# Managing and Analyzing System Log Files

System log files record almost everything that happens on your system, from kernel events to service failures and application errors. Knowing where these logs are located, how to query them with **`journalctl`** and standard tools and how to read their priority levels lets you diagnose problems quickly instead of guessing. This article also covers **`logrotate`**, which automates log rotation and compression to keep logs from filling up your disk.

*Prerequisites:*

- Access to a terminal with **`sudo`** privileges

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# 1 Where to find system log files?

SLE for NVIDIA logs several types of messages, for example, from the kernel, SELinux or other services.

Kernel messages and messages of system services registered with `systemd` are logged in the `systemd` journal (see *Section 4, "The `systemd` journal"*). The journal also forwards messages to `rsyslog`, which writes most of them to plain-text files under the `/var/log` directory. SELinux messages are logged separately, in `/var/log/audit/audit.log`.

The following list provides an overview of all system log files found in SLE for NVIDIA after a default installation. Depending on your installation scope, `/var/log` also contains log files from other services and applications not listed here. Some files and directories described below are "placeholders" and are only used when the corresponding application is installed. Most log files are only visible for the user with **`sudo`** access. Usually, you can view these files using an editor as they are in plain text.



## Important: Unsupported log files

`utmp`, `wtmp` and `lastlog` have been removed from SLE for NVIDIA and are no longer supported. If there are any applications that write into these log files, remember that the log files are incomplete then. `wtmp` has been replaced with `wtmpdb`, `lastlog` with `lastlog2`.

`audit/audit.log`
: Logs from the audit framework, including SELinux access control decisions.

`boot.log`
: Messages logged during the current boot, mirroring what is also shown on the console while the system starts up. `boot.msg` and `boot.omsg` contain raw kernel ring buffer dumps from the current and previous boot. They show the same content as **`dmesg`**. Use them to find the exact kernel command line of a boot.

`chrony/`
: Logs from the Network Time Protocol daemon (`chrony`). This directory is empty by default. Files only appear here once you enable specific logging directives (for example, `log measurements`) in `/etc/chrony.conf`.

`cups/`
: Access and error logs of the Common Unix Printing System (`cups`).

`firewall`, `firewalld`

`firewall` catches kernel-level packet-filter messages. `firewalld` holds errors and warnings from the `firewalld` daemon itself. Neither is the place to look for logged network traffic unless you have explicitly enabled that in your firewall rules.

`journal/`

The `systemd` journal's own storage location. See *Section 4, "The `systemd` journal"*.

`krb5/`

Log files from the Kerberos network authentication system. Empty unless you have installed and configured Kerberos client or server tools.

`localmessages`

Messages logged to the `local0` through `local7` facilities, commonly used by third-party applications that do not have a dedicated log file of their own. This file only appears once something logs to one of these facilities.

`mail`, `mail.info`, `mail.warn`, `mail.err`

Mail server logs, split by severity. Empty unless a mail transfer agent such as `postfix` is installed.

`messages`

The default destination for kernel and system log messages, forwarded from the journal by `rsyslog`. Together with `/var/log/warn`, this is the first place to look in case of problems.

`NetworkManager`

`NetworkManager` log files.

`pbl.log`

Log of the **`update-bootloader`** tool (also known as **`pbl`**), which configures the boot loader on SLE for NVIDIA. Check this file after a kernel update or a manual boot loader change if the system does not boot as expected.

`pcp/`

Logs from Performance Co-Pilot, installed and enabled by default for system performance monitoring.

`snapper.log`

Log of `snapper`, the tool that manages Btrfs snapshots. Check this file if a scheduled snapshot did not run or a snapshot could not be deleted.

`warn`

All system warnings and errors, filtered from `/var/log/messages`.

`zypp/`

: `libzypp` log files. Refer to these files for the package installation history.

`zypper.log`

: Logs from the command-line installer **`zypper`**.

## 2 Viewing and parsing `/var/log` files

Plain-text logs in `/var/log` can be viewed, searched and parsed with standard command-line tools.

For viewing log files, use the commands **`less`** or **`more`**. Use **`head`** and **`tail`** to view the beginning or end of a log file. To view entries appended to a log file in real time, use **`tail`** `-f`. For information about how to use these tools, see their man pages.

```
> sudo tail -f /var/log/messages
```

To search for strings or regular expressions in log files, use **`grep`**. **`awk`** is useful for parsing and rewriting log files. For example, to show only lines logged by the `sshd-session` process:

```
> sudo grep sshd-session /var/log/messages
```

Rotated log files are compressed (see *Section 5.1, "Configuring* **`logrotate`***"*). SLE for NVIDIA compresses them with **`xz`** by default, so use **`xzless`**, **`xzcat`** or **`xzgrep`** instead of the **`less`**, **`cat`** or **`grep`** commands above:

```
> sudo xzgrep sshd-session /var/log/messages-20260828.xz
```

## 3 Interpreting log entries

Whether a message comes from a plain-text file or from the journal, it follows a predictable structure and carries a priority level. Knowing both helps you find what matters quickly.

## 3.1 Structure of a plain-text log line

A line in a plain-text log file such as `/var/log/messages` consists of a time stamp, the host name, the name of the program that generated the message (usually followed by its process ID in brackets) and the message text itself:

EXAMPLE 1: A LINE FROM `/var/log/messages`

```
2026-09-07T09:21:30.439903+02:00 sles16 sshd-session[4731]: pam_unix(sshd:session):
 session opened for user tux(uid=1000) by tux(uid=0)
```

In this example, `2026-09-07T09:21:30.439903+02:00` is the time stamp (in ISO 8601 format, including the time zone offset), `sles16` is the host name, `sshd-session` is the program that logged the message, `4731` is its process ID and everything after the colon is the message itself. Not every program includes a process ID. Certain programs log under just their name.

## 3.2 Priority levels

Every log message carries a priority level indicating its severity. The same eight levels apply both to journal entries (visible in the `PRIORITY` field and filterable with `journalctl -p`) and to the selector lines in `rsyslog` configuration files (for example, `*.err` or `mail.warning`), which decide into which file a message is written. Raw kernel messages, such as those in `boot.msg` or the output of **`dmesg`**, show the same level as a bracketed number prefix, for example, `<6>` for `info`.

TABLE 1: SYSLOG PRIORITY LEVELS

| Level | Name | Meaning |
|---|---|---|
| 0 | `emerg` | The system is unusable. |
| 1 | `alert` | Action must be taken immediately. |
| 2 | `crit` | A critical condition. |
| 3 | `err` | A service or application failed to complete a requested operation. |
| 4 | `warning` | Something undesirable happened, but it is not a failure. |
| 5 | `notice` | A normal but significant condition. |

| Level | Name | Meaning |
|---|---|---|
| 6 | `info` | Normal operational information. |
| 7 | `debug` | Information useful for developers only. |

When troubleshooting, start by looking for the lowest-numbered (most severe) entries around the time the problem occurred. For example, `journalctl -p err -b` shows the messages of the current boot with the priority `err` or more severe (`crit`, `alert` and `emerg`).

# 4 The `systemd` journal

`systemd` features its own logging system called *journal*. The journal itself is a system service managed by `systemd`—`systemd-journald.service`.

The `systemd-journald` service is enabled and started by default. On SLE for NVIDIA, it stores log data persistently in `/var/log/journal/`, so entries survive a reboot, and forwards a copy of every message to `rsyslog` (see *Section 1, "Where to find system log files?"*). To query the journal, use the **`journalctl`** command (see *Section 4.1, "Using `journalctl`"*).

## 4.1 Using `journalctl`

Because the journal stores data in a binary format, you cannot open it directly with tools such as **`cat`** or **`less`**. Use the **`journalctl`** command to query and display its content instead.

Running **`journalctl`** without any options displays all logged messages, usually starting from the oldest, and pipes the output through a pager (like **`less`**) for easy navigation.

The general syntax of the **`journalctl`** command is as follows:

```
> sudo journalctl [OPTIONS...] [MATCHES...]
```



### Tip: Messages related to a specific executable

To show all journal messages related to a specific executable, specify the full path to the executable:

```
> sudo journalctl /usr/lib/systemd/systemd
```

Listed below are the common useful options to enhance the default **journalctl** behavior:

**-f**

Shows only the most recent journal messages, and prints new log entries as they are added to the journal.

**-e**

Prints the messages and jumps to the end of the journal, so that the latest entries are visible within the pager.

**-r**

Prints the messages of the journal in reverse order, so that the latest entries are listed first.

**-k**

Shows only kernel messages from the current boot. This is equivalent to `-b` with the field match `_TRANSPORT=kernel`.

**-u**

Shows only messages for the specified `systemd` unit. Besides messages with `_SYSTEMD_UNIT=`*`UNIT`*, the output includes what `systemd` logs about the unit, such as start and stop messages and core dump reports.

```
> sudo journalctl -u apache2
```

For a complete list of options refer to man page, man 1 **journalctl**.

# 5 Controlling log file growth with **logrotate**

Log files under `/var/log` grow daily and can quickly become large. **logrotate** is a tool that helps you manage log files and their growth. It allows automatic rotation, removal, compression and mailing of log files. Log files can be handled periodically (daily, weekly or monthly) or when exceeding a particular size.

**logrotate** is usually run daily by `systemd`, and thus usually modifies log files only once a day. However, exceptions occur when a log file is modified because of its size, if **logrotate** is run multiple times a day or if `--force` is enabled. View the `/var/lib/misc/logrotate.status` file to find out when a particular file was last rotated.

**logrotate** can be configured to suit your needs. For details, see *Section 5.1, "Configuring* **logrotate**".

To test your configuration without rotating anything, run **logrotate** in debug mode, pointing it at whichever configuration file is in effect (`/etc/logrotate.conf` if you have created it, or the shipped default otherwise, see *Section 5.1, "Configuring* **logrotate***"*):

```
> sudo logrotate -d /usr/etc/logrotate.conf
```

To rotate logs immediately, for example, right after changing a configuration file, use `--force` with the same path:

```
> sudo logrotate --force /usr/etc/logrotate.conf
```



### Important: logrotate does not manage the journal

**logrotate** only rotates the plain-text files under `/var/log`. The journal binary storage in `/var/log/journal/` is unaffected by it and, unless you have set a limit in a `journald.conf.d` drop-in, is only capped by the built-in `systemd` default (a percentage of the file system it resides on).

Check the current journal disk usage and trim it manually if needed with:

```
> sudo journalctl --disk-usage
> sudo journalctl --vacuum-size=500M
```

`--vacuum-time=`*TIME* (for example, `--vacuum-time=2weeks`) and `--vacuum-files=`*COUNT* work the same way, removing the oldest archived journal files until the given age or file count is reached.

## 5.1 Configuring **logrotate**

The main configuration file `logrotate.conf` defines, for example, how often to rotate logs or which tool is used for data compression. Each service can have its own logrotate configuration in `/etc/logrotate.d/`. SLE for NVIDIA ships with weekly rotation, four kept backlogs and compression enabled by default.

### 5.1.1 Adjusting `logrotate.conf`

The default version of `logrotate.conf` resides in the `/usr/etc/` directory. If the default does not suit your needs, copy the file to `/etc/logrotate.conf` and change the configuration values there. Do not modify the `/usr/etc/` version as it may be overwritten with a system update. You can replace the following values:

EXAMPLE 2: DEFAULT `/usr/etc/logrotate.conf`

```
# see "man logrotate" for details
# rotate log files weekly
weekly

# keep 4 weeks worth of backlogs
rotate 4

# create new (empty) log files after rotating old ones
create

# use date as a suffix of the rotated file
dateext

# uncomment this if you want your log files compressed
compress

# comment these to switch compression to use gzip or another
# compression scheme
compresscmd /usr/bin/xz
uncompresscmd /usr/bin/xzdec

# Additional location (directory or file) for rotation information
# include <file_or_directory>
```

`weekly`

The frequency of log rotation. You can use any of the values: `hourly`, `daily`, `weekly`, `monthly` or `yearly`.

`maxage`

You can specify a number of days that logs are kept.

`rotate 4`

The number determines the amount of log rotations to retain the rotated logs. When set to `rotate 0`, the logs are deleted immediately. When set to `rotate -1`, the logs are not removed until they reach the value of `maxage`.

`dateext`

If the option is present in the configuration file, rotated log file names receive a suffix with a date in the format `logname-YYYYMMDD`, for example, `messages-20260828.xz`. If not present, the default file name scheme is `logname.1`, `logname.2`. SLE for NVIDIA enables `dateext` by default.

`compress`

If commented out, the logs are not compressed. Enabled by default on SLE for NVIDIA.

`compresscmd` and `uncompresscmd`

Here, you can change the default compression and decompression tools by setting corresponding absolute paths to the tools. SLE for NVIDIA uses `/usr/bin/xz` and `/usr/bin/xzdec` by default.

`include` *PATH*

You can change the default location of the file with log rotation information. The default is `/var/lib/misc/logrotate.status`.

### 5.1.2 Service-specific logrotate configuration

Services and applications can have a specific logrotate configuration in `/etc/logrotate.d`. Besides the options mentioned in *Section 5.1.1, "Adjusting* `logrotate.conf`*"*, you can also use the following configurations:

`missingok`

The log rotation does not report errors if any of the specified log files are missing.

`notifempty`

An empty log file is not rotated.

`delaycompress`

The compression of rotated logs is postponed until the next log rotation.

`sharedscripts`

Denotes a section with scripts that should be executed only once regardless of the numbers of logs being rotated. If omitted, the scripts are executed for each log file being rotated.

`size`

Defines the size a log file can reach before the log rotation is initiated. This option may ignore the time scheduling. The value can be in megabytes (M), kilobytes (K) or bytes (B).

`minsize`

Logs are rotated according to the specified time schedule if their size exceeds this value. The value can be in megabytes (M), kilobytes (K) or bytes (B).

`maxsize`

Specifies the maximum log file size. Reaching this limit triggers rotation even when the time interval has not been reached. The value can be in megabytes (M), kilobytes (K) or bytes (B).

# 6 For more information

- For more information about configuring `systemd-journald` and filtering the journal by boot, time or field, see Mastering System Logs: From systemd-journald to journalctl (https://documentation.suse.com/sles/16.1/html/SLES-journalctl/index.html).
- For more information about the SELinux messages in `/var/log/audit/audit.log`, see Understanding SELinux logs (https://documentation.suse.com/sles/16.1/html/SLES-SELinux/index.html#selinux-logs).

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