

# Running Commands as Superuser with `sudo`

## WHAT?

Learn about the basic concepts of `sudo` and how to use it as a regular user.

## WHY?

Certain commands require administrator privileges. To run a command with administrator rights, the `sudo` command can be used.

## EFFORT

It takes you up to 20 minutes to read through this article. If you have a specific question, you can jump directly to the respective chapter.

## GOAL

Understanding the basic concepts of `sudo` and running commands with `sudo` for certain use cases.

## REQUIREMENTS

- `root` or `sudo` privileges. These are only available if you are the administrator of the system. For more information, refer to [Section 1, "Basic concepts of `sudo`"](#).

- The `sudo` package needs to be installed. This package is available on SUSE Linux Enterprise Micro by default.

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# 1 Basic concepts of **sudo**

Learn about the basic concepts of **sudo** and how it works on SUSE Linux Enterprise Micro systems.

**sudo** is a Linux command that is used to temporarily execute programs as another user. It is the abbreviation for substitute user and do and borrows the privileges of another user, for example, the root user. This way, **sudo** helps you accomplish system administration tasks without logging in as root.

## 1.1 **sudo** on Linux systems in general

As a regular user on Linux, you have reduced permissions that are sufficient for most of the tasks. The root user is the Linux superuser and the equivalent to the administrator.

**sudo** allows specified (non-root) users or a group of users to run privileged tasks, like calling system functions as root or another user. Through a configuration file, the system administrator can control which users are allowed to run **sudo** commands and for which tasks.

## 1.2 **sudo** on SUSE Linux Enterprise Micro systems

For security reasons, all SUSE Linux Enterprise Micro systems separate the regular user from the root user. As a regular user, you cannot write to system directories or install programs. Any user with access to the root password can gain these privileges and accidentally or maliciously break the system.

For example, you are logged in as a regular user and accidentally browse to a malicious website. An attacker cannot install malware on your system behind your back, as you are logged in as a regular user, means without any administrative permissions.

As explained above, it is not recommended to be logged in as root user permanently for security reasons. A safer approach is to stay logged with your regular user and running a restricted command prefaced with **sudo**.



### Note: **sudo** requires administrator rights

On a single-user machine, where you have set your own root password, you have the required rights to administrate your system by using the **sudo** command and to configure **sudo** settings yourself.

For more information about how to configure **sudo**, refer to <https://documentation.suse.com/smart/systems-management/html/sudo-configure-superuser-privileges/index.html>.

In a multi-user environment, such as in companies, the **sudo** privileges are managed by a system administrator and the permissions of the **root** user can be restricted. You may not be allowed to change certain system directories or files, even when executing the command with **sudo**.

### 1.3 How **sudo** works

When running a command prefaced with **sudo**, the system asks you for the password of the **root** account. After successful authentication, the command is executed with superuser privileges.

Depending on the **sudo** configuration, the elevated privileges persist for a certain period of time and as long as you are working in the same terminal session. So you do not need to provide a password again when running another **sudo** command.

To run a command with **sudo**, this syntax is used:

```
>
sudo [command]
```

The following example explains how the **sudo** command is used to open the *YaST Control Center* in the terminal directly. To open YaST, administrator rights are needed and therefore, it only works with the **sudo** command.

#### EXAMPLE 1: OPENING THE YAST CONTROL CENTER WITH **sudo**

```
> yast
Absolute path to 'yast' is '/usr/sbin/yast', so running it may require superuser
privileges (eg. root). ❶
> sudo yast
[sudo] password for root: ❷
```

- ❶ When only the **yast** command is entered, the system returns that **root** privileges are required.
- ❷ Starting the **yast** command with **sudo** prompts you for the **root** password. The password is not shown during input, neither as clear text nor as masking characters. After successful authentication, the *YaST Control Center* is opened.

The elevated privileges persist for a certain period of time, so you do not have to provide a password again for the next `sudo` command.

## 2 Running a command prefaced with `sudo`

As a regular user, you can run any command as `root` by adding `sudo` before it. This prompts you to provide the `root` password. If authenticated successfully, this runs the command as `root`.

When running a command prefaced with `sudo`, the system asks you for the password of the `root` account. After successful authentication, the command is executed with superuser privileges.

Depending on the `sudo` configuration, the elevated privileges persist for a certain period of time and as long as you are working in the same terminal session. So you do not need to provide a password again when running another `sudo` command.

### PROCEDURE 1: RUNNING A COMMAND PREFACED WITH `sudo`

The following procedure describes how to use the `sudo` command to copy a file into a directory where only the `root` user has editing rights.

1. Open a terminal and create a test file with:

```
>  
touch test.txt
```

2. Try to copy the file into the `/usr/local/bin/` directory with:

```
>  
cp test.txt /usr/local/bin
```

The terminal returns, for example:

```
cp: cannot create regular file '/usr/local/bin/test.txt': Permission denied
```

This message also appears if the required privileges were not granted to `sudo`.

3. Now, enter the same command prefaced with `sudo`:

```
>  
sudo
```

```
cp test.txt /usr/local/bin
```

4. You are prompted to enter the root password. Note that the password is not shown during input, neither as clear text nor as masking characters.

```
[sudo] password for root:
```

5. After successful authentication, the test file is copied to /usr/local/bin.

You have run your first sudo command.

### 3 Common **sudo** commands

By adding sudo before any command, you can run commands with elevated permissions. You can also run commands as another user and use their environment variables.

This section provides examples of common commands that often require administrative privileges.

#### Repeat the last command with sudo

To repeat the last command as an administrator, run sudo !! and enter the password. For example, a user without administrative privileges cannot create a directory under the /etc/ directory. To create it, run sudo !!.

```
> mkdir /etc/test/
mkdir: cannot create directory '/etc/test/': Permission denied

> sudo !!
sudo mkdir /etc/test/
[sudo] password for root:

> ls -alrt /etc | grep test
drwxr-xr-x 1 root root      0 Apr 20 12:48 test
```

#### Manage packages using sudo and zypper

To run package management commands as an administrator, add sudo before the command:

```
>
sudo
```

```
zypper [--GLOBAL-OPTIONS] <COMMAND> [--COMMAND-OPTIONS] [ARGUMENTS]
```

For example, to install the Docker CE containerization platform from its official package repository, run the following commands with sudo:

```
>
sudo
zypper addrepo https://download.docker.com/linux/suse/docker-ce
>
sudo
zypper refresh
>
sudo
zypper search docker-ce
>
sudo
zypper install docker-ce
```

You do not need to add sudo before zypper commands that do not modify the system, or provide privileged access to information. For example, you can list the repositories for the installed software packages on your system without using sudo:

```
>
zypper lr
```

### Manage system services using sudo and systemctl

In systems that use systemd for managing services, you can use the systemctl command with sudo. For example, to restart the Apache Web Server service, run:

```
>
sudo
systemctl restart apache2
```

You do not need to add sudo before systemctl commands that do not modify the system, or provide privileged access to information. For example, you can display the status of Network Manager without using sudo:

```
> systemctl status NetworkManager
● NetworkManager.service - Network Manager
   Loaded: loaded (/usr/lib/systemd/system/NetworkManager.service; enabled; vendor preset: disabled)
   Drop-In: /usr/lib/systemd/system/NetworkManager.service.d
            └─NetworkManager-ovs.conf
   Active: active (running) since DAY YYYY-MM-DD HH:MM:SS TIMEZONE; 1h 21min ago
   Docs: man:NetworkManager(8)
```

[...]

### Modify a user account using `sudo` and `usermod`

To run the `usermod` command for modifying user accounts, use:

```
>
sudo
usermod [OPTION] USERNAME
```

For example, to set the number of days to `30` for permanently disabling the user account `tux` after password expiry, run:

```
>
sudo
usermod --inactive 30 tux
```

### Modify file and directory ownership using `sudo` and `chown`

To change file and directory ownerships from the current owner to a new owner, use:

```
>
sudo
chown [OPTION] [OWNER:[GROUP]] FILE
```

For example, to give `tux` the ownership of files and subdirectories in the `/home/test/tux-files` directory, run:

```
>
sudo
chown tux /home/test/tux-files/ --recursive
```

You can test the change in ownership by running the following command:

```
>
ls -alrt /home/test/tux-files/ --recursive
```

### Run a command as another user using `sudo -s`

Instead of using the `su` command for switching to a different user and then running commands, you can use the `sudo -s` command. A shell run by the `sudo -s` command inherits the environment of the current user. The `sudo -s` command also offers a few privilege control measures.

To run a command as a different user, use:

```
>
sudo
-s -u USERNAME COMMAND
```



By default, the command runs from the directory of the previous user, because the target user inherits the environment of the previous user.

For example, to recursively list the files and subdirectories of the `/home/test/tux-files/` directory as the target user `tux`, run:

```
>
sudo
-s -u tux ls -alrt /home/test/tux-files/ --recursive
```

When you use the `sudo -s` approach for running a command as a different user, the command is logged in your history.

#### Run a command as another user with a clean environment using `sudo -i`

When using the `sudo -s` command, the target user inherits the environment of the previous user. You can prevent it by using the `sudo -i` command, where the target user gets a clean environment and starts at their own `$HOME` directory.

To run a command as a different user with a clean environment, use:

```
>
sudo
-i -u USERNAME COMMAND
```

The `sudo -i` command runs the shell as an interactive login shell of the target user. As a result, there are shell startup scripts such as `.profile` and `.bash_profile` files.

For example, to list the files and subdirectories of the `/home/test/tux-files/` directory as `tux`, run the following command:

```
>
sudo
-i -u tux ls -alrt /home/test/tux-files/
```

When you use the `sudo -i` approach for running a command as a different user, the command is logged in your history.

## 4 Difference between `sudo` and `su`

Learn the difference between `sudo` and `su` commands and when to use which.

On Linux systems, you can preface a command with either `sudo` or `su`. Both let you execute commands as `root`.

## 4.1 Characteristics of the **sudo** command

- **sudo** allows you to run a command as root. Depending on the configuration, it does not require you to enter the root password, but only the user's password. This way, no sensitive information needs to be shared with all the other (regular) users.
- With the **sudo** configuration file, the system administrator can control which users are allowed to use **sudo** and restrict the usage to certain tasks.
- **sudo** caches the password for a certain period of time. After this period, you are prompted for the password again, when running another **sudo** command.
- All commands executed with **sudo** are logged individually. The log file tracks date and time, the user that ran the command, and the command itself.


## 4.2 Characteristics of the **su** command

- **su** allows you to run a command as root but requires you to know the root password.
- It cannot be configured to restrict access to certain users and tasks and elevate the privileges for anyone who knows the root password.
- The privileges are elevated for the entire terminal session. As long as you stay in the session, you are not prompted for the password again.
- Commands executed with **su** are not logged individually, as all actions can only be logged with the user account.

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