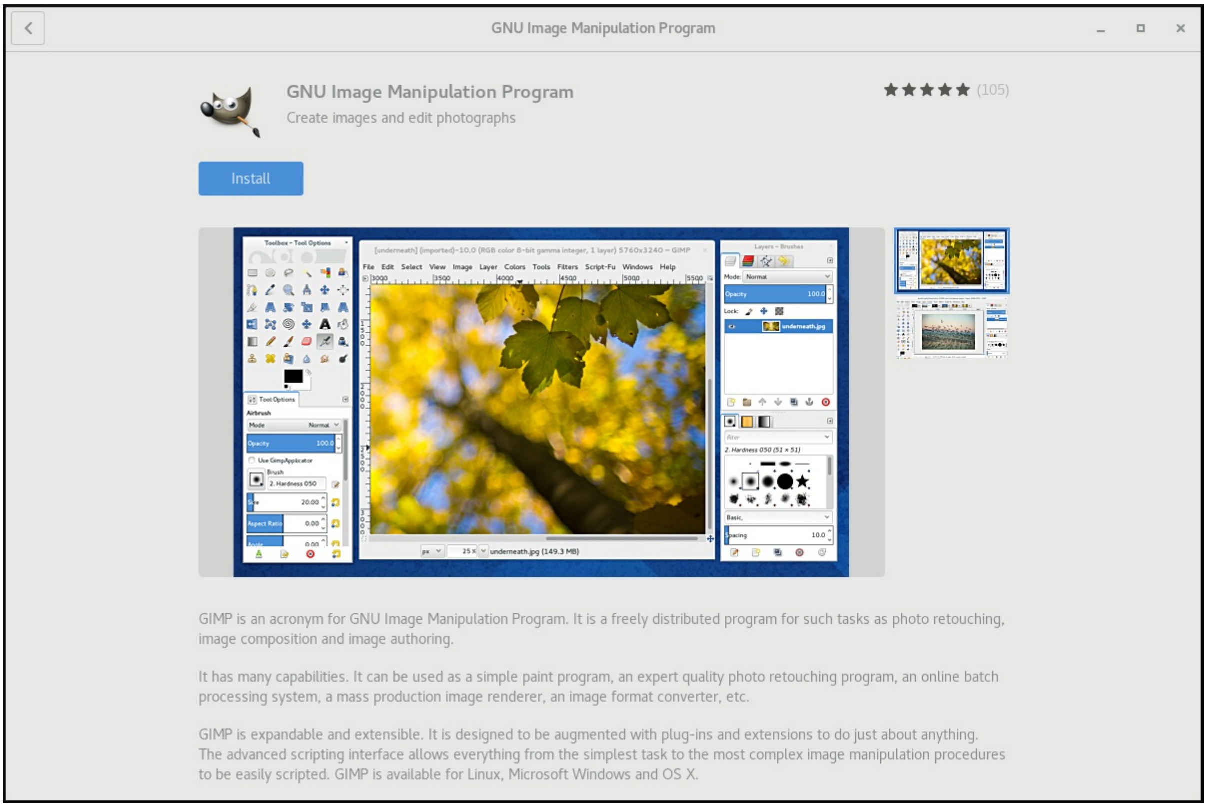
1. Click the application’s icon that automatically appears to open GNOME Software.



GIMP is an acronym for GNU Image Manipulation Program. It is a freely distributed program for such tasks as photo retouching, image composition and image authoring. ...

Source: eng.brq.redhat.com

2. Click again the icon of the application and finish the installation in GNOME Software as described above.


GNU Image Manipulation Program
GNU Image Manipulation Program
Create images and edit photographs
★★★★★ (105)
Install

GIMP is an acronym for GNU Image Manipulation Program. It is a freely distributed program for such tasks as photo retouching, image composition and image authoring.

It has many capabilities. It can be used as a simple paint program, an expert quality photo retouching program, an online batch processing system, a mass production image renderer, an image format converter, etc.

GIMP is expandable and extensible. It is designed to be augmented with plug-ins and extensions to do just about anything. The advanced scripting interface allows everything from the simplest task to the most complex image manipulation procedures to be easily scripted. GIMP is available for Linux, Microsoft Windows and OS X.

Procedure

1. Open a terminal.

2. Run the **yum install** command with the name of the required application:

```
~]# yum install <application_name>
```

1.6. DESKTOP ICONS

In RHEL 8, the **Desktop icons** functionality is no longer provided by the Nautilus file manager, but by the **desktop icons** gnome-shell extension available in the **gnome-shell-extension-desktop-icons** package.

Desktop icons in GNOME Classic

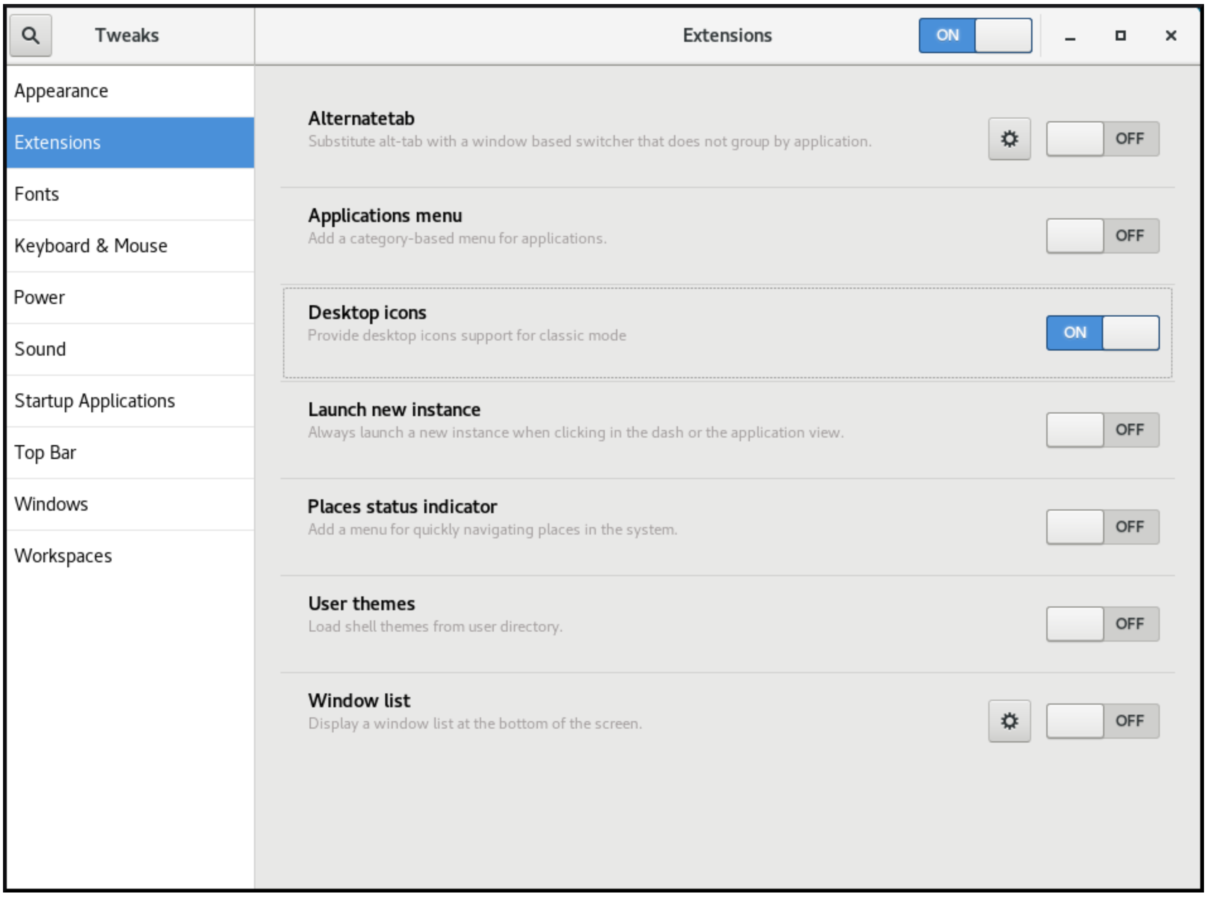
The GNOME Classic environment includes the **gnome-shell-extension-desktop-icons** package by default. Desktop icons are always on, and cannot be turned off. If you want to create a desktop icon for a file, you just need to put this file into the /**Desktop** directory, and the icon appears automatically.

Desktop icons in GNOME Standard

If you have only the GNOME Standard environment available, and not GNOME Classic, you must install **gnome-shell-extension-desktop-icons**.

After the package has been installed, you can switch the desktop icons on or off by using the **Tweaks** application:

1. Go to **Tweaks**, and select **Extensions** - **Desktop icons**, and switch it on.



Extensions ON

Alternatetab — OFF
Substitute alt-tab with a window based switcher that does not group by application.

Applications menu — OFF
Add a category-based menu for applications.

Desktop icons — ON
Provide desktop icons support for classic mode

Launch new instance — OFF
Always launch a new instance when clicking in the dash or the application view.

Places status indicator — OFF
Add a menu for quickly navigating places in the system.

User themes — OFF
Load shell themes from user directory.

Window list — OFF
Display a window list at the bottom of the screen.

2. Put the required file into the /**Desktop** directory, and the icon appears automatically on your desktop.

1.7. HANDLING SOUND

In Red Hat Enterprise Linux 8, sound is handled by the **PulseAudio** sound server that lets programs output the audio using the **Pulseaudio** daemon.

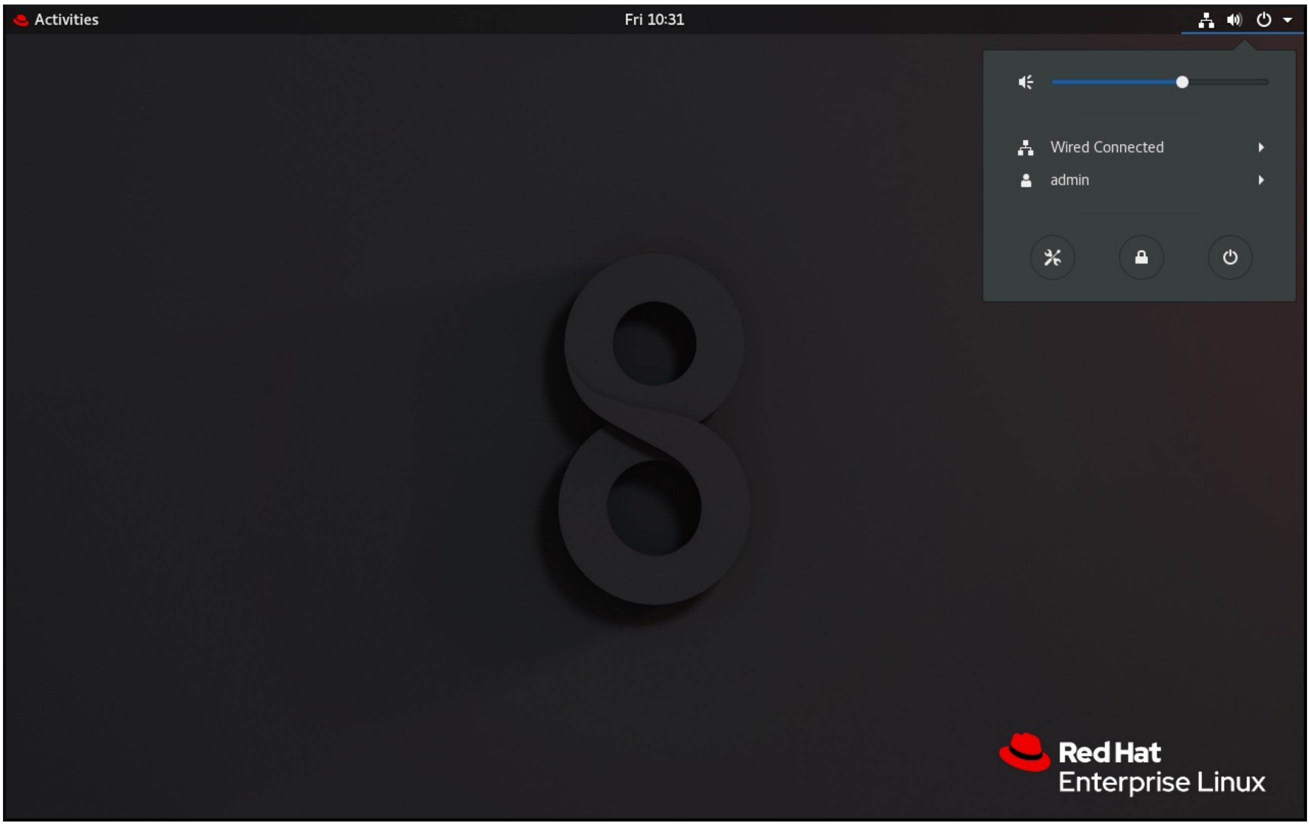
For more information on **PulseAudio**, see the **pulseaudio** man page.

To handle sound, you can use one of these two graphical applications in GNOME:

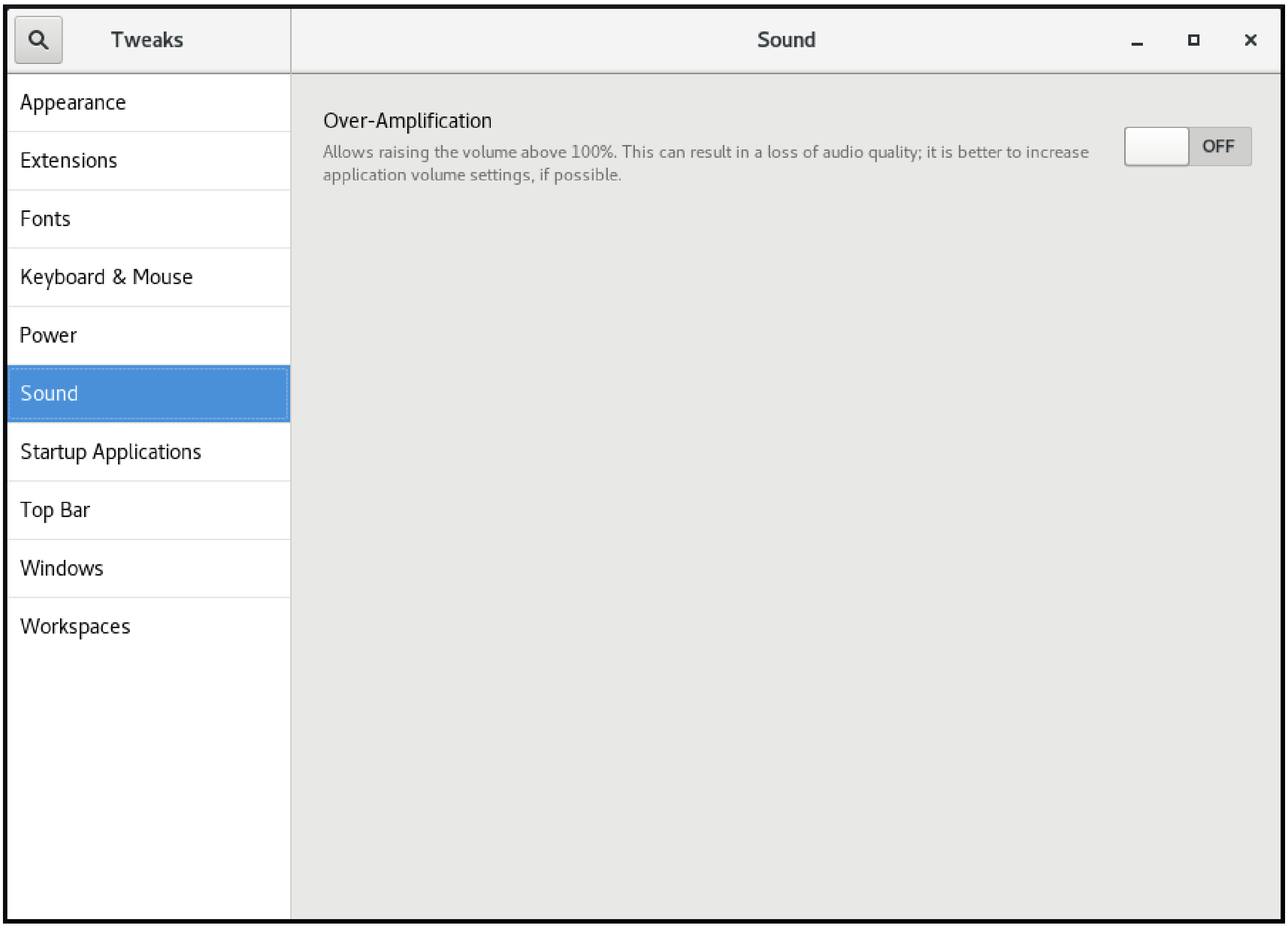
- **System menu**

- **Tweaks** tool
- **GNOME Control Center**

System menu is located in the top right corner, and it only enables you to set the intensity of the sound output or sound input through the sound bar. The sound bar for input sound is available only if you are running an application that is supposed to use an iternal microphone (built-in audio), such as some teleconference tools.



Tweaks tool only enables you to configure the Over-Amplification.

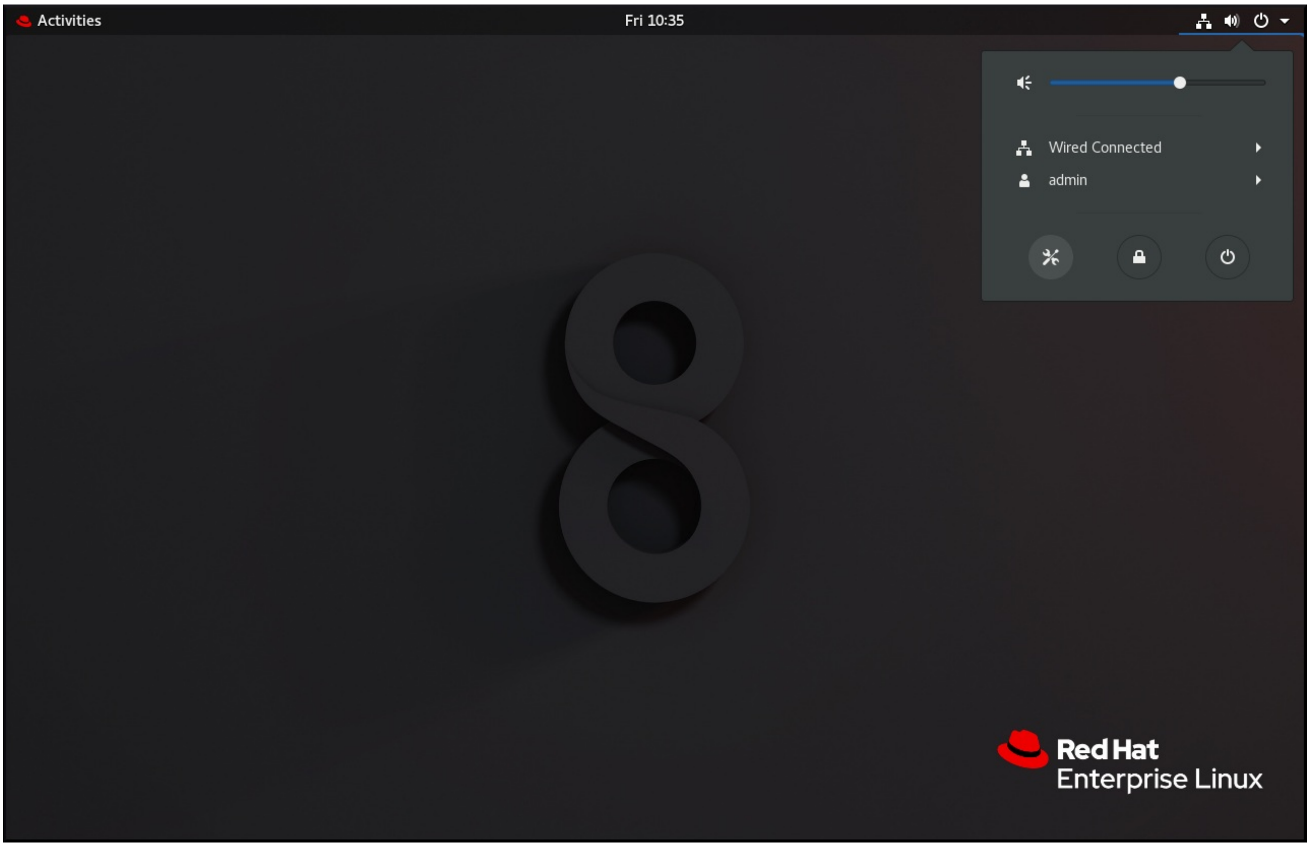


Over-Amplification

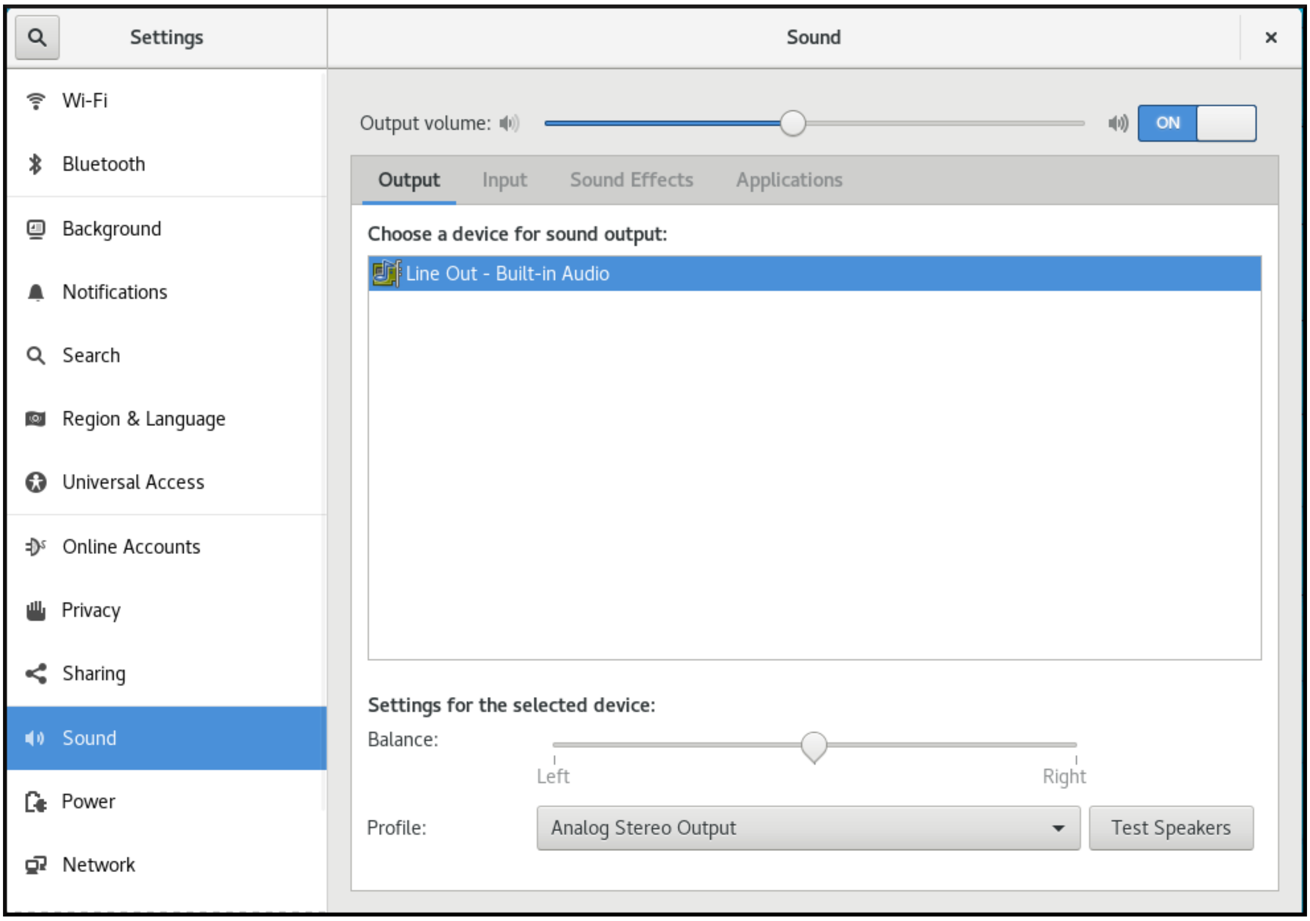
Allows raising the volume above 100%. This can result in a loss of audio quality; it is better to increase application volume settings, if possible.

OFF

GNOME Control Center provides more options to configure sound. You can launch this tool by using one of the approaches described in Launching applications. Moreover, you can also launch it from the **System menu** by clicking on its icon.



When **GNOME Control Center** opens, choose **Sound** from the left vertical bar.



Output volume: ON

Choose a device for sound output:

Line Out - Built-in Audio

Settings for the selected device:

Balance:

Profile: Analog Stereo Output

Through **GNOME Control Center** - **Sound**, you can configure the following:

- **Output** sound
- **Input** sound
- **Sound effects**
- **Applications**

The **Output** and **Input** menus show only the built-in audio devices unless you connect any external device that can handle sound.

The **Output** menu enables you to select the required profile from available analog or digital profiles that are displayed depending on available output devices.

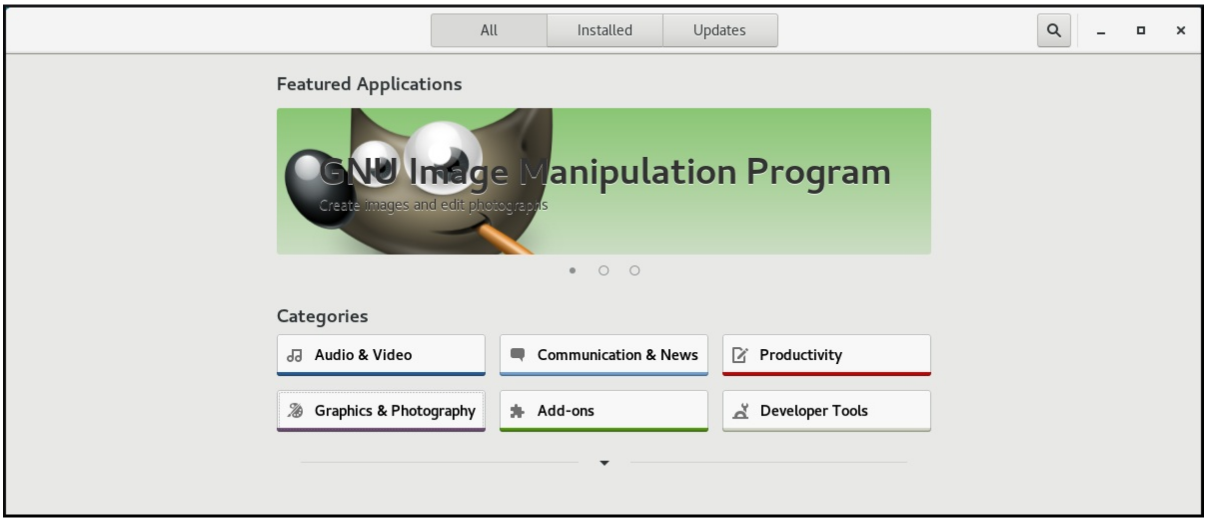
The **Applications** menu shows all currently running applications that can process sound, and allows you to amplify or lower the sound of a particular application.

1.8. HANDLING GRAPHICS AND PHOTOS

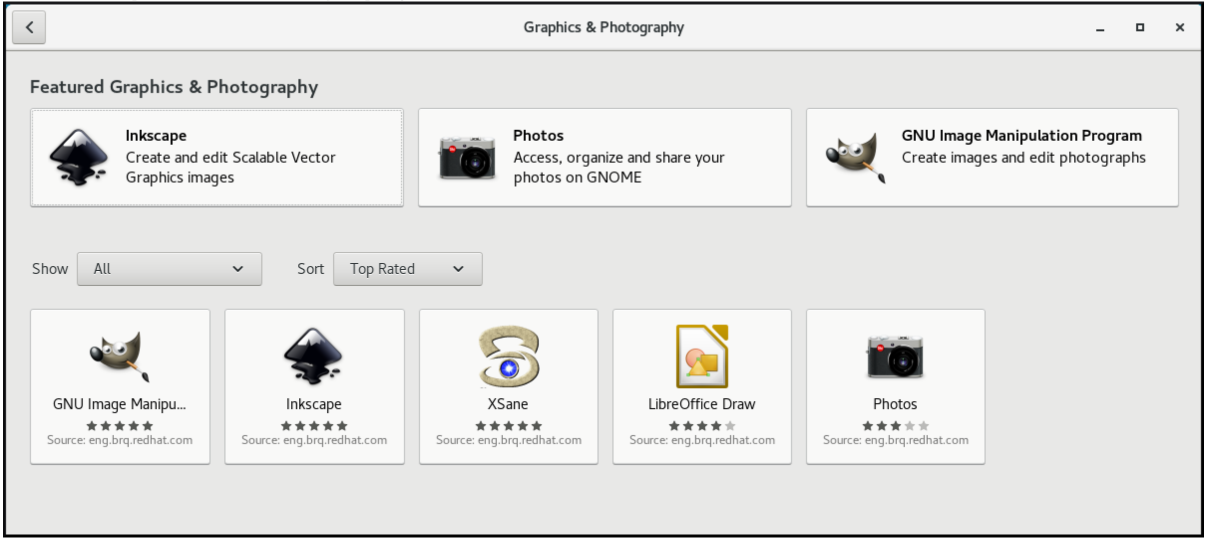
GNOME Shell provides multiple tools to handle graphics and photography.

You can check the available tools under the **Graphics & Photography** menu in GNOME Software:

1. Open the GNOME software.



2. Go to **Graphics & Photography**.


Graphics & Photography
Featured Graphics & Photography
Inkscape
Create and edit Scalable Vector Graphics images
Photos
Access, organize and share your photos on GNOME
GNU Image Manipulation Program
Create images and edit photographs
GNU Image Manipu...
Source: eng.brq.redhat.com
Inkscape
Source: eng.brq.redhat.com
XSane
Source: eng.brq.redhat.com
LibreOffice Draw
Source: eng.brq.redhat.com
Photos
Source: eng.brq.redhat.com

Show All

Sort Top Rated

The available tools include:

- **Photos**
  For accessing, organizisng and sharing your photos.

- **GNU Image Manipulation Program**
  For creating images and editing photographs.

- **Inkspace**
  For creating and editing scalable vector graphics images.

- **XSane**
  For scanning images with a scanner.

- **LibreOffice Draw**
  For create and editing drawings, flow charts, and logos.

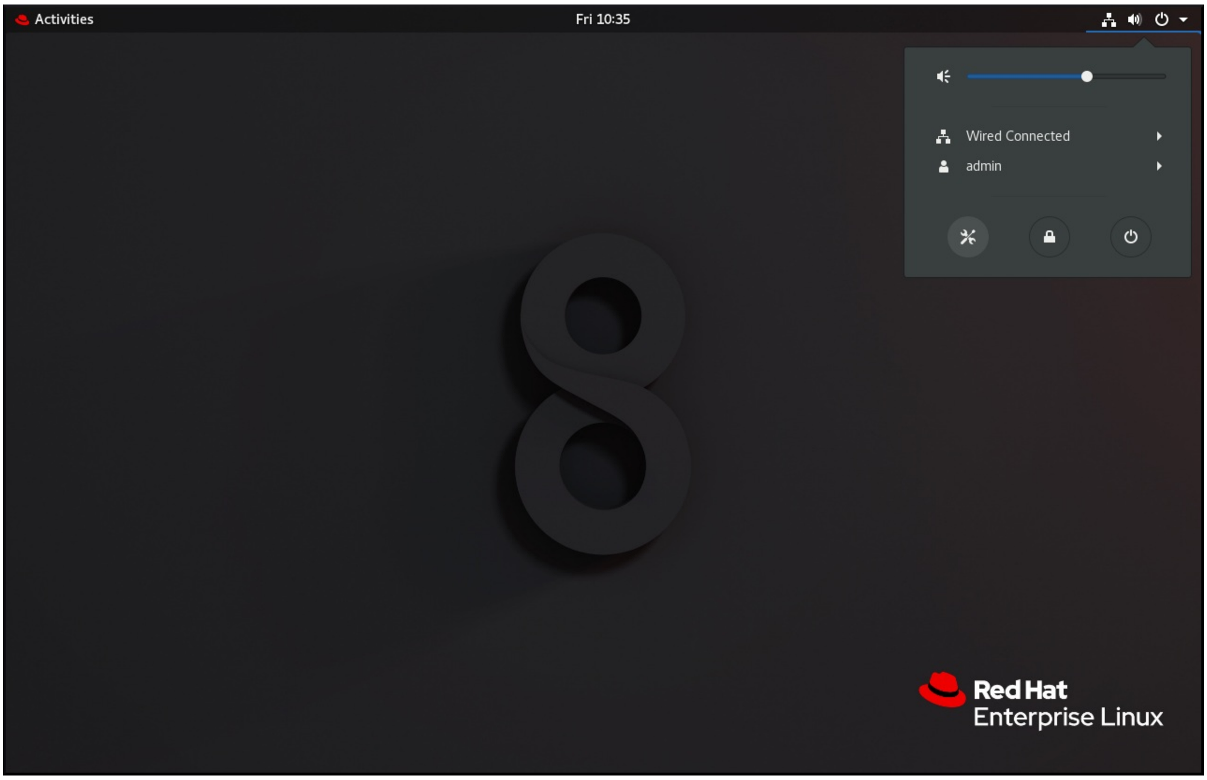
1.9. HANDLING PRINTING

In GNOME Shell, printing can be set up using the **GNOME Control center** GUI.

1.9.1. Starting GNOME control center for setting up printing

Procedure

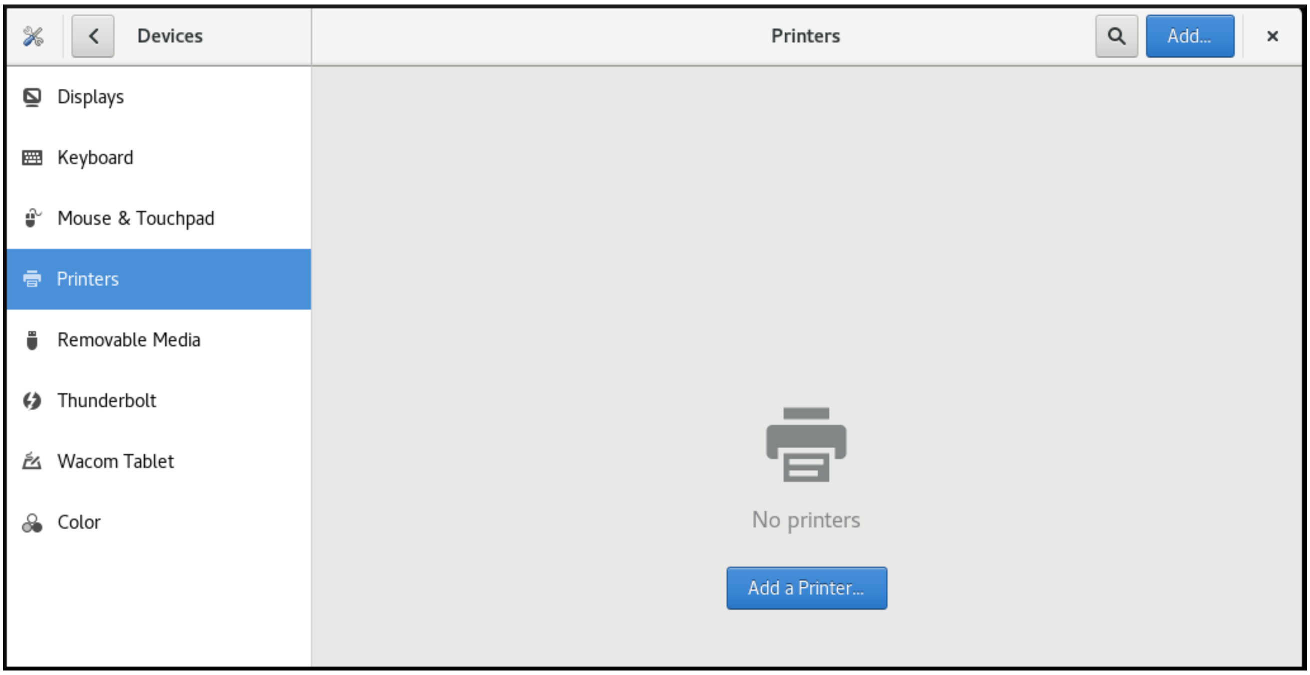
1. Use one of the approaches described in Section 1.4, “Launching applications” to start the **GNOME Control center** GUI.
   Moreover, you can also start the GNOME Control center from the **system menu** in the top right corner by clicking on the "Settings" icon.



2. When the **GNOME Control center** GUI appears, go to:

Devices → Printers

Figure 1.1. GNOME Control center configuration tool



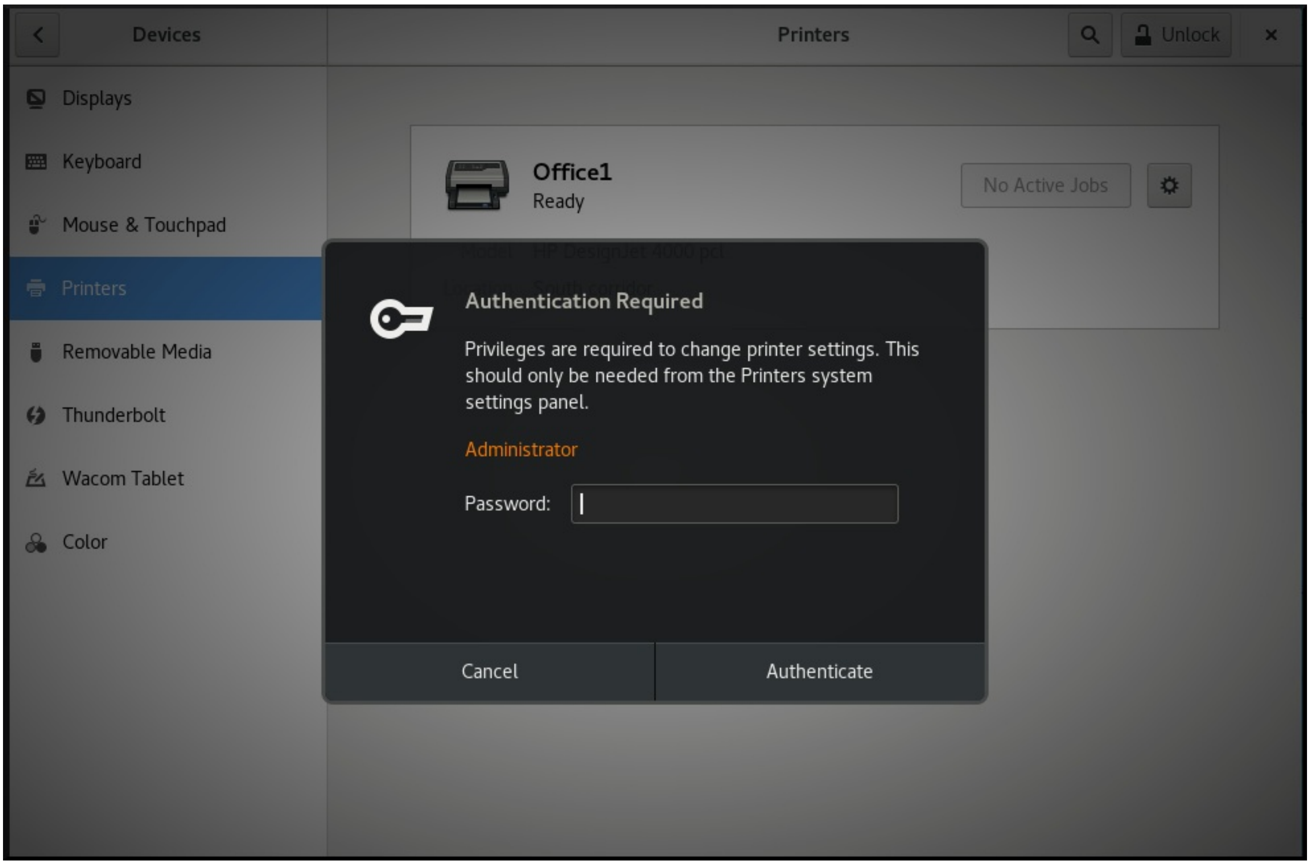
1.9.2. Adding a new printer in GNOME Control center

This section describes how to add a new printer using the **GNOME Control center** GUI.

Prerequisites

To be able to add a new printer using the **GNOME Control center** GUI, you must click on **Unlock**, which appears on the right side of the top bar, and authenticate as one of the following users:

- Superuser
- Any user with the administrative access provided by **sudo** (users listed within **/etc/sudoers**)
- Any user belonging to the **printadmin** group in **/etc/group**



Authentication Required

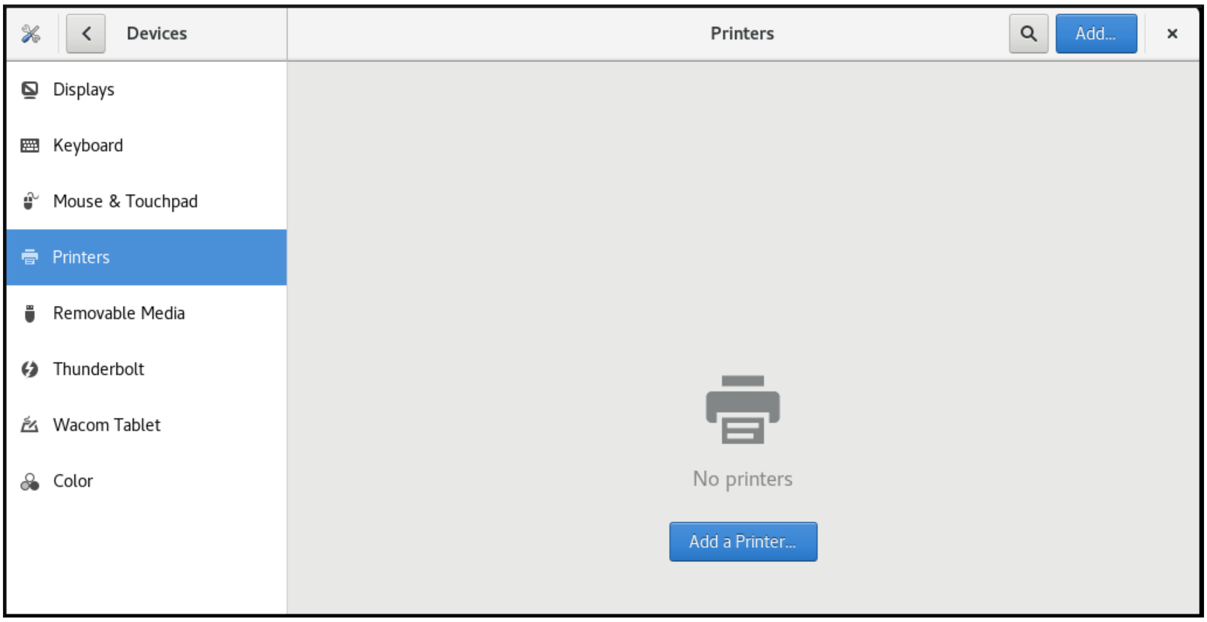
Privileges are required to change printer settings. This should only be needed from the Printers system settings panel.

Administrator

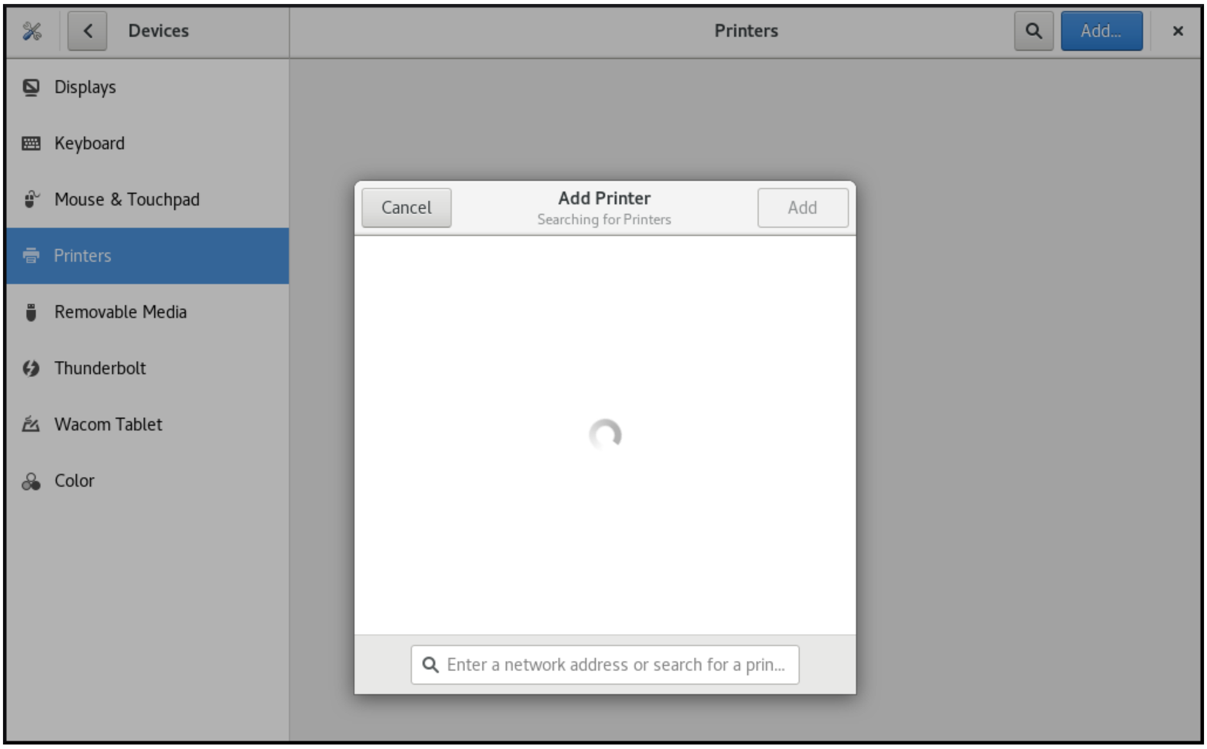
Password:

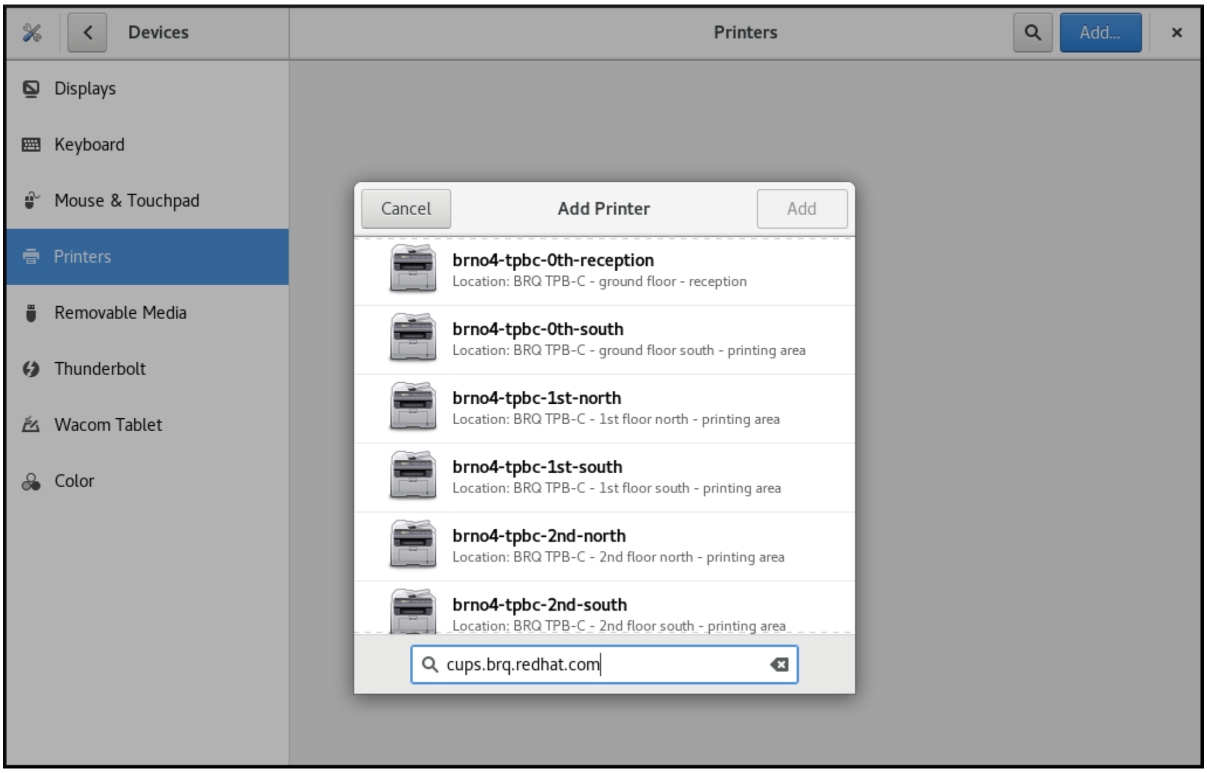
Procedure

1. Open the Add Printer dialog.



2. Select one of the available printers (including also network printers), or enter printer IP address or the hostname of a printer server.





brno4-tpbc-0th-reception
Location: BRQ TPB-C - ground floor - reception

brno4-tpbc-0th-south
Location: BRQ TPB-C - ground floor south - printing area

brno4-tpbc-1st-north
Location: BRQ TPB-C - 1st floor north - printing area

brno4-tpbc-1st-south
Location: BRQ TPB-C - 1st floor south - printing area

brno4-tpbc-2nd-north
Location: BRQ TPB-C - 2nd floor north - printing area

brno4-tpbc-2nd-south
Location: BRQ TPB-C - 2nd floor south - printing area

cups.brq.redhat.com

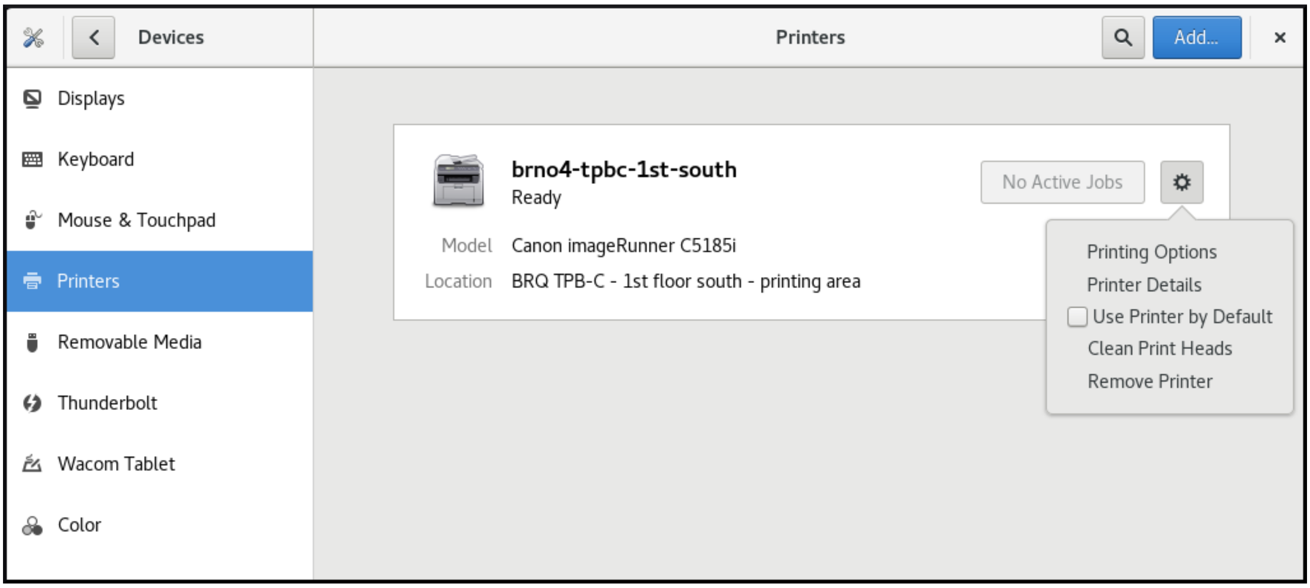
1.9.3. Configuring a printer in GNOME Control center

This section describes how to configure a new printer, and how to maintain a configuration of a printer using the **GNOME Control center** GUI.

Displaying printer's settings menu

Procedure

- Click the "settings" button on the right to display a settings menu for the selected printer:



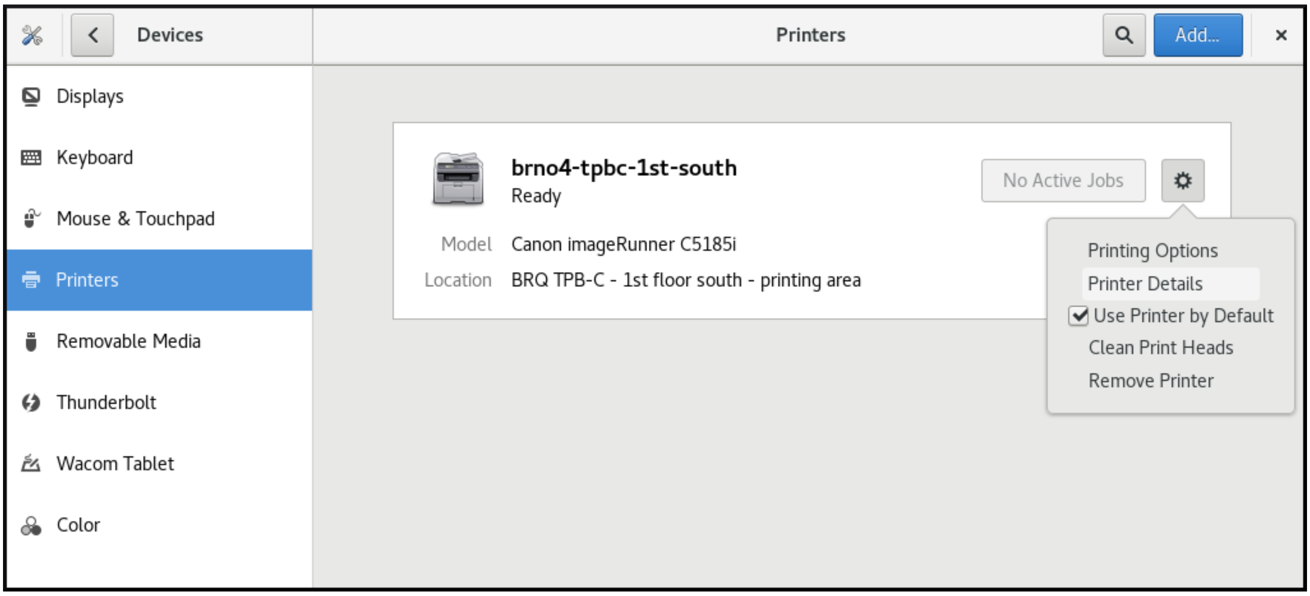
brno4-tpbc-1st-south
Ready

Model Canon imageRunner C5185i
Location BRQ TPB-C - 1st floor south - printing area

Displaying and modifying printer's details

Procedure

- Click **Printer Details** to display and modify selected printer's settings:



brno4-tpbc-1st-south
Ready

Model Canon imageRunner C5185i

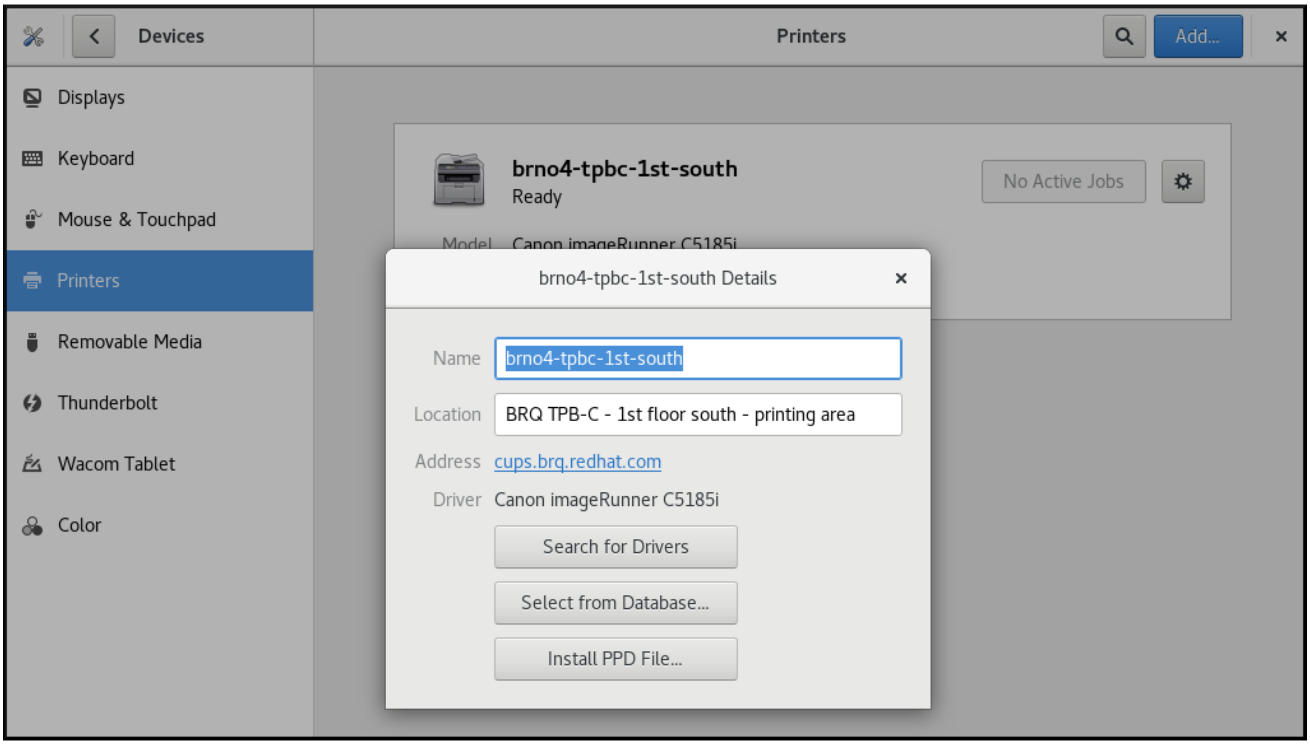
Location BRQ TPB-C - 1st floor south - printing area

With this menu you can:

- **Search for Drivers**
  GNOME Control Center communicates with **PackageKit** that searches for a suitable driver suitable in available repositories.

- **Select from Database**
  This option enables you to select a suitable driver from databases that have already been installed on the system.

- **Install PPD File**
  This option enables you to select from a list of available postscript printer description (PPD) files that can be used as a driver for your printer.



Name brno4-tpbc-1st-south

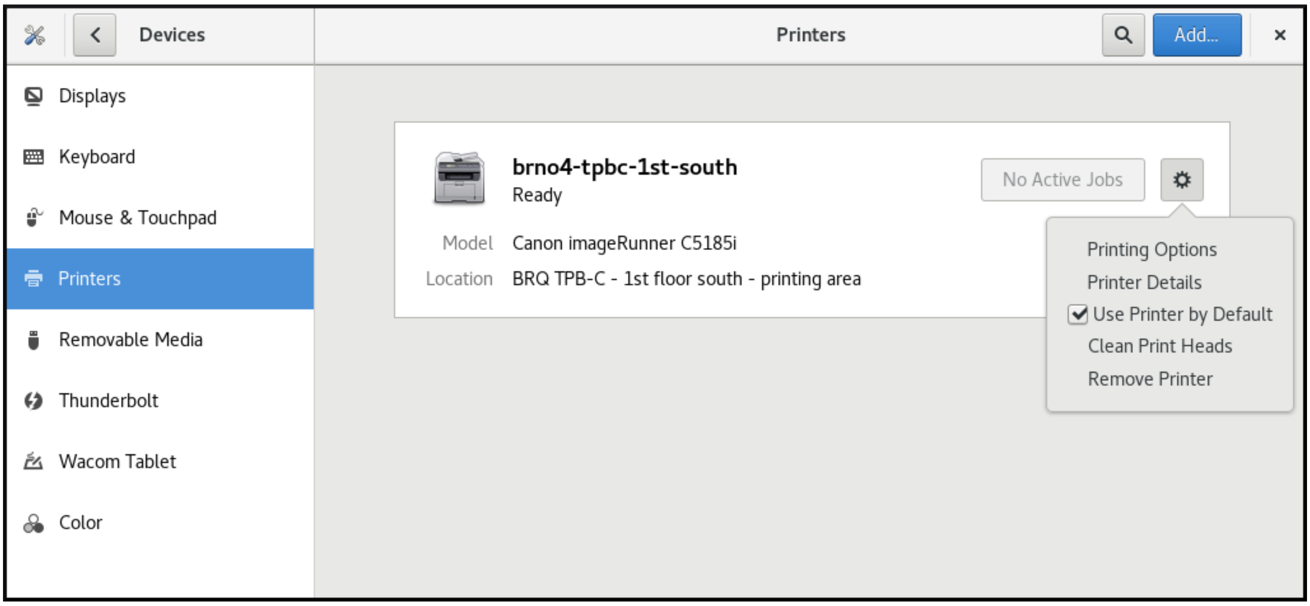
Location BRQ TPB-C - 1st floor south - printing area

Address cups.brq.redhat.com

Driver Canon imageRunner C5185i

Setting the default printer
Procedure

- Click **Use Printer by Default** to set the selected printer as the default printer:

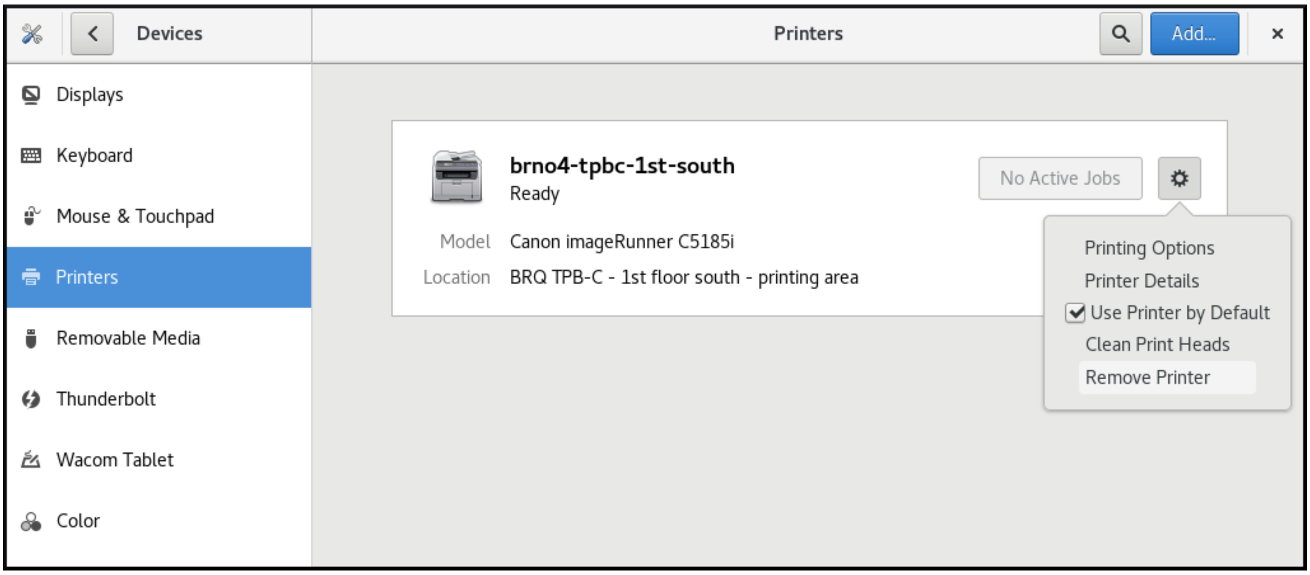


brno4-tpbc-1st-south
Ready
Model Canon imageRunner C5185i
Location BRQ TPB-C - 1st floor south - printing area

Removing a printer

Procedure

- Click **Remove Printer** to remove the selected printer:



brno4-tpbc-1st-south
Ready
Model Canon imageRunner C5185i
Location BRQ TPB-C - 1st floor south - printing area

1.9.4. Printing a test page in GNOME Control Center

This section describes how to print a test page to make sure that the printer functions properly.

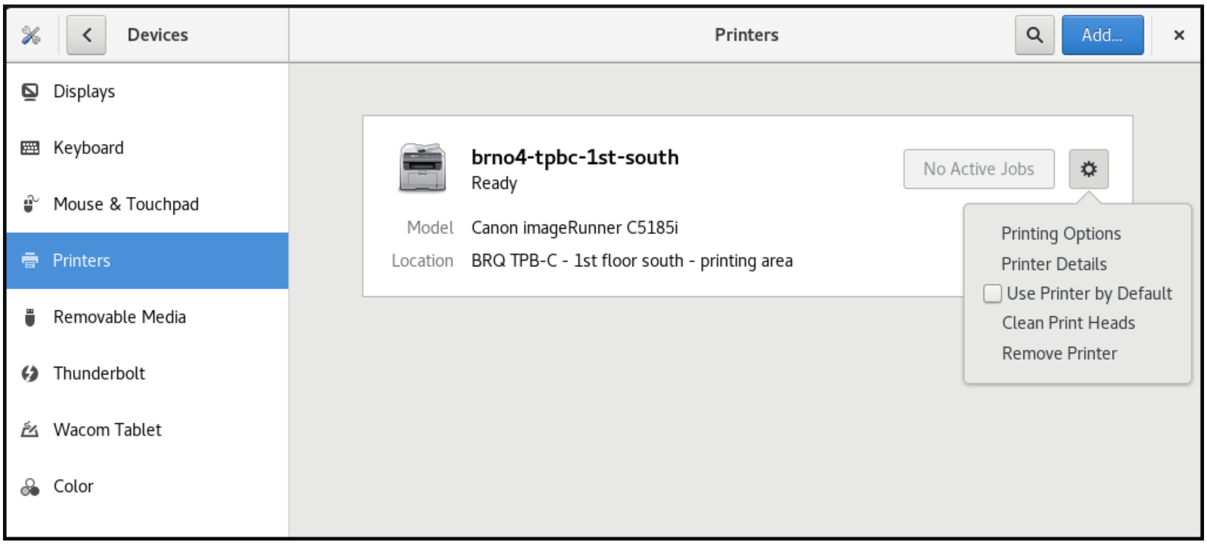
You might want to print a test page if one of the below prerequisites is met.

Prerequisites

- A printer has been set up.
- A printer configuration has been changed.

Procedure

1. Click the "settings" button on the right to display a settings menu for the selected printer:



brno4-tpbc-1st-south
Ready

Model Canon imageRunner C5185i

Location BRQ TPB-C - 1st floor south - printing area

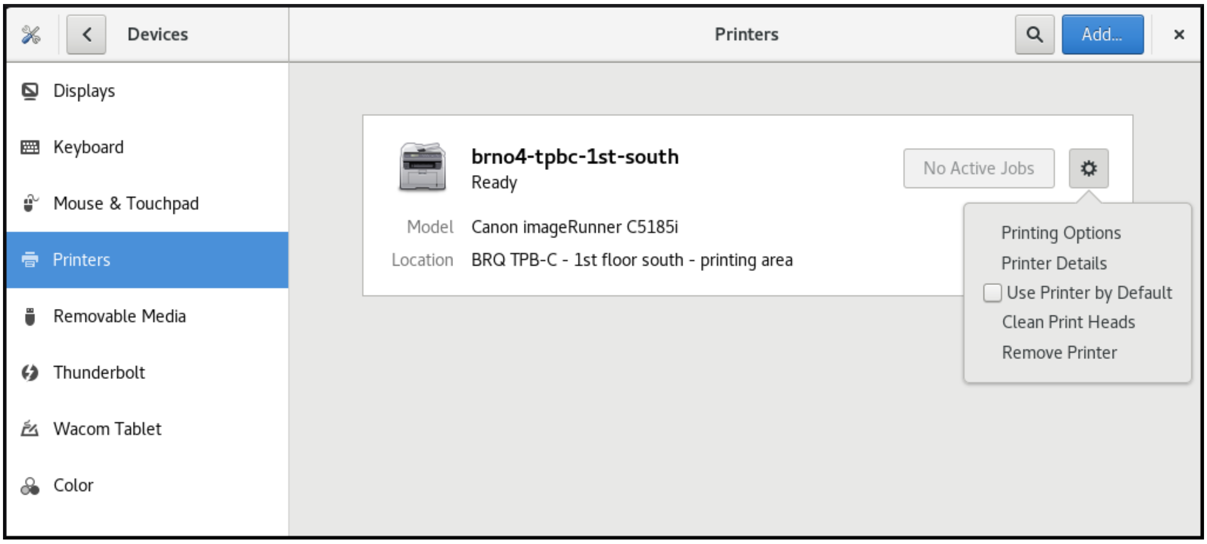
2. Click **Printing Options → Test Page**

1.9.5. Setting print options using GNOME Control center

This section describes how to set print options using the **GNOME Control center** GUI.

Procedure

1. Click the "settings" button on the right to display a settings menu for the selected printer:



brno4-tpbc-1st-south
Ready

Model Canon imageRunner C5185i

Location BRQ TPB-C - 1st floor south - printing area

2. Click **Printing Options**

1.10. SHARING MEDIA BETWEEN APPLICATIONS

Red Hat Enterprise Linux 8 includes the PipeWire media server, which ensures access to multimedia devices and media sharing between applications.

When running a remote desktop session on **GNOME Shell on Wayland**, PipeWire and the VNC server is used. The functionality of remote desktop session is provided by the **gnome-remote-desktop** and **pipewire** packages.

On **X.Org**, just VNC is needed to run a remote desktop session. This functionality on **X.Org** is provided by the **vino** package.

PipeWire is used also with teleconference tools such as BlueJeans when running on **GNOME Shell on Wayland**. In such case, the **pipewire service** is activated automatically when you start sharing your screen within the teleconference tool.

To check the status of the **pipewire service**, run:

```
~]$ systemctl --user status pipewire
```

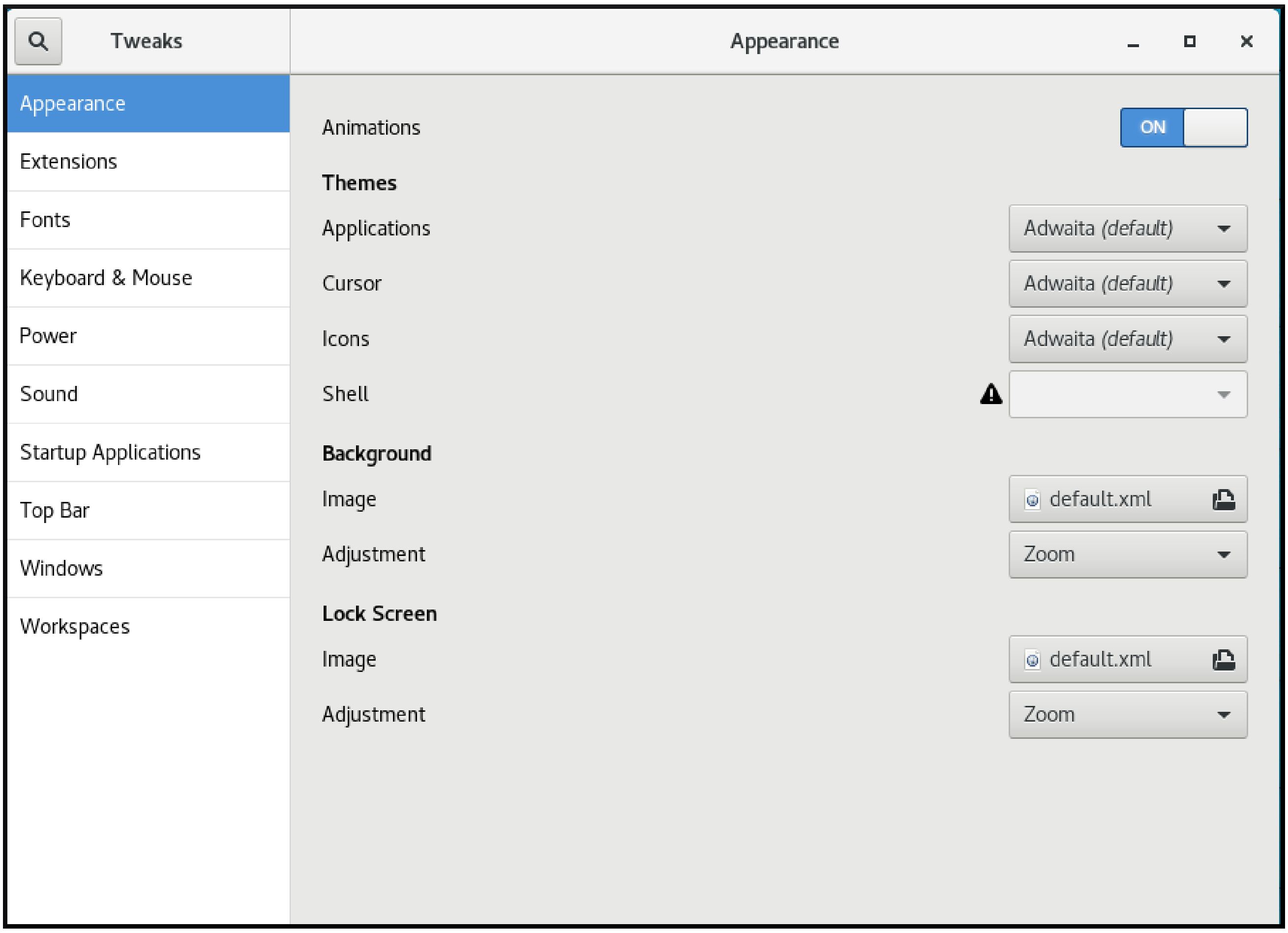
1.11. CUSTOMIZING GNOME SHELL ENVIRONMENT WITH THE TWEAKS TOOL

You can customize the GNOME Shell environment for a particular user by using the **Tweaks** tool.

To open **Tweaks**, use one of the approaches described in Section 1.4, "Launching applications".

To choose the required item that you want to customize, use the vertical menu on the left. For example you can choose the applications to start automatically when you log in by using the **Statup Applications** menu, or you can customize your top bar appearance by using the **Top Bar** menu.

The Tweaks tool



Animations: ON

Themes

Applications: Adwaita *(default)*

Cursor: Adwaita *(default)*

Icons: Adwaita *(default)*

Shell: ⚠

Background

Image: default.xml

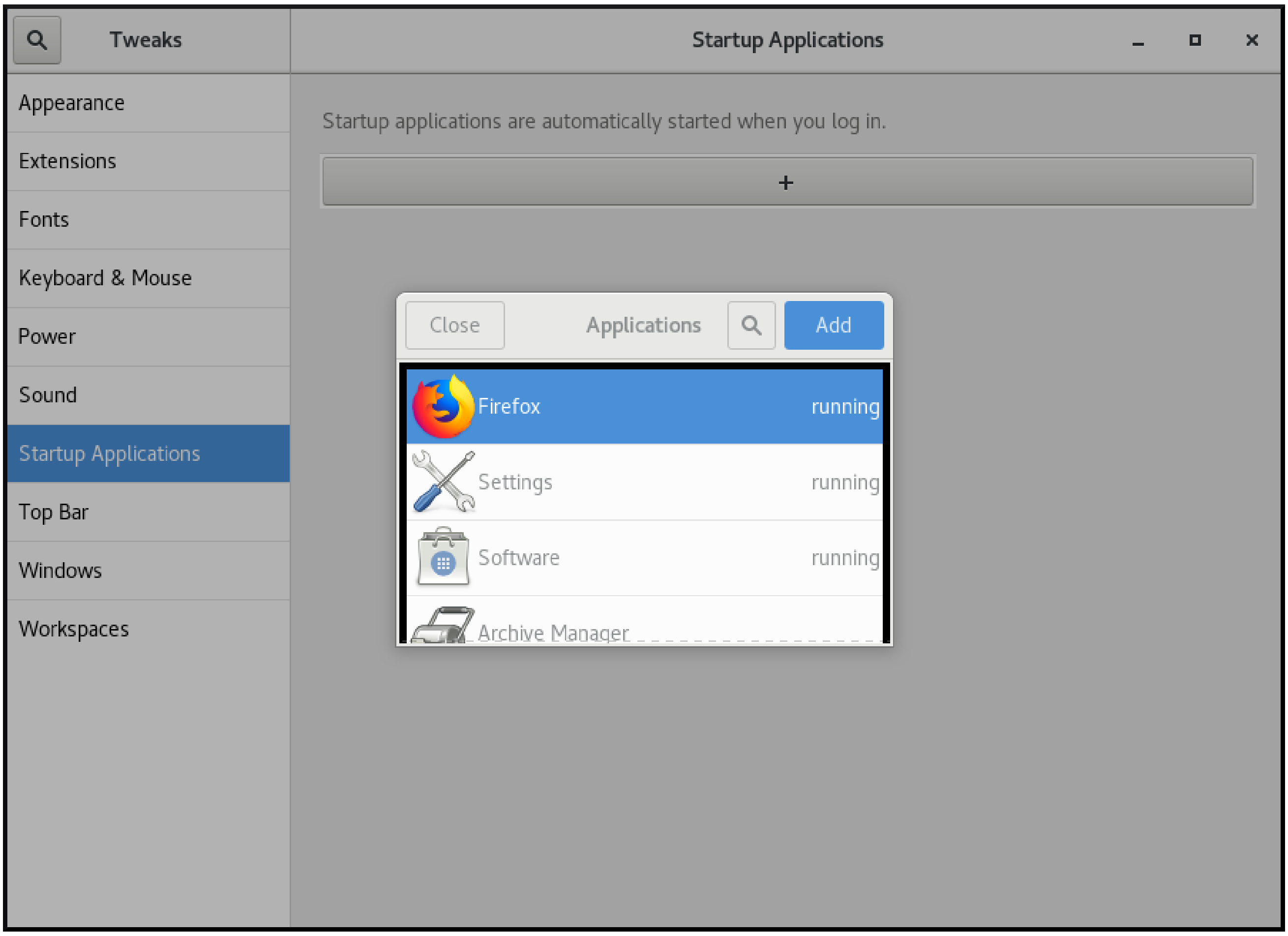
Adjustment: Zoom

Lock Screen

Image: default.xml

Adjustment: Zoom

Customizing startup applications in Tweaks



Startup applications are automatically started when you log in.

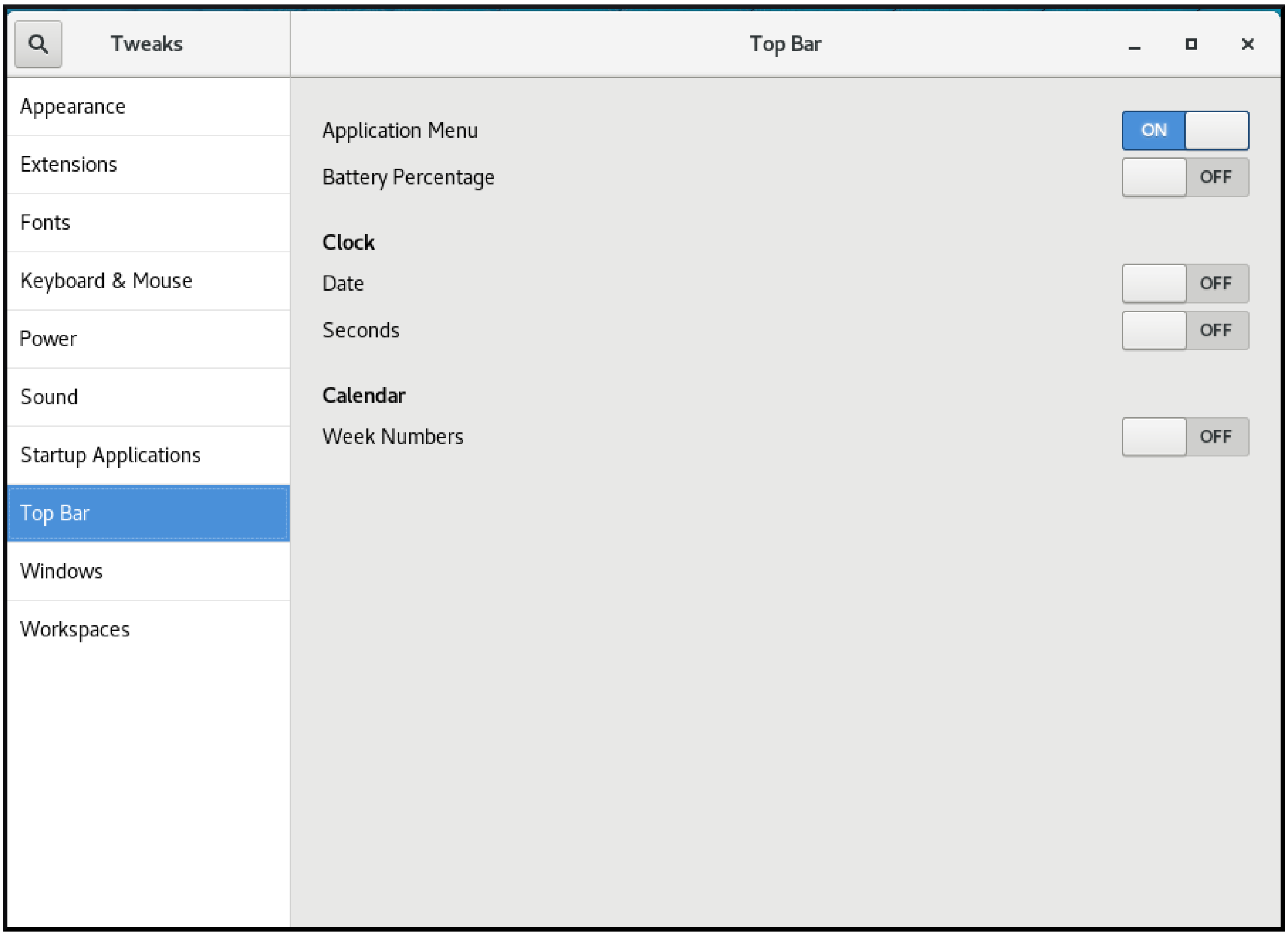
Firefox running

Settings running

Software running

Archive Manager

Customizing the appearance of your top bar in Tweaks



Application Menu ON

Battery Percentage OFF

Clock

Date OFF

Seconds OFF

Calendar

Week Numbers OFF

CHAPTER 2. DISPLAYING GRAPHICS

In Red Hat Enterprise Linux 8, you can choose between two protocols to build a graphical user interface:

- **X11**
- **Wayland**

The **X11** protocol uses **X.Org** as the display server. Displaying graphics based on this protocol works the same way as in Red Hat Enterprise Linux 7, where this was the only option.

The **Wayland** protocol on Red Hat Enterprise Linux 8 uses GNOME Shell as its compositor and display server, which is further referred as **GNOME Shell on Wayland**. Displaying graphics based on the **Wayland** protocol has some differences and limitation compared to **X11**. For more information, see Key differences between the Wayland and X11 protocol and Current Wayland limitations.

New installations of Red Hat Enterprise Linux 8 automatically select **GNOME Shell on Wayland**. However, you can switch to **X.Org**, or select the required combination of GNOME environment and display server as described in Section 1.3, “Selecting GNOME environment and display protocol” .

Note that there are also a few environments where **X.Org** is preferred over **GNOME Shell on Wayland**, such as:

- Cirrus graphics used in a VM environment
- Matrox graphics
- Aspeed graphics
- QXL graphics used in a VM environment
- Nvidia graphics when used with the proprietary driver

IMPORTANT

The Nvidia graphics by default use **Nouveau**, which is an open source driver. **Nouveau** is supported on **Wayland**, hence you can use Nvidia graphics with **Nouveau** on **GNOME Shell on Wayland** without any limitations. However, using Nvidia graphics with proprietary Nvidia binary drivers is not supported on **GNOME Shell on Wayland**. In this case, you need to switch to **X.Org** as described in Section 1.3, “Selecting GNOME environment and display protocol”.

NOTE

You can find the current list of environments for which Wayland is not available in the **/usr/lib/udev/rules.d/61-gdm.rules** file.

For additional information on the **Wayland** project, see Wayland documentation.

2.1. KEY DIFFERENCES BETWEEN THE WAYLAND AND X11 PROTOCOL

2.1.1. X11 Applications

Client applications need to be ported to the **Wayland** protocol or use a graphical toolkit that has a **Wayland** backend, such as GTK, to be able to work natively with the compositor and display server based on **Wayland**.

Legacy **X11** applications that cannot be ported to **Wayland** automatically use **Xwayland** as a proxy between the **X11** legacy clients and the **Wayland** compositor. **Xwayland** functions both as an **X11** server and a **Wayland** client. The role of **Xwayland** is to translate the **X11** protocol into the **Wayland** protocol and reversely, so that **X11** legacy applications can work with the display server based on **Wayland**.

On **GNOME Shell on Wayland**, **Xwayland** is started automatically at startup, which ensures that most **X11** legacy applications work as expected when using **GNOME Shell on Wayland**. However, the **X11** and **Wayland** protocols are different, and hence some clients relying on **X11**-specific features may behave differently under **Xwayland**. For such specific clients, you can switch to the **X.Org** display server as described in Section 1.3, “Selecting GNOME environment and display protocol” .

2.1.2. libinput

Red Hat Enterprise Linux 8 uses a new unified input stack, **libinput**, which manages all common device types, such as mice, touchpads, touchscreens, tablets, trackballs and pointing sticks. This unified stack is used both by the **X.Org** and by the **GNOME Shell on Wayland** compositor.

GNOME Shell on Wayland uses **libinput** directly for all devices, and no switchable driver support is available. Under **X.Org**, **libinput** is implemented as the **X.Org libinput** driver, and driver support is outlined below.

2.1.2.1. Mice, touchscreens, trackballs, pointing sticks

Red Hat Enterprise Linux 8 uses the **X.Org libinput** driver for these devices. The **X.Org evdev** driver, which was used in Red Hat Enterprise Linux 7, is available as fallback where required.

2.1.2.2. Touchpads

Red Hat Enterprise Linux 8 uses the **X.Org libinput** driver for touchpads. The **X.Org synaptics** driver, which was used for touchpads in Red Hat Enterprise Linux 7, is no longer available.

2.1.2.3. Graphics tablets

Red Hat Enterprise Linux 8 continues using the **X.Org wacom** driver, which was used for tablet devices in Red Hat Enterprise Linux 7. However, the **X.Org** libinput driver is available where required.

2.1.2.4. Other input devices

Red Hat Enterprise Linux 7 used the **X.Org evdev** driver for other input devices that are not included not in the above categories. Red Hat Enterprise Linux 8 uses the **X.Org libinput** driver by default but can fall back to the **X.Org evdev** driver if a device is incompatible with **libinput**.

2.1.3. Gestures

GNOME Shell on Wayland supports new touchpad and touchscreen gestures. These gestures include:

- Switching workspaces by dragging up or down with four fingers.
- Opening the **Activities Overview** by bringing three fingers closer together.

2.2. CURRENT WAYLAND LIMITATIONS

2.2.1. Nvidia drivers

Proprietary Nvidia binary drivers are not supported with **GNOME Shell on Wayland**. To avoid any complications while using the Nvidia GPU, GNOME Shell automatically falls back to **X.Org**, which means that the login screen does not provide any option based on the **Wayland** protocol.

NOTE

The **Nouveau** driver is still supported and is the default driver for Nvidia graphics.

2.2.2. Remote desktop

With **GNOME Shell on Wayland**, VNC support is provided by the **gnome-remote-desktop** package. Remote access using VNC via **gnome-remote-desktop** currently requires an already logged in session, and only the primary monitor is accessible. Screen sharing with **GNOME Shell on Wayland** is possible using the PipeWire media server. For more details on the PipeWire media server, see PipeWire project.

For more advanced VNC usage, you need to switch to **X.org**, where traditional VNC tools are available.

2.2.3. X Display Manager

The X Display Manager Control Protocol (XDMCP) is not supported with **GNOME Shell on Wayland**.

Hence, it is not possible to use the X display manager to start a session on the **X.Org** display server from the same or another computer.

2.2.4. Additional Limitations

The following additional limitations related to the **Wayland** protocol should be noted:

- **X.Org** screen manipulation utilities are not available.
- The xrandr utility is not supported because **Wayland** handles layout, rotations, and resolutions differently.
- The GNOME Shell cannot be restarted using the ALT+F2/r method.
- Due to stability issues, using **X11** instead of **Wayland** is recommended in virtual environments.
- **Wayland** does not support the custom or niche devices that cannot be handled by the **libinput** driver.

CHAPTER 3. CONFIGURING GNOME AT LOW LEVEL

3.1. INTRODUCTION TO CONFIGURING GNOME

To be able to configure the GNOME Desktop Environment, you need to understand these basic terms:

- dconf
- GSettings
- gsettings

dconf has two different meanings.

Firstly, **dconf** is a key-based Binary Large Object (BLOB) database for storing GNOME configurations. **dconf** manages user settings such as GDM, application, and proxy settings, and serves as the back end for **GSettings**.

Secondly, **dconf** is a command-line utility which is used for reading and writing individual values or entire directories from and to a dconf database.

GSettings is a high-level API for application settings which serves as the front end for dconf.

gsettings is a command-line tool which is used to view and change user settings.

3.2. MANAGING USER AND SYSTEM GNOME SETTINGS

dconf allows system administrators and users several levels of control over GNOME configuration:

- Administrators can define default settings that apply to all users.
- Users can override the defaults with their own settings.
- Administrators can also lock settings to prevent users from overriding them.

3.3. DISPLAYING GSETTINGS VALUES FOR DESKTOP APPLICATIONS

3.3.1. Using dconf-editor and gsettings utility

Viewing and editing of the **GSettings** values can be achieved with one of the following tools:

- dconf-editor GUI tool
- gsettings command-line utility

NOTE

The **dconf-editor** is not installed on the system by default. To install it, run the following command as the **root** user:

```
~]# yum install dconf-editor
```

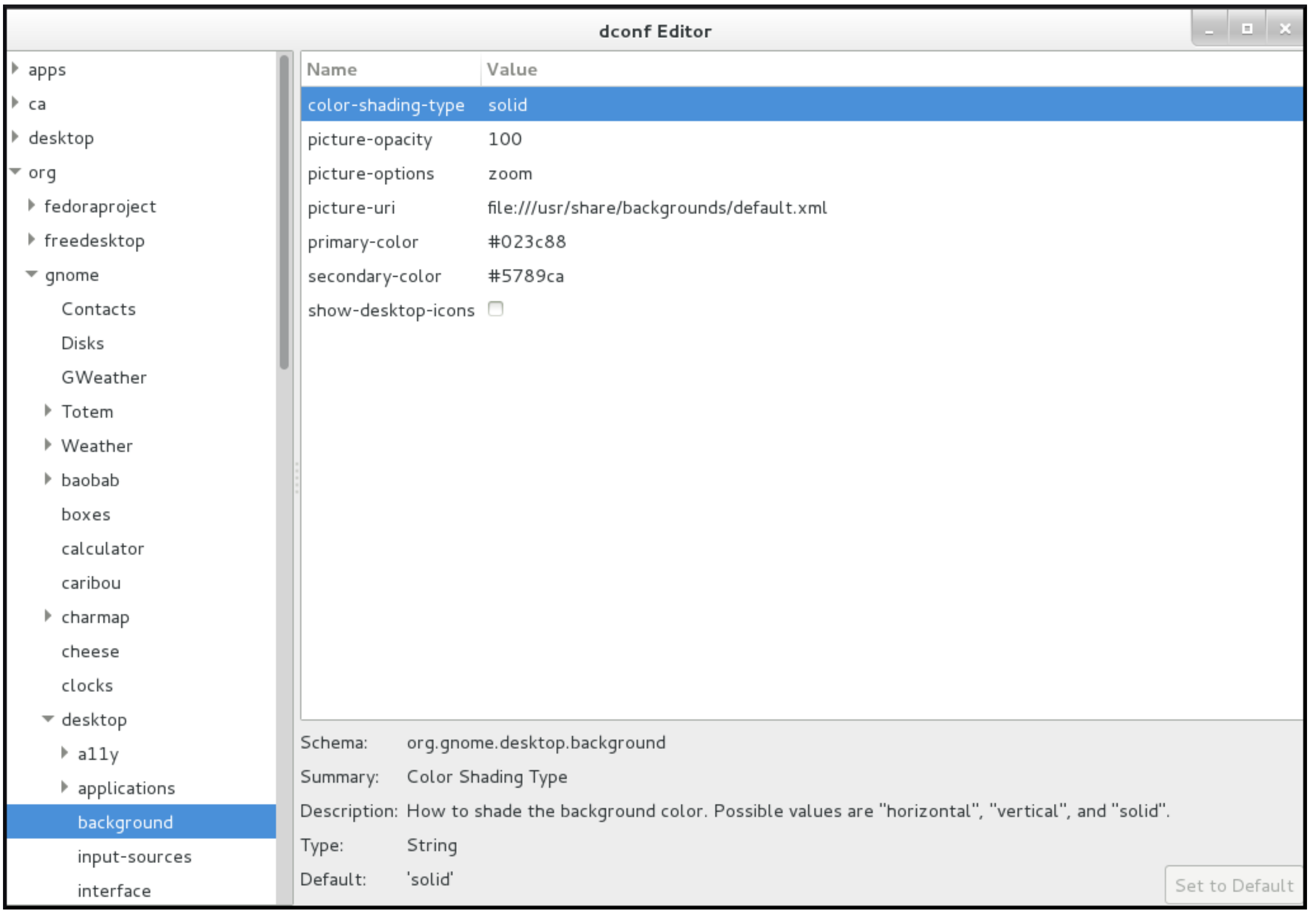
The **dconf-editor** and **gsettings utility** has the following in common:

- allow browsing and changing options for system and application preferences
- allow to change preferences
- can be run by regular users, because both tools are intended to browse and modify the current user’s GSettings database

The **dconf-editor** provides a GUI for browsing the settings and their editing. It presents the hierarchy of settings in a tree-view and also displays additional information about each setting, including the description, type and default value.

The **gsettings** utility can be used to display and set dconf values. **gsettings** utility supports Bash completion for commands and settings. This tools also allows you to automate configuration in shell scripts.

Figure 3.1. dconf-editor showing org.gnome.destop.background GSettings keys



Name	Value
color-shading-type	solid
picture-opacity	100
picture-options	zoom
picture-uri	file:///usr/share/backgrounds/default.xml
primary-color	#023c88
secondary-color	#5789ca
show-desktop-icons	☐

Schema: org.gnome.desktop.background
Summary: Color Shading Type
Description: How to shade the background color. Possible values are "horizontal", "vertical", and "solid".
Type: String
Default: 'solid'

3.3.2. Additional information

- For more information on the **dconf-editor** tool, see the **dconf-editor(1)** man page and the dconf-editor Project documentation.
- For more information on the **gsettings** utility, see the **gsettings(1)** man page.

3.4. USING DCONF PROFILES

3.4.1. Introduction to dconf profiles

A dconf profile is a list of system's hardware and software configuration databases, which the dconf system collects.

The dconf profiles allow you to compare identical systems to troubleshoot hardware or software problems.

The dconf system stores its profiles in the text files which can be located either within the **/etc/dconf/profile/** directory or elsewhere. The **$DCONF_PROFILE** environment variable can specify a relative path to the file from **/etc/dconf/profile/**, or an absolute path, such as in a user's home directory.

Note that key pairs which are set in a dconf profile override the default settings.

3.4.2. Selecting a dconf profile

On startup, **dconf** consults the **$DCONF_PROFILE** environment to find the name of the dconf profile to open. The result depends on whether the variable is set or not:

- If set, **dconf** attempts to open the profile named in the variable and aborts if this step fails.
- If not set, **dconf** attempts to open the profile named **user** and uses an internal hard-wired configuration if this step fails.

Each line in a dconf profile specifies one dconf database.

The first line indicates the database used to write changes. The remaining lines show read-only databases.

The following is a sample profile stored in **/etc/dconf/profile/user**:

```
user-db:user
system-db:local
system-db:site
```

In this example, the dconf profile specifies three databases. **user** is the name of the user database which can be found in **~/.config/dconf**, and **local** and **site** are system databases, located in **/etc/dconf/db/**.

NOTE

To apply a new dconf user profile to the user's session, you need to log out and log in, because the dconf profile for a session is determined at login.

WARNING

As a user or application developer, do not manipulate dconf directly. To manipulate dconf, always use the **dconf-editor** or the **gsettings utility**. The only exception to use dconf directly is when setting system-wide default configurations, because the aforementioned tools do not allow to manipulate such configurations.

3.5. CONFIGURING CUSTOM DEFAULT VALUES

Machine-wide default settings can be set by providing a default for a key in a dconf profile. These defaults can be overridden by the user.

Setting a default for a key has two prerequisites:

- the user profile exists
- the value for the key was added to a dconf database

For example, to set the default background:

1. Create the user profile in **/etc/dconf/profile/user**:

   ```
   user-db:user
   system-db:local
   ```

   where **local** is the name of a dconf database.

2. Create a keyfile for the local database in **/etc/dconf/db/local.d/01-background**, which contains the following default settings:

   ```
   ~]# dconf path

   [org/gnome/desktop/background]

   # GSettings key names and their corresponding values
   picture-uri='file:///usr/local/share/backgrounds/wallpaper.jpg'
   picture-options='scaled'
   primary-color='000000'
   secondary-color='FFFFFF'
   ```

   In the default setting of the keyfile, the following GSettings keys are used:

Table 3.1. org.gnome.desktop.background schemas GSettings Keys

Key Name	Possible Values	Description
picture-options	"none", "wallpaper", "centered", "scaled", "stretched", "zoom", "spanned"	Determines how the image set by wallpaper_filename is rendered.
picture-uri	filename with the path	URI to use for the background image. Note that the backend only supports local **file://** URIs.
primary-color	default: 000000	Left or Top color when drawing gradients, or the solid color.
secondary-color	default: FFFFFF	Right or Bottom color when drawing gradients, not used for solid color.

1. Edit the keyfile according to your preferences.

For more information, see Section 3.3, “Displaying GSettings values for desktop applications” .

2. Update the system databases:

```
~]# dconf update
```

When the user profile is created or changed, the user needs to log out and log in again before the changes will be applied.

If you want to avoid creating a user profile, you can use the **dconf command-line utility** to read and write individual values or entire directories from and to a dconf database. For more information, see the **dconf(1)** man page.

3.5.1. Locking down specific settings

By using the lockdown mode in dconf, you can prevent users from changing specific settings.

To lock down a GSettings key:

1. Create a locks subdirectory in the keyfile directory such as **/etc/dconf/db/local.d/locks/**.
2. Add any number of files with keys that you want to lock into this directory.

Without enforcing the system settings using a lockdown, any settings that users make take precedence over the system settings. User can thus override the system settings with their own.

For example, to lock settings for the default wallpaper:

1. Set a default wallpaper.
2. Create a new **/etc/dconf/db/local.d/locks/** directory.
3. Create a new file in **/etc/dconf/db/local.d/locks/00-default-wallpaper** with the following contents, listing one key per line:

```
# Prevent users from changing values for the following keys:
/org/gnome/desktop/background/picture-uri
/org/gnome/desktop/background/picture-options
/org/gnome/desktop/background/primary-color
/org/gnome/desktop/background/secondary-color
```

4. Update the system databases:

```
~]# dconf update
```

3.6. STORING USER SETTINGS OVER NFS

For **dconf** to work correctly when using Network File System (NFS) home directories, the **dconf keyfile back end** must be used.

Note that **dconf keyfile back end**only works properly if the **glib2-fam** package is installed. Without this package, notifications on configuration changes made on remote machines are not displayed properly.

With Red Hat Enterprise Linux 8, **glib2-fam** is available in the BaseOs repository.

To set the **dconf keyfile back end**

1. Ensure that the **glib2-fam** package is installed on the system.
   To verify whether the package is installed on the system:

   ```
   ~]#  yum list installed
   ```

   If **glib2-fam** is not in the list of installed packages, install it by running:

   ```
   ~]# yum install glib2-fam
   ```

2. Create or edit the **/etc/dconf/profile/user** file on every client.

3. At the very beginning of **/etc/dconf/profile/user file**, add the following line:

   ```
   service-db:keyfile/user
   ```

The **dconf keyfile back end**takes effect the next time that the user logs in. It polls the keyfile to determine whether updates have been made, so settings may not be updated immediately.

3.7. SETTING GSETTINGS KEYS PROPERTIES

This section describes how to set GSettings keys properties for a single-logged user.

Each GSettings key can have only one value in a dconf database. Setting the same key to a different value at a different place of the dconf database overrides the previous value.

Values of some keys are of array type. For array type, you can specify the value of the key as a list of multiple elements separated by a comma.

To set a GSettings key of array type, follow this syntax:

```
key=['option1', 'option2']
```

The following example shows setting of the **org.gnome.desktop.input-sources.xkb-options GSettings** key whose value is of array type:

Example settings of the org.gnome.desktop.input-sources.xkb-options GSettings Key

```
[org/gnome/desktop/input-sources]
# Enable Ctrl-Alt-Backspace for all users
# Set the Right Alt key as the Compose key and enable it
xkb-options=['terminate:ctrl_alt_bksp', 'compose:ralt']
```

3.8. WORKING WITH GSETTINGS KEYS ON COMMAND LINE

This section focuses on using of the **gsettings** command to configure, manipulate and manage the GSettings keys. The most frequent use cases that can be resolved by using the **gsettings** command are shown.

3.8.1. Setting key value

To set a value of a key:

```
gsettings set SCHEMA [:PATH] KEY
```

Note that the value is specified as a serialised GVariant.

Example 3.1. Adding selected applications into the favorite applications key

To add selected applications among your favorite applications:

```
$ gsettings set org.gnome.shell favorite-apps "['firefox.desktop', 'evolution.desktop',
'rhythmbox.desktop', 'shotwell.desktop', 'org.gnome.Nautilus.desktop',
'org.gnome.Software.desktop', 'yelp.desktop', 'org.gnome.Terminal.desktop',
'org.gnome.clocks.desktop']"
```

If the operation succeeds, no return code is shown. As a result, all listed applications are added to favorite applications. The change is valid immediately.

3.8.2. Monitoring key changes

To monitor a key for changes and print values that changed:

```
gsettings monitor SCHEMA [:PATH] [KEY]
```

Note that if the KEY argument is not specified, all keys in the schema are monitored. Monitoring continues until the process is terminated.

Example 3.2. Monitoring changes of the favorite applications key

To monitor the changes of the **favorite applications** key, open two terminals and run:

In the first terminal:

```
$ gsettings monitor org.gnome.shell favorite-apps
```

In the second terminal:

```
$ gsettings set org.gnome.shell favorite-apps "['firefox.desktop', 'evolution.desktop',
'rhythmbox.desktop', 'shotwell.desktop', 'org.gnome.Nautilus.desktop',
'org.gnome.Software.desktop', 'yelp.desktop', 'org.gnome.Terminal.desktop']"
```

As a result, a notification whether and how **favorite applications** changed is displayed in the first terminal:

```
favorite-apps: ['firefox.desktop', 'evolution.desktop', 'rhythmbox.desktop', 'shotwell.desktop',
'org.gnome.Nautilus.desktop', 'org.gnome.Software.desktop', 'yelp.desktop',
'org.gnome.Terminal.desktop']
```

3.8.3. Checking whether key is writable

To check whether a key is writable:

```
gsettings writable SCHEMA [:PATH] KEY
```

Example 3.3. Checking whether the favorite applications key is writable

To check whether the **favorite applications** key is writable:

```
$ gsettings writable org.gnome.shell favorite-apps
```

As a result, the return code shows **True**.

3.8.4. Checking key valid values

To check the range of valid values for a key:

```
gsettings range SCHEMA [:PATH] KEY
```

Example 3.4. Checking the range of valid values for the remember-mount-password key

To check valid values for the **remember-mount-password key**:

```
$ gsettings range org.gnome.shell remember-mount-password
```

As a result, the return code displays type of the key value, which is **type b** in this particular case. For more information, see GNOME developer.

3.8.5. Checking description of valid key values

To check the description of valid values for a key:

```
gsettings describe SCHEMA [:PATH] KEY
```

Example 3.5. Checking the description of valid values for the picture-uri key

To check the description of valid values for the **picture-uri** key:

```
$ gsettings describe org.gnome.desktop.screensaver picture-uri
```

As a result, the following output is displayed:

```
URI to use for the background image. Note that the backend only supports local file:// URIs.
```

3.8.6. Querying key value

To get the value of a key:

```
gsettings get SCHEMA [:PATH] KEY VALUE
```

Note that the value is displayed as a serialised GVariant.

Example 3.6. Querying value of the remember-mount-password key

To get value of the **remember-mount-password** key:

```
$ gsettings get org.gnome.shell remember-mount-password
```

As a result, the return code displays **false**.

3.8.7. Resetting key value

To reset the value of a key:

```
gsettings reset SCHEMA [:PATH] KEY
```

If resetting succeeds, no return code is displayed. Default values are in stored dconf and gsettings-desktop-schemas files.

Example 3.7. Resetting the lock-delay key to its default value

The default value of the **lock-delay** key is 0, and it is stored in the **/usr/share/glib-2.0/schemas/org.gnome.desktop.screensaver.gschema.xml** file.

Users can set the value of **lock-delay** as needed.

For example, to set the **lock-delay** key for screensaver to 200:

```
$ gsettings set org.gnome.desktop.screensaver lock-delay 200
```

To reset the **lock-delay** key for screensaver to its default value:

```
$ gsettings reset org.gnome.desktop.screensaver lock-delay
```

As a result, the value of **lock-delay** value is set to 0.

3.8.8. Resetting schema

To reset a schema:

```
gsettings reset-recursively SCHEMA [:PATH]
```

Example 3.8. Resetting the org.gnome.desktop.screensaver schema to its defaults

To reset the **org.gnome.desktop.screensaver** schema to its defaults:

```
$ gsettings reset-recursively org.gnome.desktop.screensaver
```

As a result, the **lock-delay** value is reset to 0, and other keys within the **org.gnome.desktop.screensaver** schema that were changed by user are reset to their defaults as well.

3.8.9. Listing installed non-relocatable schemas

To list installed schemas that are non-relocatable:

```
gsettings list-schemas [--print-paths]
```

If the **[--print-paths]** argument is specified , the path where each schema is mapped is printed as well.

Example 3.9. Listing installed non-relocatable schemas

To list all schemas installed on your system that are non-relocatable:

```
$ gsettings list-schemas
```

As a result, a full list of schemas is returned. The following list is truncated.

```
org.gnome.rhythmbox.library
org.gnome.shell.overrides
org.gnome.system.proxy.https
org.gnome.clocks
org.gnome.eog.fullscreen
org.gnome.login-screen
org.gnome.eog.view
```

3.8.10. Listing schema keys

To list the keys that are in the selected schema:

```
gsettings list-keys SCHEMA [:PATH]
```

Example 3.10. Listing keys in the org.gnome.shell schema

To list keys in the **org.gnome.shell** schema:

```
$ gsettings list-keys org.gnome.shell
```

As a result, a list of keys is returned. The following list is truncated.

```
enabled-extensions
command-history
remember-mount-password
always-show-log-out
had-bluetooth-devices-setup
looking-glass-history
disable-user-extensions
app-picker-view
```

```
disable-extension-version-validation
development-tools
favorite-apps
```

3.8.11. Listing schema children

To list children of a selected schema:

```
gsettings list-children SCHEMA [:PATH]
```

Note that the list is empty if there are no children.

Example 3.11. Listing children of the org.gnome.shell schema

To list children of the **org.gnome.shell** schema:

```
$ gsettings list-children org.gnome.shell
```

As a result, the following output is returned:

```
keyboard org.gnome.shell.keyboard
keybindings org.gnome.shell.keybindings
```

3.8.12. Listing schema's keys and values

To list keys and values of a selected schema recursively:

```
gsettings list-recursively [SCHEMA [:PATH]]
```

Note that if the schema whose keys you want to list is not specified, all keys within all schemas are listed.

Example 3.12. Listing keys and values recursively

To list keys and values in all schemas recursively:

```
$ gsettings list-recursively
```

As a result, all key and values in all schemas on system are listed, as shown below. Note that the following list is truncated.

```
org.gnome.nautilus.desktop network-icon-visible false
org.gnome.nautilus.desktop font ''
org.gnome.nautilus.desktop network-icon-name 'Network Servers'
org.gnome.nautilus.desktop home-icon-name 'Home'
org.gnome.nautilus.desktop volumes-visible true
org.gnome.Vinagre always-enable-listening false
org.gnome.Vinagre always-show-tabs false
org.gnome.Vinagre show-accels false
org.gnome.Vinagre history-size 15
org.gnome.Vinagre shared-flag true
```

3.9. ACKNOWLEDGEMENTS

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CHAPTER 4. CUSTOMIZING DESKTOP APPEARANCE

This section explains how system administrators can customize appearance of the desktop environment for different users of the system.

4.1. CUSTOMIZING DESKTOP BACKGROUNDS

As a system administrator, you can configure the default desktop background, add extra backgrounds, or add multiple backgrounds using the **dconf** utility.

If the users of the system are not permitted to change background from the defaults, system administrator needs to lock the settings using the **locks** directory. Otherwise, each user can customize the background according to their preferences.

4.1.1. Customizing the default desktop background

You can configure the default desktop background and its appearance by setting the relevant GSettings keys in the **org.gnome.desktop.background** schema.

For more information about **GSettings**, see Section 3.1, "Introduction to configuring GNOME" .

Use the following procedure to set the default background:

Procedure

1. Create a local database for machine-wide settings in **/etc/dconf/db/local.d/00-background**:

```
# Specify the dconf path
[org/gnome/desktop/background]

# Specify the path to the desktop background image file
picture-uri='file:///usr/local/share/backgrounds/wallpaper.jpg'
# Specify one of the rendering options for the background image:
# 'none', 'wallpaper', 'centered', 'scaled', 'stretched', 'zoom', 'spanned'
picture-options='scaled'
# Specify the left or top color when drawing gradients or the solid color
primary-color='000000'
# Specify the right or bottom color when drawing gradients
secondary-color='FFFFFF'
```

2. Optionally, if you want an user to not be able to change the default background, override the user's setting in the **/etc/dconf/db/local.d/locks/background** file:

```
# List the keys used to configure the desktop background
/org/gnome/desktop/background/picture-uri
/org/gnome/desktop/background/picture-options
/org/gnome/desktop/background/primary-color
/org/gnome/desktop/background/secondary-color
```

3. Update the system databases:

```
# dconf update
```

4. Users must log out and back in again before the system-wide settings take effect.

4.1.2. Adding extra backgrounds

You can make extra backgrounds available to users on your system.

Procedure

1. Use the **org.gnome.desktop.background** schemas to create a file in the **xml** format specifying your extra background's appearance.

   Table 4.1. Frequently used org.gnome.desktop.background schemas GSettings Keys

Key Name	Possible Values	Description
picture-options	"none", "wallpaper", "centered", "scaled", "stretched", "zoom", "spanned"	Determines how the image set by wallpaper_filename is rendered.
color-shading-type	"horizontal", "vertical", and "solid"	Determines shade the background color.
primary-color	default: #023c88	Left or Top color when drawing gradients, or the solid color.
secondary-color	default: #5789ca	Right or Bottom color when drawing gradients, not used for solid color.

   idef::desktop-title[] The full range of options can be found in the **dconf-editor** GUI or the **gsettings** command-line utility. For more information, see Section 3.3, "Displaying GSettings values for desktop applications". endif::

2. Store the *.xml file under the **/usr/share/gnome-background-properties/** directory.

When an user clicks their name in the top right corner, chooses **Settings**, and in the **Personal** section of the table selects **Background**, they will see the new background available.

Example implementation of org.gnome.desktop.background GSettings keys

An example extra backgrounds file with one <wallpaper> element

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE wallpapers SYSTEM "gnome-wp-list.dtd">
<wallpapers>
  <wallpaper deleted="false">
    <name>Company Background</name>
    <name xml:lang="de">Firmenhintergrund</name>
    <filename>/usr/local/share/backgrounds/company-wallpaper.jpg</filename>
    <options>zoom</options>
    <shade_type>solid</shade_type>
    <pcolor>#ffffff</pcolor>
    <scolor>#000000</scolor>
  </wallpaper>
</wallpapers>
```

In one configuration file, you can specify multiple **<wallpaper>** elements to add more backgrounds as shown in the following example with two **<wallpaper>** elements, adding two different backgrounds.

An example extra backgrounds file with two **<wallpaper>** elements

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE wallpapers SYSTEM "gnome-wp-list.dtd">
<wallpapers>
  <wallpaper deleted="false">
    <name>Company Background</name>
    <name xml:lang="de">Firmenhintergrund</name>
    <filename>/usr/local/share/backgrounds/company-wallpaper.jpg</filename>
    <options>zoom</options>
    <shade_type>solid</shade_type>
    <pcolor>#ffffff</pcolor>
    <scolor>#000000</scolor>
  </wallpaper>
  <wallpaper deleted="false">
    <name>Company Background 2</name>
    <name xml:lang="de">Firmenhintergrund 2</name>
    <filename>/usr/local/share/backgrounds/company-wallpaper-2.jpg</filename>
    <options>zoom</options>
    <shade_type>solid</shade_type>
    <pcolor>#ff0000</pcolor>
    <scolor>#00ffff</scolor>
  </wallpaper>
</wallpapers>
```

4.1.3. Setting the screen shield

Screen shield is the screen that quickly slides down when the system is locked. It is controlled by the **org.gnome.desktop.screensaver.picture-uri** GSettings key. GDM uses its own dconf profile, so you can set the default background by changing the settings in that profile.

For more information on **GSettings** and **dconf**, see Section 3.1, “Introduction to configuring GNOME” .

Procedure

1. Create a gdm database for machine-wide settings in **/etc/dconf/db/gdm.d/01-screensaver**:

   ```
   [org/gnome/desktop/screensaver]
   picture-uri='file:///opt/corp/background.jpg'
   ```

   Replace **/opt/corp/background.jpg** with the path to the image file you want to use as the screen shield. Supported formats are PNG, JPG, JPEG, and TGA. Note that the image will be scaled if necessary to fit the screen.

2. Update the system databases:

   ```
   # dconf update
   ```

3. Users must log out and back in again before the system-wide settings take effect.

Troubleshhoting

If the screen shield does not update, you can:

1. Make sure that you have updated the system databases by running the **dconf update** command as the **root** user.

2. Try restarting GDM.

4.2. USING GNOME SHELL EXTENSIONS TO CUSTOMIZE DESKTOP ENVIRONMENT

GNOME Shell extensions allow for the customization of the default GNOME Shell interface and its parts, such as window management and application launching.

> **IMPORTANT**
>
> Before deploying third-party GNOME Shell extensions on Red Hat Enterprise Linux, make sure to read the following document to learn about the Red Hat support policy for third-party software:How does Red Hat Global Support Services handle third-party software, drivers, and/or uncertified hardware/hypervisors?

4.2.1. Enabling machine-wide extensions

Prerequisite:
To make extensions available to all users on the system, install them in the **/usr/share/gnome-shell/extensions** directory.

Procedure

1. Create a local database file for machine-wide settings in **/etc/dconf/db/local.d/00-extensions**:

```
[org/gnome/shell]
# List all extensions that you want to have enabled for all users
enabled-extensions=['myextension1@myname.example.com',
'myextension2@myname.example.com']
```

   The **enabled-extensions** key specifies the enabled extensions using the extensions' uuid (**myextension1@myname.example.com** and **myextension2@myname.example.com**).

2. Update the system databases:

```
# dconf update
```

3. Users must log out and back in again before the system-wide settings take effect.

> **NOTE**
>
> There is currently no way to enable additional extensions for users who have already logged in. This does not apply for existing users who have installed and enabled their own GNOME extensions.

4.2.2. Locking down enabled extensions

You can prevent the user from enabling or disabling extensions by locking down the **org.gnome.shell.enabled-extensions key**.

Procedure

1. Create a local database file for machine-wide settings in **/etc/dconf/db/local.d/00-extensions**:

   ```
   [org/gnome/shell]
   # List all extensions that you want to have enabled for all users
   enabled-extensions=['myextension1@myname.example.com',
   'myextension2@myname.example.com']
   ```

   The **enabled-extensions** key specifies the enabled extensions using the extensions' uuid (**myextension1@myname.example.com** and **myextension2@myname.example.com**).

2. Override the user's setting and prevent the user from changing it in **/etc/dconf/db/local.d/locks/extensions**:

   ```
   # Lock the list of mandatory extensions
   /org/gnome/shell/enabled-extensions
   ```

3. Update the system databases:

   ```
   # dconf update
   ```

4. Users must log out and back in again before the system-wide settings take effect.

After locking down the **org.gnome.shell.enabled-extensions**, any extensions installed in **~/.local/share/gnome-shell/extensions** or **/usr/share/gnome-shell/extensions** that are not listed in the **org.gnome.shell.enabled-extensions** key will not be loaded by GNOME Shell, thus preventing the user from using them.

4.2.3. Setting up mandatory extensions

In GNOME Shell, you can provide a set of extensions that the user has to use.

Prerequisites

The extensions must be installed under the **/usr/share/gnome-shell/extensions** directory.

Procedure

1. Create a local database file for machine-wide settings in **/etc/dconf/db/local.d/00-extensions-mandatory**:

   ```
   [org/gnome/shell]
   # List all mandatory extensions
   enabled-extensions=['myextension1@myname.example.com',
   'myextension2@myname.example.com']
   ```

   The **enabled-extensions** key specifies the enabled extensions using the extensions' uuid (**myextension1@myname.example.com** and **myextension2@myname.example.com**).

2. Override the user's setting and prevent the user from changing it in **/etc/dconf/db/local.d/locks/extensions-mandatory**:

   ```
   # Lock the list of mandatory extensions
   /org/gnome/shell/enabled-extensions
   ```

3. Update the system databases:

```
# dconf update
```

4. Users must log out and back in again before the system-wide settings take effect.

CHAPTER 5. CUSTOMIZING GNOME DESKTOP FEATURES

5.1. ENABLING THE CTRL+ALT+BACKSPACE SHORTCUT

The **Ctrl+Alt+Backspace** shortcut key combination is used for terminating the **X.Org** display server.

You might want to terminate **X.Org** especially when:

- A program caused **X.Org** to stop working.
- You need to switch from your logged-in session quickly.
- You have launched a program that failed.
- You cannot operate in the current session.
- Your screen freezes.

To enable the **Ctrl+Alt+Backspace** shortcut to forcibly terminate **X.Org** by default for all users, you need to set the **org.gnome.desktop.input-sources.xkb-options** GSettings key.

Procedure

1. Create a local database for machine-wide settings in **/etc/dconf/db/local.d/00-input-sources**:

```
[org/gnome/desktop/input-sources]
# Enable Ctrl-Alt-Backspace for all users
xkb-options=['terminate:ctrl_alt_bksp']
```

2. Override the user’s setting, and prevent the user from changing it in **/etc/dconf/db/local.d/locks/input-sources**:

```
# Lock the list of enabled XKB options
/org/gnome/desktop/input-sources/xkb-options
```

3. Update the system databases for the changes to take effect:

```
# dconf update
```

4. Users must log out and back in again before the system-wide settings take effect.

If the **Ctrl+Alt+Backspace** key combination is enabled, all users can terminate **X.Org** , which brings them back to the login prompt.

5.2. DISABLING COMMAND-LINE ACCESS

To disable command-line access for a desktop user, you need to make configuration changes in a number of different contexts:

- Section 5.2.1, “Setting the org.gnome.desktop.lockdown.disable-command-line Key”
- Section 5.2.2, “Disabling virtual terminal switching on X.Org”

- Remove **Terminal** and any other application that provides access to the terminal from the **Applications menu** and **Activities Overview** in GNOME Shell. This is done by removing menu items for those applications.

NOTE

The following steps do not remove the desktop user's permissions to access a command line, but rather remove the ways that the desktop user could access command line.

5.2.1. Setting the org.gnome.desktop.lockdown.disable-command-line Key

This approach prevents the user from:

- Accessing the terminal
- Specifying a command line to be executed by using the **Alt+F2** command prompt

Procedure

1. Create a local database for machine-wide settings in **/etc/dconf/db/local.d/00-lockdown**:

```
[org/gnome/desktop/lockdown]
# Disable command-line access
disable-command-line=true
```

2. Override the user's setting and prevent the user from changing it in **/etc/dconf/db/local.d/locks/lockdown**:

```
# Lock the disabled command-line access
/org/gnome/desktop/lockdown
```

3. Update the system databases:

```
# dconf update
```

4. Users must log out and back in again before the system-wide settings take effect.

5.2.2. Disabling virtual terminal switching on X.Org

With the **X.Org** display server, users can normally use the **Ctrl+Alt+function** key shortcuts to switch from the GNOME Desktop and **X.Org** to a virtual terminal. You can disable access to all virtual terminals by modifying the **X.Org** configuration. The **X.Org** configuration should be modified by adding the **DontVTSwitch** option to the **Serverflags** section of an X configuration file in the **/etc/X11/xorg.conf.d/** directory, as shown by the following procedure.

IMPORTANT

You cannot apply the procedure if **GNOME Shell on Wayland** is used as the display server.

Procedure

1. Create or edit an X configuration file in the **/etc/X11/xorg.conf.d/** directory:

NOTE

By convention, these host-specific configuration file names start with two digits and a hyphen and always have the **.conf** extension. Thus, the following file name can be **/etc/X11/xorg.conf.d/10-xorg.conf**.

```
Section "Serverflags"

Option "DontVTSwitch" "yes"

EndSection
```

2. Restart the **X.Org** display server for the changes to take effect.

5.3. PREVENTING THE COMPUTER FROM SUSPENDING WHEN CLOSING THE LID

When closing the lid of your laptop, the computer by default suspends in order to save power. You can prevent the computer from suspending when closing the lid by changing the setting for that behavior.

WARNING

Some laptops can overheat if they are left running with the lid closed, especially if they are in a confined place. Therefore, consider whether changing the default setting from **suspend** to an other option is beneficial in your case.

Procedure

1. Open the **/etc/systemd/logind.conf** file for editing.
2. Find the **HandleLidSwitch=suspend** line in the file.
   If it is quoted out with the **#** character at the start, unquote it by removing **#**.

   If the line is not present in the file, add it.
3. Replace the default **suspend** parameter with:
   - **lock** for the screen to lock
   - **ignore** for nothing to happen
   - **poweroff** for the computer to switch off
     For example:

     ```
     [Login]
     HandleLidSwitch=lock
     ```
4. Save your changes, and close the editor.

5. Run the following command so that your changes preserve the next restart of the system:

   ```
   # systemctl restart systemd-logind.service
   ```

WARNING

Restarting the service forcibly interrupts any currently running GNOME session of any desktop user who is logged in. This can result in users losing unsaved data.

For more information on the **/etc/systemd/logind.conf** file, see the **logind.conf** man page.

5.4. CHANGING BEHAVIOR WHEN PRESSING THE POWER BUTTON IN GRAPHICAL TARGET MODE

When the machine is booted to a graphical login screen or user session, hitting the **power** button makes the machine suspend by default. This happens both in cases when the user presses the **power** button physically or when pressing a virtual **power** button from a remote console. To achieve a different behavior when pressing the **power** button, set the function of this button with **dconf**.

For example, if you want the system to shutdown after pressing the **power** button, use the following procedure:

Procedure

1. Create a local database for system-wide settings in the **/etc/dconf/db/local.d/01-power** file:

   ```
   [org/gnome/settings-daemon/plugins/power]
   power-button-action='interactive'
   ```

2. Override the user’s setting, and prevent the user from changing it in the **/etc/dconf/db/local.d/locks/01-power** file:

   ```
   /org/gnome/settings-daemon/plugins/power/power-button-action
   ```

3. Update the system databases:

   ```
   # dconf update
   ```

4. Log out and back in again before the system-wide settings take effect.

This configuration initiates a system shutdown after pressing the **power** button. To configure the system differently, you can set the behavior of particular buttons.

Options for particular buttons:

- nothing
  does nothing

- suspend

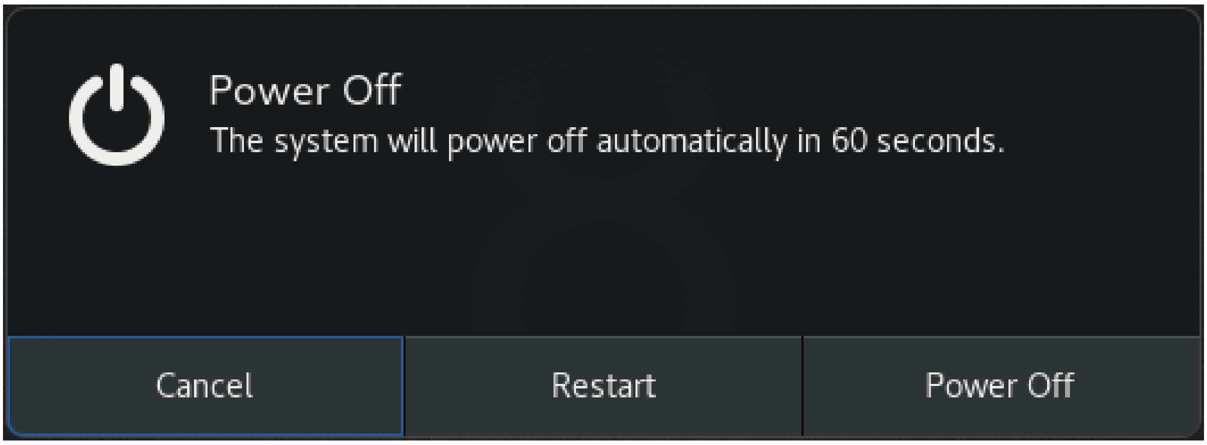
suspends the system

- hibernate
  hibernates the system

- interactive
  shows a pop-up query asking the user what to do

  With interactive mode, the system powers off automatically after 60 seconds when hitting the power button. However, you can choose a different behavior from the pop-up query as shown in the figure below.

Pop-up query for interactive mode



Power Off

The system will power off automatically in 60 seconds.

CHAPTER 6. LOCKING DOWN SELECTED TASKS

This section describes how to lock down for users the following tasks:

- Printing
- File saving on disk
- Repartitioning
- User logout and user switching

6.1. LOCKING DOWN PRINTING

You can disable the print dialog from being shown to users. This can be useful if you are giving temporary access to a user or you do not want the user to print to network printers.

IMPORTANT

The feature only works in applications which support it. Not all GNOME and third party applications have this feature enabled. The changes do not have effect on applications which do not support this feature.

To provent applications from printing, lock down the **org.gnome.desktop.lockdown.disable-printing** key:

Procedure

1. Create the user profile in **/etc/dconf/profile/user** unless it already exists:

```
user-db:user
system-db:local
```

2. Create a local database for machine-wide settings in the **etc/dconf/db/local.d/00-lockdown** file:

```
[org/gnome/desktop/lockdown]

# Prevent applications from printing
disable-printing=true
```

3. Override the user's setting and prevent the user from changing it in the **/etc/dconf/db/local.d/locks/lockdown** file:

```
# List the keys used to configure lockdown
/org/gnome/desktop/lockdown/disable-printing
```

4. Update the system databases:

```
# dconf update
```

Having followed these steps, applications supporting this lockdown key, such as **Evolution**, **Evince**, or **Gedit**, will disable printing.

6.2. LOCKING FILE SAVING ON DISK

You can disable the **Save** and **Save As** dialogs. This can be useful if you are giving temporary access to a user or you do not want the user to save files to the computer.

IMPORTANT

The feature only works in applications which support it. Not all GNOME and third party applications have this feature enabled. The changes will have no effect on applications which do not support this feature.

To prevent applications from file saving, lock down the **org.gnome.desktop.lockdown.disable-save-to-disk** key:

Procedure

1. Create the user profile in **/etc/dconf/profile/user** unless it already exists:

```
user-db:user
system-db:local
```

2. Create a local database for machine-wide settings in the **/etc/dconf/db/local.d/00-lockdown** file:

```
[org/gnome/desktop/lockdown]

# Prevent the user from saving files on disk
disable-save-to-disk=true
```

3. Override the user’s setting and prevent the user from changing it in the **/etc/dconf/db/local.d/locks/lockdown** file:

```
# Lock this key to disable saving files on disk
/org/gnome/desktop/lockdown/disable-save-to-disk
```

4. Update the system databases:

```
# dconf update
```

Having followed these steps, applications supporting this lockdown key, for example **Videos**, **Image Viewer**, **Evolution**, **Document Viewer**, or **GNOME Shell**, will disable their **Save As** dialogs.

6.3. LOCKING REPARTITIONING

polkit enables you to set permissions for individual operations. For **udisks2**, the utility for disk management services, the configuration is located at **/usr/share/polkit-1/actions/org.freedesktop.udisks2.policy**. This file contains a set of actions and default values, which can be overridden by system administrator.

IMPORTANT

polkit configuration stored in **/etc** overrides the configuration shipped by packages in **/usr/share/**.

Procedure

1. Create a file with the same content as in **/usr/share/polkit-1/actions/org.freedesktop.udisks2.policy**:

   ```
   cp /usr/share/polkit-1/actions/org.freedesktop.udisks2.policy /etc/share/polkit-
   1/actions/org.freedesktop.udisks2.policy
   ```

   Do not change the **/usr/share/polkit-1/actions/org.freedesktop.udisks2.policy** file, your changes will be overwritten by the next package update.

2. Delete the action you do not need, and add the following lines to the **/etc/polkit-1/actions/org.freedesktop.udisks2.policy** file:

   ```
   <action id="org.freedesktop.udisks2.modify-device">
     <message>Authentication is required to modify the disks settings</message>
        <defaults>
          <allow_any>no</allow_any>
          <allow_inactive>no</allow_inactive>
          <allow_active>yes</allow_active>
        </defaults>
    </action>
   ```

   Replace **no** by **auth_admin** if you want to ensure only the **root** user is able to perform the action.

3. Save the changes.

When the user tries to change the disks settings, the following message is returned:

```
Authentication is required to modify the disks settings.
```

6.4. LOCKING DOWN USER LOGOUT AND USER SWITCHING

To prevent the user from logging out, use the folowing procedure.

Procedure

1. Create the **/etc/dconf/profile/user** profile, which contains the following lines:

   ```
   user-db:user
   system-db:local
   ```

   where **local** is the name of a dconf database

2. Create the **/etc/dconf/db/local.d/** directory if it does not already exist.

3. Create the **/etc/dconf/db/local.d/00-logout** key file to provide information for the local database:

   ```
   [org/gnome/desktop/lockdown]
   # Prevent the user from user switching
   disable-log-out=true
   ```

4. Override the user’s setting, and prevent the user from changing it in the **/etc/dconf/db/local.d/locks/lockdown** file:

```
# Lock this key to disable user logout
/org/gnome/desktop/lockdown/disable-log-out
```

5. Update the system databases:

```
# dconf update
```

6. Users must log out and back in again before the system-wide settings take effect.

IMPORTANT

Users can evade the logout lockdown by switching to a different user. To prevent such scenario, lock down user swithcing as well.

To lock down user switching, use the following procedure:

Procedure

1. Create the **/etc/dconf/profile/user** profile, which contains the following lines:

```
user-db:user
system-db:local
```

where **local** is the name of a dconf database

2. Create the **/etc/dconf/db/local.d/** directory if it does not already exist.

3. Create the **/etc/dconf/db/local.d/00-user-switching** key file to provide information for the local database:

```
[org/gnome/desktop/lockdown]
# Prevent the user from user switching
disable-user-switching=true
```

4. Override the user’s setting, and prevent the user from changing it in the **/etc/dconf/db/local.d/locks/lockdown** file:

```
# Lock this key to disable user switching
/org/gnome/desktop/lockdown/disable-user-switching
```

5. Update the system databases:

```
# dconf update
```

6. Users must log out and back in again before the system-wide settings take effect.

CHAPTER 7. MANAGING USER SESSIONS

7.1. WHAT GDM IS

The GNOME Display Manager (GDM) is a graphical login program running in the background that runs and manages the **X.Org** display servers for both local and remote logins.

GDM is a replacement for XDM, the X Display Manager. However, GDM is not derived from XDM and does not contain any original XDM code. In addition, there is no support for a graphical configuration tool in GDM, so editing the **/etc/gdm/custom.conf** configuration file is necessary to change the GDM settings.

7.2. RESTARTING GDM

When you make changes to the system configuration such as setting up the login screen banner message, login screen logo, or login screen background, restart GDM for your changes to take effect.

> **WARNING**
>
> Restarting the service forcibly interrupts any currently running GNOME session of any desktop user who is logged in. This can result in users losing unsaved data.

Procedure

- To restart the GDM service, run the following command:

  ```
  # systemctl restart gdm.service
  ```

Procedure

- To display results of the GDM configuration, run the following command:

  ```
  $ DCONF_PROFILE=gdm gsettings list-recursively org.gnome.login-screen
  ```

7.3. ADDING AN AUTOSTART APPLICATION FOR ALL USERS

To start an application automatically when the user logs in, create a .desktop file for that application in the **/etc/xdg/autostart/** directory. To manage autostart applications for individual users, use the **gnome-session-properties** application.

Procedure

1. Create a .desktop file in the **/etc/xdg/autostart/** directory:

   ```
   [Desktop Entry]
   Type=Application
   Name=Files
   ```

```
Exec=nautilus -n
OnlyShowIn=GNOME;
AutostartCondition=GSettings org.gnome.desktop.background show-desktop-icons
```

Replace **Files** with the name of the application.

Replace **nautilus -n** with the command you want to use to run the application.

2. Use the **AutostartCondition** key to check for a value of a GSettings key.
   The session manager runs the application automatically if the key's value is true. If the key's value changes in the running session, the session manager starts or stops the application, depending on what the previous value for the key was.

7.4. CONFIGURING AUTOMATIC LOGIN

As an administrator, you can enable automatic login from the **Users panel** in **GNOME Settings**, or you can set up automatic login manually in the GDM custom configuration file, as follows.

Run the follwoing procedure to set up automatic login for a user john.

Procedure

- Edit the **/etc/gdm/custom.conf** file, and make sure that the **[daemon]** section in the file specifies the following:

```
[daemon]
AutomaticLoginEnable=True
AutomaticLogin=john
```

Replace **john** with the user that you want to be automatically logged in.

7.5. CONFIGURING AUTOMATIC LOGOUT

User sessions that have been idle for a specific period of time can be ended automatically. You can set different behavior based on whether the machine is running from a battery or from mains power by setting the corresponding GSettings key, then locking it.

> **WARNING**
>
> Users can potentially lose unsaved data if an idle session is automatically ended.

To set automatic logout for a mains powered machine:

Procedure

1. Create a local database for machine-wide settings in the **/etc/dconf/db/local.d/00-autologout** file:

```
[org/gnome/settings-daemon/plugins/power]
# Set the timeout to 900 seconds when on mains power
```

```
sleep-inactive-ac-timeout=900
# Set action after timeout to be logout when on mains power
sleep-inactive-ac-type='logout'
```

2. Override the user's setting, and prevent the user from changing it in the **/etc/dconf/db/local.d/locks/autologout** file:

```
# Lock automatic logout settings
/org/gnome/settings-daemon/plugins/power/sleep-inactive-ac-timeout
/org/gnome/settings-daemon/plugins/power/sleep-inactive-ac-type
```

3. Update the system databases:

```
# dconf update
```

4. Users must log out and back in again before the system-wide settings take effect.

The following GSettings keys are of interest:

- org.gnome.settings-daemon.plugins.power.sleep-inactive-ac-timeout
  The number of seconds that the computer needs to be inactive before it goes to sleep if it is running from AC power.

- org.gnome.settings-daemon.plugins.power.sleep-inactive-ac-type
  What should happen when the timeout has passed if the computer is running from AC power.

- org.gnome.settings-daemon.plugins.power.sleep-inactive-battery-timeout
  The number of seconds that the computer needs to be inactive before it goes to sleep if it is running from power.

- org.gnome.settings-daemon.plugins.power.sleep-inactive-battery-type
  What should happen when the timeout has passed if the computer is running from battery power.

If you want to list available values for a key, use the following procedure:

Procedure

- Run the **gsettings range** command on the required key. For example:

```
$ gsettings range org.gnome.settings-daemon.plugins.power sleep-inactive-ac-type
enum
'blank'
'suspend'
'shutdown'
'hibernate'
'interactive'
'nothing'
'logout'
```

7.6. SETTING SCREEN BRIGHTNESS AND IDLE TIME

This section describes how to:

- Configure the drop in the brightness leve
- Set brightness level
- Set idle time

Configuring the drop in the brightness level

To set the drop in the brightness level when the device has been idle for some time:

Procedure

1. Create a local database for machine-wide settings in the **/etc/dconf/db/local.d/00-power** file including these lines:

   ```
   [org/gnome/settings-daemon/plugins/power]
   idle-dim=true
   ```

2. Update the system databases:

   ```
   # dconf update
   ```

3. Users must log out and back in again before the system-wide settings take effect.

Setting brightness level

To set brightness level:

Procedure

1. Create a local database for machine-wide settings in the **/etc/dconf/db/local.d/00-power** file, as in the following example:

   ```
   [org/gnome/settings-daemon/plugins/power]
   idle-brightness=30
   ```

   Replace **30** with the integer value you want to use.

2. Update the system databases:

   ```
   # dconf update
   ```

3. Users must log out and back in again before the system-wide settings take effect.

Setting idle time

To set idle time after which the screen is blanked and the default screensaver is displayed:

Procedure

1. Create a local database for machine-wide settings in **/etc/dconf/db/local.d/00-session**, as in the following example:

   ```
   [org/gnome/desktop/session]
   idle-delay=uint32 900
   ```

   Replace **900** with the integer value you want to use.

You must include the **uint32** along with the integer value as shown.

2. Update the system databases:

```
# dconf update
```

3. Users must log out and back in again before the system-wide settings take effect.

7.7. LOCKING THE SCREEN WHEN THE USER IS IDLE

To enable the screensaver and make the screen lock automatically when the user is idle, follow this procedure:

Procedure

1. Create a local database for system-wide settings in the **etc/dconf/db/local.d/00-screensaver** file:

```
[org/gnome/desktop/session]
# Set the lock time out to 180 seconds before the session is considered idle
idle-delay=uint32 180
[org/gnome/desktop/screensaver]
# Set this to true to lock the screen when the screensaver activates
lock-enabled=true
# Set the lock timeout to 180 seconds after the screensaver has been activated
lock-delay=uint32 180
```

You must include the **uint32** along with the integer key values as shown.

2. Override the user’s setting, and prevent the user from changing it in the **/etc/dconf/db/local.d/locks/screensaver** file:

```
# Lock desktop screensaver settings
/org/gnome/desktop/session/idle-delay
/org/gnome/desktop/screensaver/lock-enabled
/org/gnome/desktop/screensaver/lock-delay
```

3. Update the system databases:

```
# dconf update
```

4. Users must log out and back in again before the system-wide settings take effect.

7.8. SCREENCAST RECORDING

GNOME Shell features a built-in screencast recorder. The recorder allows users to record desktop or application activity during their session and distribute the recordings as high-resolution video files in the **webm** format.

To make a screencast:

Procedure

1. To start the recording, press **Ctrl**+**Alt**+**Shift**+**R** shortcut.

When the recorder is capturing the screen activity, it displays a red circle in the bottom-right corner of the screen.

2. To stop the recording, press **Ctrl**+**Alt**+**Shift**+**R** shortcup.
   The red circle in the bottom-right corner of the screen disappears.

3. Navigate to the **~/Videos** directory where you can find the recorded video with a file name that starts with Screencast and includes the date and time of the recording.

NOTE

The built-in recorder always captures the entire screen, including all monitors in multi-monitor setups.