SUSE

Managing System Logs of SLE Micro

WHAT?

System log file analysis is one of the most important tasks when analyzing the system. In fact, looking at the system log files should be the first thing to do when maintaining or troubleshooting a system. SUSE Linux Enterprise Micro automatically logs almost everything that happens on the system in detail.

WHY?

This article provides instructions on how to examine what happened on your system by viewing system logs.

EFFORT

It takes about 20 minutes to read and understand this article.

GOAL

You will get an overview where the log files reside and how to manage them.

REQUIREMENTS

- `root` privileges.

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Contents

1 Where to find system log files?

SLE Micro 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 `systemd` journal (see *Section 4, "The `systemd` logging system—journal"*). Other system log files are located under the `/var/log` directory. SELinux messages are logged in `/var/log/audit/audit.log`. For details, refer to SELinux troubleshooting (https://documentation.suse.com/smart/systems-management/html/setroubleshoot-slemicro/index.html) ↗.

The following list provides an overview of all system log files found in SUSE Linux Enterprise Micro 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 `root`. 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 Micro and are no longed 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/`

Logs from the audit framework.

`ConsoleKit/`

Logs of the `ConsoleKit` daemon (daemon for tracking what users are logged in and how they interact with the computer).

`cups/`

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

`firewalld`

Firewall logs.

`krb5/`

Log files from the Kerberos network authentication system.

`chrony/`

   Logs from the Network Time Protocol daemon (`chrony`).

`YaST2/`

   All YaST log files.

`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

You can view and parse plain text logs in `/var/log` using CLI commands as described further.

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.

To search for strings or regular expressions in log files, use **grep**. **awk** is useful for parsing and rewriting log files.

3   Managing log files with **logrotate**

Log files under `/var/log` grow daily and quickly become very 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, refer to *Section 3.1, "Configuring* **logrotate***".*

3.1 Configuring **logrotate**

The main configuration file `logrotate.conf` defines, for example, how often to rotate logs or which tool is used for data compressions. Each service can have its own logrotate configuration in `/etc/logrotate.d/`.

3.1.1 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 get overwritten with a system update. You can replace the following values:

`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 extension with a date in the format: `logname.YYYYMMDD`. If not present, the default file name scheme is: `logname.1`, `logname.2`.

`compress`

> If commented out, the logs are not compressed.

`compresscmd` **and** `uncompresscmd`

> Here, you can change the default compression and decompression tools by setting corresponding absolute paths to the tools.

`include` *PATH*

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

3.1.2 Service-specific logrotate configuration

Services and applications can have a specific logrotate configuration in `/etc/logrotate.d`. Besides the options mentioned in *Section 3.1.1, "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).

4 The `systemd` logging system—journal

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

The service collects and stores logging data by maintaining structured indexed journals based on logging information received from the kernel, user processes, standard input, and system service errors. The `systemd-journald` service is enabled and started by default.

The journal stores log data in `/var/log/journal/`.

4.1 Usage of the **journalctl** command

This section introduces several common useful options to enhance the default `journalctl` behavior.

The `journalctl` command has the following syntax:

```
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
```

The command takes the following options:

-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. This is equivalent to the field match `_TRANSPORT=kernel`.

-u

Shows only messages for the specified `systemd` unit. This is equivalent to the field match `_SYSTEMD_UNIT=UNIT`.

```
> sudo journalctl -u apache2
 [...]
```

```
Jun 03 10:07:11 pinkiepie systemd[1]: Starting The Apache Webserver...
Jun 03 10:07:12 pinkiepie systemd[1]: Started The Apache Webserver.
```

4.2 Filtering journal logs

When `journalctl` is called without options, the command outputs the full content of the journal, the oldest entries listed first. The output can be filtered by specific options or journal fields.

4.2.1 Filtering based on time interval

You can filter the output of `journalctl` by specifying the starting and/or ending date. The date specification should be of the format `2014-06-30 9:17:16`. If the time part is omitted, midnight is assumed. If seconds are omitted, `:00` is assumed. If the date part is omitted, the current day is assumed. Instead of numeric expression, you can specify the keywords "yesterday," "today" or "tomorrow." They refer to midnight of the day before the current day, of the current day, or of the day after the current day. If you specify "now," it refers to the current time. You can also specify relative times prefixed with `-` or `+`, referring to times before or after the current time.

Show only new messages since now, and update the output continuously:

```
> sudo journalctl --since "now" -f
```

Display all messages from midnight until 3:20 a.m.

```
> sudo journalctl --since "today" --until "3:20"
```

4.2.2 Filtering based on a boot number

`journalctl` can filter messages based on a specific system boot. To list all available boots, run

```
> sudo journalctl --list-boots
-1 097ed2cd99124a2391d2cffab1b566f0 Mon 2014-05-26 08:36:56 EDT—Fri 2014-05-30 05:33:44
EDT
 0 156019a44a774a0bb0148a92df4af81b Fri 2014-05-30 05:34:09 EDT—Fri 2014-05-30 06:15:01
EDT
```

The first column lists the boot offset: `0` for the current boot, `-1` for the previous one, `-2` for the one prior to that, etc. The second column contains the boot ID, followed by the limiting time stamps of the specific boot.

Show all messages from the current boot:

```
> sudo journalctl -b
```

If you need to see journal messages from the previous boot, add an offset parameter. The following example outputs the previous boot messages:

```
> sudo journalctl -b -1
```

Another way is to list boot messages based on the boot ID. For this purpose, use the _BOOT_ID field:

```
> sudo journalctl _BOOT_ID=156019a44a774a0bb0148a92df4af81b
```

4.2.3 Filtering based on fields

You can filter the output of the journal by specific fields. The syntax of a field to be matched is `FIELD_NAME=MATCHED_VALUE`, such as `_SYSTEMD_UNIT=httpd.service`. You can specify multiple matches in a single query to filter the output messages even more. See **man 7 systemd.journal-fields** for a list of default fields.

Show messages produced by a specific process ID:

```
> sudo journalctl _PID=1039
```

Show messages belonging to a specific user ID:

```
# journalctl _UID=1000
```

Show messages from the kernel ring buffer (the same as **dmesg** produces):

```
> sudo journalctl _TRANSPORT=kernel
```

Show messages from the service's standard or error output:

```
> sudo journalctl _TRANSPORT=stdout
```

Show messages produced by a specified service only:

```
> sudo journalctl _SYSTEMD_UNIT=avahi-daemon.service
```

If two different fields are specified, only entries that match both expressions at the same time are shown:

```
> sudo journalctl _SYSTEMD_UNIT=avahi-daemon.service _PID=1488
```

If two matches refer to the same field, all entries matching either expression are shown:

```
> sudo journalctl _SYSTEMD_UNIT=avahi-daemon.service _SYSTEMD_UNIT=dbus.service
```

You can use the `+` separator to combine two expressions in a logical `OR`. The following example shows all messages from the Avahi service process with the process ID 1480 together with all messages from the D-Bus service:

```
> sudo journalctl _SYSTEMD_UNIT=avahi-daemon.service _PID=1480 +
  _SYSTEMD_UNIT=dbus.service
```

4.3 Journald configuration

```
> sudo systemctl restart systemd-journald
```

4.3.1 Changing the journal size limit

The journal log data uses up to 10% of the file system on which `/var/log/journal` resides. For example, if `/var/log/journal` is located on a 30 GB `/var` partition, the journal may use up to 3 GB of the disk space. To change this limit, change (and uncomment) the `SystemMaxUse` option:

```
SystemMaxUse=50M
```

4.3.2 Forwarding the journal to `/dev/ttyX`

You can forward the journal to a terminal device to inform you about system messages on a preferred terminal screen, for example, `/dev/tty12`. Change the following journald options to

```
ForwardToConsole=yes
TTYPath=/dev/tty12
```

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