SUSE

Managing Core Dumps with `systemd-coredump`

`systemd-coredump` is a system service in SUSE Linux Enterprise Server that automatically collects, compresses and logs application core dumps when processes crash. By capturing process memory images and storing them alongside `systemd` journal metadata, it enables administrators to easily inspect crash stack traces, manage storage retention policies and debug application failures using utilities like **`coredumpctl`** and gdb.

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1 Using `systemd-coredump` to debug application crashes

systemd-coredump collects and displays core dumps to analyze application crashes. A core dump is an image of the process memory at the time of termination.

1.1 Using `systemd-coredump`

By default, when a process crashes, `systemd-coredump` performs the following actions:

- Stores the core dump in `/var/lib/systemd/coredump/`.
- Logs the event to the systemd journal.
- Includes a backtrace where possible.

You can examine the dump file using **`coredumpctl`** or external tools such as **`gdb`** or **`crash`**.



Note

Core dumps stored in `/var/lib/systemd/coredump/` are by default automatically deleted after three days. This is configured through the `d /var/lib/systemd/coredump` line in `/usr/lib/tmpfiles.d/systemd.conf`.

It is recommended not to edit `/usr/lib/tmpfiles.d/systemd.conf` directly, as the changes will be overwritten during the next system update. Hence, perform the following:

1. Copy the file to `/etc/tmpfiles.d/systemd.conf`. As files in `/etc/` take precedence over those in `/usr/lib/`, your custom configuration is applied.
2. Open the file and find the line: `d /var/lib/systemd/coredump`

3. Edit the age parameter; for example, change `3d` to `7d` to retain data for a week, or use the `W` notation for longer periods.

2 Configuration of `systemd-coredump`

`systemd-coredump` provides a centralized, automated framework for capturing and managing process crashes by intercepting kernel signals to store compressed memory images and metadata, which are then easily analyzed through the `coredumpctl` utility.

`systemd-coredump` is enabled by default. The primary configuration file is located at `/etc/systemd/coredump.conf`.

```
[Coredump]
#Storage=external
#Compress=yes
#ProcessSizeMax=2G
#ExternalSizeMax=2G
#JournalSizeMax=767M
#MaxUse=
#KeepFree=
```

The following parameters in `[Coredump]` define how dumps are handled:

`Storage`
: Defines where to store dumps such as `none`, `external`, `journal`. The default is `external`.
For example:

```
[Coredump]
# Directs dumps to be stored inside the system journal
Storage=journal

# Compress the data to save space within the journal
Compress=yes

# Limits the size of a single core dump stored in the journal to 500MB
# If a process dump is larger than 500M, it will be dropped/ignored
JournalSizeMax=500M

# Processes larger than 1GB will not be handled at all
ProcessSizeMax=1G
```

`Compress`

Enables/disables compression for the stored core dump. By default, this is enabled.

`ProcessSizeMax`

The maximum size of a core dump to be processed. The default size is `2G`.

`ExternalSizeMax`

The maximum size for a dump stored on disk. The default size is `2G`, and this also supports a value of infinity.

`JournalSizeMax`

The maximum size of core dumps that can be stored directly within the system journal (when Storage=journal is used). If a core dump exceeds this value, it will be ignored or handled according to other storage settings.

`MaxUse`

The maximum amount of disk space the core dump storage (typically `/var/lib/systemd/coredump/`) is allowed to occupy. This value supports absolute sizes in bytes (e.g., `2G`) or a percentage of the total filesystem size (e.g., `10%`). Once this limit is reached, older core dumps are automatically deleted to make room for new ones.

The size units are `B`, `K`, `M`, `G`, `T`, `P`, and `E`.

`KeepFree`

The minimum amount of free disk space to maintain on the filesystem where core dumps are stored. This value can be specified in bytes (using suffixes such as K, M, G) or as a percentage of the total filesystem size (e.g., `15%`). `systemd-coredump` will stop saving new dumps if the available disk space would fall below this threshold.

The size units are `B`, `K`, `M`, `G`, `T`, `P`, and `E`.



Note

A new instance of `systemd-coredump` is invoked for every crash. Configuration changes are applied immediately to the next crash; you do not need to restart any services.

2.1 Managing core dump storage

To minimize the storage of sensitive information or prevent disk exhaustion in `/var/lib/systemd/coredump`, you can modify the `Storage=` option in `/etc/systemd/coredump.conf`.



Note

If the `Storage=` field is omitted, set to an empty value, or set to an invalid string, systemd defaults to `external`.

The available storage options are:

- `Storage=none` the event is logged to the journal, but the memory image (the core dump itself) is discarded and files are not created in `/var/lib/systemd/coredump`.
- `Storage=journal` The core dump is compressed and stored directly within the systemd journal metadata and files are not created in `/var/lib/systemd/coredump`. The storage is managed by `/etc/systemd/journald.conf` limits.
- `Storage=external` The event is logged to the journal, and the memory image is saved as a separate file. The files are created in `/var/lib/systemd/coredump`.

As core dumps may not be preserved after a system restart (for example, if stored in volatile journal memory or a temporary directory), run the command below to save a core dump to a permanent file for later analysis:

```
coredumpctl -o my_app.dump dump >PID<
```

For more information, see `man systemd-coredump, man coredumpctl, man core, and man coredump.conf` for complete command and option listing.

3 Creating and analyzing a core dump

In this section you force an application to quit without a proper shutdown. Thus the application creates a core dump that you can use to learn how to investigate core dumps.

The following procedure uses Vim to trigger a segmentation fault (segfault) for testing purposes.

1. Ensure the `debuginfo-pool` and `debuginfo-update` repositories are active for your registration and enabled.

   ```
   > sudo  zypper mr -e REPOSITORY
   ```

2. Install the debug information for vim.

```
> sudo  zypper install vim-debuginfo
```

3. To trigger a crash, open a file with Vim, then from another terminal, send a SIGSEGV signal to the process:

```
ps ax | grep vim
# kill -s SIGSEGV <PID>
```

vim shows error messages, if any.

```
Vim: Caught deadly signal SEGV
Vim: Finished.
Segmentation fault (core dumped)
```

4. Verify if the crash was captured:

```
coredumpctl
TIME                         PID  UID  GID SIG PRESENT EXE
Wed 2019-11-12 11:56:47 PST 2345 1000 100 11  *       /bin/vim
```

An asterisk * in the PRESENT column indicates the dump file is available on disk.

- To view the stack trace and metadata of the latest crash:

```
coredumpctl info
PID: 2345 (vim)
UID: 0 (root)
GID: 0 (root)
Signal: 11 (SEGV)
Timestamp: Wed 2019-11-12 11:58:05 PST
Command Line: vim testfile
Executable: /bin/vim
Control Group: /user.slice/user-1000.slice/session-1.scope
    Unit: session-1.scope
    Slice: user-1000.slice
    Session: 1
    Owner UID: 1000 (tux)
    Boot ID: b5c251b86ab34674a2222cef102c0c88
    Machine ID: b43c44a64696799b985cafd95dc1b698
    Hostname: linux-uoch
    Coredump: /var/lib/systemd/coredump/core.vim.0.b5c251b86ab34674a2222cef102
    Message: Process 2345 (vim) of user 0 dumped core.

         Stack trace of thread 2345:
         #0  0x00007f21dd87e2a7 kill (libc.so.6)
```

```
          #1  0x000000000050cb35 may_core_dump (vim)
          #2  0x00007f21ddbfec70 __restore_rt (libpthread.so.0)
          #3  0x00007f21dd92ea33 __select (libc.so.6)
          #4  0x000000000050b4e3 RealWaitForChar (vim)
          #5  0x000000000050b86b mch_inchar (vim)
[...]
```

You can filter core dumps by PID, COMM (command), or EXE (full path to the executable).

- To filter all core dumps for Vim:

```
coredumpctl info /bin/vim
```

- To filter single core dump by PID 2345:

```
coredumpctl info 2345
```

- To load a specific crash for PID 2345 directly into the debugger:

```
coredumpctl gdb 2345
```

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