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LCE508 - Managing Logs

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Presentation

Most of the system logs under Linux can be found in **/var/log**.



Important : It is a good idea to put **/var/log** on a separate partition when installing Linux such that verbose logging does not crash the system by consuming too much disk space.

The /bin/dmesg Command

This command shows the boot sequence messages from the (**Kernel Ring Buffer**) that were consigned to the **/var/log/dmesg** file during the last boot process:

```
[root@centos8 ~]# dmesg | more
[    0.000000] Linux version 4.18.0-240.22.1.el8_3.x86_64 (mockbuild@kbuilder.bsys.centos.org) (gcc version 8.3.1
20191121 (Red Hat 8.3.1-5) (G
CC)) #1 SMP Thu Apr 8 19:01:30 UTC 2021
[    0.000000] Command line: BOOT_IMAGE=(hd0,msdos1)/vmlinuz-4.18.0-240.22.1.el8_3.x86_64
root=UUID=4c0cc28c-0d59-45be-bd73-d292b80be33c ro cra
shkernel=auto resume=UUID=c8bb3f47-d67f-4b21-b781-766899dc83d4 rhgb quiet
[    0.000000] x86/fpu: Supporting XSAVE feature 0x001: 'x87 floating point registers'
[    0.000000] x86/fpu: Supporting XSAVE feature 0x002: 'SSE registers'
[    0.000000] x86/fpu: Supporting XSAVE feature 0x004: 'AVX registers'
[    0.000000] x86/fpu: xstate_offset[2]: 576, xstate_sizes[2]: 256
[    0.000000] x86/fpu: Enabled xstate features 0x7, context size is 832 bytes, using 'standard' format.
[    0.000000] BIOS-provided physical RAM map:
[    0.000000] BIOS-e820: [mem 0x0000000000000000-0x0000000000009fbff] usable
[    0.000000] BIOS-e820: [mem 0x0000000000009fc00-0x0000000000009ffff] reserved
[    0.000000] BIOS-e820: [mem 0x000000000000f0000-0x000000000000ffffff] reserved
[    0.000000] BIOS-e820: [mem 0x00000000000100000-0x000000000000dffefffff] usable
[    0.000000] BIOS-e820: [mem 0x00000000000dff0000-0x00000000000dffefffff] ACPI data
[    0.000000] BIOS-e820: [mem 0x0000000000fec00000-0x0000000000fec00fff] reserved
[    0.000000] BIOS-e820: [mem 0x0000000000fee00000-0x0000000000fee00fff] reserved
[    0.000000] BIOS-e820: [mem 0x0000000000fffc0000-0x0000000000fffffffff] reserved
[    0.000000] BIOS-e820: [mem 0x0000000000100000000-0x000000000011fffffffff] usable
[    0.000000] NX (Execute Disable) protection: active
[    0.000000] SMBIOS 2.5 present.
[    0.000000] DMI: innotek GmbH VirtualBox/VirtualBox, BIOS VirtualBox 12/01/2006
[    0.000000] Hypervisor detected: KVM
--More--
```

Command Line Switches

The following switches can be used with the dmesg command:

```
[root@centos8 ~]# dmesg --help
```

Usage:

```
dmesg [options]
```

Display or control the kernel ring buffer.

Options:

-C, --clear	clear the kernel ring buffer
-c, --read-clear	read and clear all messages
-D, --console-off	disable printing messages to console
-E, --console-on	enable printing messages to console
-F, --file <file>	use the file instead of the kernel log buffer
-f, --facility <list>	restrict output to defined facilities
-H, --human	human readable output
-k, --kernel	display kernel messages
-L, --color[=<when>]	colorize messages (auto, always or never) colors are enabled by default
-l, --level <list>	restrict output to defined levels
-n, --console-level <level>	set level of messages printed to console
-P, --nopager	do not pipe output into a pager
-p, --force-prefix	force timestamp output on each line of multi-line messages
-r, --raw	print the raw message buffer
-S, --syslog	force to use syslog(2) rather than /dev/kmsg
-s, --buffer-size <size>	buffer size to query the kernel ring buffer
-u, --userspace	display userspace messages
-w, --follow	wait for new messages
-x, --decode	decode facility and level to readable string
-d, --show-delta	show time delta between printed messages

```
-e, --reltime      show local time and time delta in readable format
-T, --ctime       show human-readable timestamp (may be inaccurate!)
-t, --notime      don't show any timestamp with messages
  --time-format <format> show timestamp using the given format:
                        [delta|reltime|ctime|notime|iso]
```

Suspending/resume will make ctime and iso timestamps inaccurate.

```
-h, --help        display this help
-V, --version     display version
```

Supported log facilities:

```
kern - kernel messages
user - random user-level messages
mail - mail system
daemon - system daemons
auth - security/authorization messages
syslog - messages generated internally by syslogd
lpr - line printer subsystem
news - network news subsystem
```

Supported log levels (priorities):

```
emerg - system is unusable
alert - action must be taken immediately
crit - critical conditions
err - error conditions
warn - warning conditions
notice - normal but significant condition
info - informational
debug - debug-level messages
```

For more details see `dmesg(1)`.

Security Logging

The last Command

This command shows user connexion timestamps stored in the `/var/log/wtmp` file:

```
[root@centos8 ~]# last
trainee pts/0      10.0.2.2        Thu Jun  3 09:01  still logged in
reboot  system boot    4.18.0-240.22.1. Thu Jun  3 09:01  still running
trainee pts/0      10.0.2.2        Wed Jun  2 12:07 - crash (20:54)
trainee pts/0      10.0.2.2        Wed Jun  2 11:16 - 12:06 (00:50)
reboot  system boot    4.18.0-240.22.1. Wed Jun  2 11:12  still running
trainee pts/0      10.0.2.2        Wed Jun  2 11:13 - 11:14 (00:01)
reboot  system boot    4.18.0-240.22.1. Wed Jun  2 11:10 - 11:14 (00:04)
trainee pts/0      10.0.2.2        Wed Jun  2 11:08 - 11:12 (00:04)
reboot  system boot    4.18.0-240.22.1. Wed Jun  2 11:04 - 11:12 (00:07)
trainee pts/0      10.0.2.2        Wed Jun  2 06:40 - 11:06 (04:26)
trainee pts/0      10.0.2.2        Wed Jun  2 06:39 - 06:39 (00:00)
reboot  system boot    4.18.0-240.22.1. Wed Jun  2 06:07 - 11:07 (04:59)
trainee pts/1      10.0.2.2        Wed May 26 16:51 - crash (6+13:15)
trainee pts/0      10.0.2.2        Wed May 26 10:37 - 18:50 (08:13)
trainee pts/0      10.0.2.2        Wed May 26 08:48 - 10:36 (01:48)
trainee tty1                    Wed May 26 08:47 - crash (6+21:19)
reboot  system boot    4.18.0-240.22.1. Wed May 26 08:44 - 11:07 (7+02:22)
trainee pts/0      10.0.2.2        Wed Apr 21 07:23 - 19:14 (11:51)
trainee pts/0      10.0.2.2        Tue Apr 20 23:13 - 07:22 (08:08)
trainee pts/1                    Tue Apr 20 10:59 - 11:00 (00:00)
trainee pts/0      10.0.2.2        Tue Apr 20 09:59 - 23:13 (13:13)
trainee pts/1      10.0.2.2        Tue Apr 20 04:10 - 04:29 (00:19)
trainee pts/0      10.0.2.2        Tue Apr 20 02:21 - 09:57 (07:36)
trainee tty1                    Tue Apr 20 02:17 - crash (36+06:26)
trainee pts/0      10.0.2.2        Mon Apr 19 13:55 - 02:17 (12:22)
```

```
trainee pts/0      10.0.2.2          Mon Apr 19 12:05 - 13:47 (01:42)
reboot  system boot  4.18.0-240.22.1. Mon Apr 19 12:05 - 11:07 (43+23:01)
trainee pts/0      10.0.2.2          Mon Apr 19 11:40 - crash (00:24)
reboot  system boot  4.18.0-147.8.1.e Mon Apr 19 11:37 - 11:07 (43+23:29)
trainee pts/0      10.0.2.2          Tue Sep  1 09:59 - 11:10 (01:10)
reboot  system boot  4.18.0-147.8.1.e Tue Sep  1 09:58 - 11:10 (01:11)
reboot  system boot  4.18.0-147.8.1.e Fri May   8 08:13 - 11:10 (116+02:56)
```

```
wtmp begins Fri May  8 08:13:49 2020
```

Command Line Switches

The following switches can be used with the last command:

```
[root@centos8 ~]# last --help
```

Usage:

```
last [options] [<username>...] [<tty>...]
```

Show a listing of last logged in users.

Options:

```
-<number>          how many lines to show
-a, --hostlast     display hostnames in the last column
-d, --dns          translate the IP number back into a hostname
-f, --file <file> use a specific file instead of /var/log/wtmp
-F, --fulltimes    print full login and logout times and dates
-i, --ip           display IP numbers in numbers-and-dots notation
-n, --limit <number> how many lines to show
-R, --nohostname   don't display the hostname field
-s, --since <time> display the lines since the specified time
-t, --until <time> display the lines until the specified time
-p, --present <time> display who were present at the specified time
```

```
-w, --fullnames      display full user and domain names
-x, --system         display system shutdown entries and run level changes
  --time-format <format> show timestamps in the specified <format>:
                        notime|short|full|iso

-h, --help           display this help
-V, --version        display version
```

For more details see `last(1)`.

The lastlog Command

This command shows the most recent user connexion timestamps:

```
[root@centos8 ~]# lastlog
Username      Port    From      Latest
root          pts/0             Thu Jun  3 09:01:46 -0400 2021
bin           *Never logged in**
daemon       *Never logged in**
adm          *Never logged in**
lp           *Never logged in**
sync        *Never logged in**
shutdown    *Never logged in**
halt        *Never logged in**
mail        *Never logged in**
operator    *Never logged in**
games       *Never logged in**
ftp         *Never logged in**
nobody      *Never logged in**
dbus        *Never logged in**
systemd-coredump *Never logged in**
systemd-resolve *Never logged in**
tss         *Never logged in**
```

```
polkitd          **Never logged in**
unbound          **Never logged in**
libstoragemgmt  **Never logged in**
cockpit-ws       **Never logged in**
sssd             **Never logged in**
setroubleshoot  **Never logged in**
sshd             **Never logged in**
chrony           **Never logged in**
tcpdump         **Never logged in**
trainee          pts/0    10.0.2.2    Thu Jun  3 09:01:39 -0400 2021
cockpit-wsinstance **Never logged in**
rngd            **Never logged in**
gluster         **Never logged in**
qemu           **Never logged in**
rpc            **Never logged in**
rpcuser       **Never logged in**
saslauth      **Never logged in**
radvd         **Never logged in**
dnsmasq       **Never logged in**
fenestros2    pts/0                Tue Apr 20 15:20:26 -0400 2021
fenestros1    **Never logged in**
apache        **Never logged in**
```

Command Line Switches

The following switches can be used with the lastlog command:

```
[root@centos8 ~]# lastlog --help
Usage: lastlog [options]
```

Options:

```
-b, --before DAYS          print only lastlog records older than DAYS
-C, --clear                clear lastlog record of an user (usable only with -u)
```

```
-h, --help          display this help message and exit
-R, --root CHROOT_DIR  directory to chroot into
-S, --set            set lastlog record to current time (usable only with -u)
-t, --time DAYS      print only lastlog records more recent than DAYS
-u, --user LOGIN      print lastlog record of the specified LOGIN
```

The lastb Command

This command shows the user connexion timestamps for failed logins as stored in the **/var/log/btmp** file:

```
[root@centos8 ~]# lastb
trainee tty1          Thu Jun  3 09:51 - 09:51 (00:00)
trainee tty1          Thu Jun  3 09:51 - 09:51 (00:00)
trqinee tty1          Thu Jun  3 09:51 - 09:51 (00:00)

btmp begins Thu Jun  3 09:51:07 2021
```

Command Line Switches

The following switches can be used with the lastb command:

```
[root@centos8 ~]# lastb --help

Usage:
lastb [options] [<username>...] [<tty>...]

Show a listing of last logged in users.

Options:
-<number>          how many lines to show
-a, --hostlast     display hostnames in the last column
```

```
-d, --dns           translate the IP number back into a hostname
-f, --file <file>  use a specific file instead of /var/log/btmp
-F, --fulltimes     print full login and logout times and dates
-i, --ip           display IP numbers in numbers-and-dots notation
-n, --limit <number> how many lines to show
-R, --nohostname   don't display the hostname field
-s, --since <time> display the lines since the specified time
-t, --until <time> display the lines until the specified time
-p, --present <time> display who were present at the specified time
-w, --fullnames    display full user and domain names
-x, --system       display system shutdown entries and run level changes
                   --time-format <format> show timestamps in the specified <format>:
                                     notime|short|full|iso

-h, --help         display this help
-V, --version      display version
```

For more details see `last(1)`.

The `/var/log/secure` File

This file shows user authentication timestamps, notably for the `su` command:

```
[root@centos8 ~]# tail -n 15 /var/log/secure
Jun  3 09:01:20 centos8 sshd[905]: Server listening on :: port 22.
Jun  3 09:01:39 centos8 sshd[1585]: Accepted password for trainee from 10.0.2.2 port 52734 ssh2
Jun  3 09:01:39 centos8 systemd[1590]: pam_unix(systemd-user:session): session opened for user trainee by (uid=0)
Jun  3 09:01:39 centos8 sshd[1585]: pam_unix(sshd:session): session opened for user trainee by (uid=0)
Jun  3 09:01:46 centos8 su[1627]: pam_systemd(su-l:session): Cannot create session: Already running in a session
or user slice
Jun  3 09:01:46 centos8 su[1627]: pam_unix(su-l:session): session opened for user root by trainee(uid=1000)
Jun  3 09:51:05 centos8 login[1158]: pam_unix(login:auth): check pass; user unknown
Jun  3 09:51:05 centos8 login[1158]: pam_unix(login:auth): authentication failure; logname=LOGIN uid=0 euid=0
```

```
tty=tty1 ruser= rhost=
Jun  3 09:51:07 centos8 login[1158]: FAILED LOGIN 1 FROM tty1 FOR trqinee, Authentication failure
Jun  3 09:51:18 centos8 unix_chkpwd[2400]: password check failed for user (trainee)
Jun  3 09:51:18 centos8 login[1158]: pam_unix(login:auth): authentication failure; logname=LOGIN uid=0 euid=0
tty=tty1 ruser= rhost=  user=trainee
Jun  3 09:51:20 centos8 login[1158]: FAILED LOGIN 2 FROM tty1 FOR trainee, Authentication failure
Jun  3 09:51:45 centos8 login[1158]: pam_unix(login:auth): check pass; user unknown
Jun  3 09:51:45 centos8 login[1158]: pam_unix(login:auth): authentication failure; logname=LOGIN uid=0 euid=0
tty=tty1 ruser= rhost=
Jun  3 09:51:47 centos8 login[1158]: FAILED LOGIN SESSION FROM tty1 FOR trainee , Authentication failure
```

The `/var/log/audit/audit.log` File

This file contains **events** from the audit system. Events are:

- system calls,
- file access information,
- messages from SELinux.

Consult the end of the `/var/log/audit.log` file:

```
[root@centos8 ~]# tail -n 15 /var/log/audit/audit.log
type=PROCTITLE msg=audit(1622728321.894:455): proctitle=2F7573722F7362696E2F63726F6E64002D6E
type=USER_START msg=audit(1622728321.901:456): pid=2420 uid=0 auid=1000 ses=53 subj=system_u:system_r:crond_t:s0-
s0:c0.c1023 msg='op=PAM:session_open grantors=pam_loginuid,pam_keyinit,pam_limits,pam_systemd acct="trainee"
exe="/usr/sbin/crond" hostname=? addr=? terminal=cron res=success'UID="root" AUID="trainee"
type=CRED_REFR msg=audit(1622728321.902:457): pid=2420 uid=0 auid=1000 ses=53 subj=system_u:system_r:crond_t:s0-
s0:c0.c1023 msg='op=PAM:setcred grantors=pam_env,pam_localuser,pam_unix acct="trainee" exe="/usr/sbin/crond"
hostname=? addr=? terminal=cron res=success'UID="root" AUID="trainee"
type=CRED_DISP msg=audit(1622728321.908:458): pid=2420 uid=0 auid=1000 ses=53 subj=system_u:system_r:crond_t:s0-
s0:c0.c1023 msg='op=PAM:setcred grantors=pam_env,pam_localuser,pam_unix acct="trainee" exe="/usr/sbin/crond"
hostname=? addr=? terminal=cron res=success'UID="root" AUID="trainee"
```

```
type=USER_END msg=audit(1622728321.910:459): pid=2420 uid=0 auid=1000 ses=53 subj=system_u:system_r:crond_t:s0-s0:c0.c1023 msg='op=PAM:session_close grantors=pam_loginuid,pam_keyinit,pam_limits,pam_systemd acct="trainee" exe="/usr/sbin/crond" hostname=? addr=? terminal=cron res=success'UID="root" AUID="trainee"
type=SERVICE_STOP msg=audit(1622728330.965:460): pid=1 uid=0 auid=4294967295 ses=4294967295 subj=system_u:system_r:init_t:s0 msg='unit=fprintd comm="systemd" exe="/usr/lib/systemd/systemd" hostname=? addr=? terminal=? res=success'UID="root" AUID="unset"
type=USER_ACCT msg=audit(1622728381.954:461): pid=2439 uid=0 auid=4294967295 ses=4294967295 subj=system_u:system_r:crond_t:s0-s0:c0.c1023 msg='op=PAM:accounting grantors=pam_access,pam_unix,pam_localuser acct="trainee" exe="/usr/sbin/crond" hostname=? addr=? terminal=cron res=success'UID="root" AUID="unset"
type=CRED_ACQ msg=audit(1622728381.954:462): pid=2439 uid=0 auid=4294967295 ses=4294967295 subj=system_u:system_r:crond_t:s0-s0:c0.c1023 msg='op=PAM:setcred grantors=pam_env,pam_localuser,pam_unix acct="trainee" exe="/usr/sbin/crond" hostname=? addr=? terminal=cron res=success'UID="root" AUID="unset"
type=LOGIN msg=audit(1622728381.954:463): pid=2439 uid=0 subj=system_u:system_r:crond_t:s0-s0:c0.c1023 old-auid=4294967295 auid=1000 tty=(none) old-ses=4294967295 ses=54 res=1UID="root" OLD-AUID="unset" AUID="trainee"
type=SYSCALL msg=audit(1622728381.954:463): arch=c000003e syscall=1 success=yes exit=4 a0=7 a1=7ffdc7a6d50 a2=4 a3=0 items=0 ppid=1126 pid=2439 auid=1000 uid=0 gid=0 euid=0 suid=0 fsuid=0 egid=0 sgid=0 fsgid=0 tty=(none) ses=54 comm="crond" exe="/usr/sbin/crond" subj=system_u:system_r:crond_t:s0-s0:c0.c1023 key=(null)ARCH=x86_64 SYSCALL=write AUID="trainee" UID="root" GID="root" EUID="root" SUID="root" FSUID="root" EGID="root" SGID="root" FSGID="root"
type=PROCTITLE msg=audit(1622728381.954:463): proctitle=2F7573722F7362696E2F63726F6E64002D6E
type=USER_START msg=audit(1622728381.960:464): pid=2439 uid=0 auid=1000 ses=54 subj=system_u:system_r:crond_t:s0-s0:c0.c1023 msg='op=PAM:session_open grantors=pam_loginuid,pam_keyinit,pam_limits,pam_systemd acct="trainee" exe="/usr/sbin/crond" hostname=? addr=? terminal=cron res=success'UID="root" AUID="trainee"
type=CRED_REFR msg=audit(1622728381.962:465): pid=2439 uid=0 auid=1000 ses=54 subj=system_u:system_r:crond_t:s0-s0:c0.c1023 msg='op=PAM:setcred grantors=pam_env,pam_localuser,pam_unix acct="trainee" exe="/usr/sbin/crond" hostname=? addr=? terminal=cron res=success'UID="root" AUID="trainee"
type=CRED_DISP msg=audit(1622728381.966:466): pid=2439 uid=0 auid=1000 ses=54 subj=system_u:system_r:crond_t:s0-s0:c0.c1023 msg='op=PAM:setcred grantors=pam_env,pam_localuser,pam_unix acct="trainee" exe="/usr/sbin/crond" hostname=? addr=? terminal=cron res=success'UID="root" AUID="trainee"
type=USER_END msg=audit(1622728381.968:467): pid=2439 uid=0 auid=1000 ses=54 subj=system_u:system_r:crond_t:s0-s0:c0.c1023 msg='op=PAM:session_close grantors=pam_loginuid,pam_keyinit,pam_limits,pam_systemd acct="trainee" exe="/usr/sbin/crond" hostname=? addr=? terminal=cron res=success'UID="root" AUID="trainee"
```

Managing Audit Events

Managing Audit events uses two binaries:

auditd

auditd is the audit system's daemon. When started it writes events to the log file. It is configured by the **/etc/audit/auditd.conf** file:

```
[root@centos8 ~]# cat /etc/audit/auditd.conf
#
# This file controls the configuration of the audit daemon
#

local_events = yes
write_logs = yes
log_file = /var/log/audit/audit.log
log_group = root
log_format = ENRICHED
flush = INCREMENTAL_ASYNC
freq = 50
max_log_file = 8
num_logs = 5
priority_boost = 4
name_format = NONE
##name = mydomain
max_log_file_action = ROTATE
space_left = 75
space_left_action = SYSLOG
verify_email = yes
action_mail_acct = root
admin_space_left = 50
admin_space_left_action = SUSPEND
```

```
disk_full_action = SUSPEND
disk_error_action = SUSPEND
use_libwrap = yes
##tcp_listen_port = 60
tcp_listen_queue = 5
tcp_max_per_addr = 1
##tcp_client_ports = 1024-65535
tcp_client_max_idle = 0
transport = TCP
krb5_principal = auditd
##krb5_key_file = /etc/audit/audit.key
distribute_network = no
q_depth = 400
overflow_action = SYSLOG
max_restarts = 10
plugin_dir = /etc/audit/plugins.d
```

Command Line Switches

The following switches can be used with the auditd command:

```
[root@centos8 ~]# auditd --help
auditd: unrecognized option '--help'
Usage: auditd [-f] [-l] [-n] [-s disable|enable|nochange] [-c <config_file>]
```

auditctl

This binary is used to configure the audit system. At boot time, auditctl reads and applies the rules specified in the **/etc/audit/audit.rules** file:

```
[root@centos8 ~]# cat /etc/audit/audit.rules
## This file is automatically generated from /etc/audit/rules.d
```

```
-D
-b 8192
-f 1
--backlog_wait_time 60000
```

Command Line Switches

The command line switches for the auditctl command are:

```
[root@centos8 ~]# auditctl --help
usage: auditctl [options]
  -a <l,a>          Append rule to end of <l>ist with <a>ction
  -A <l,a>          Add rule at beginning of <l>ist with <a>ction
  -b <backlog>      Set max number of outstanding audit buffers
                    allowed Default=64
  -c               Continue through errors in rules
  -C f=f           Compare collected fields if available:
                    Field name, operator(=,!<,>,<=,
                    >=,&&=) value
  -d <l,a>         Delete rule from <l>ist with <a>ction
                    l=task,exit,user,exclude
                    a=never,always
  -D               Delete all rules and watches
  -e [0..2]        Set enabled flag
  -f [0..2]        Set failure flag
                    0=silent 1=printk 2=panic
  -F f=v           Build rule: field name, operator(=,!<,>,<=,
                    >=,&&=) value
  -h               Help
  -i               Ignore errors when reading rules from file
  -k <key>         Set filter key on audit rule
  -l               List rules
  -m text          Send a user-space message
  -p [r|w|x|a]    Set permissions filter on watch
```

```
                r=read, w=write, x=execute, a=attribute
-q <mount,subtree> make subtree part of mount point's dir watches
-r <rate>          Set limit in messages/sec (0=none)
-R <file>         read rules from file
-s               Report status
-S syscall       Build rule: syscall name or number
-t               Trim directory watches
-v               Version
-w <path>        Insert watch at <path>
-W <path>        Remove watch at <path>
--loginuid-immutable Make loginuids unchangeable once set
--backlog_wait_time Set the kernel backlog_wait_time
--reset-lost     Reset the lost record counter
```

Viewing Audit Events

Two binaries are supplied to view audit events: **aureport** and **ausearch**:

The aureport Command

```
[root@centos8 ~]# aureport
```

```
Summary Report
```

```
=====
```

```
Range of time in logs: 05/08/2020 08:13:52.320 - 06/03/2021 10:20:02.028
```

```
Selected time for report: 05/08/2020 08:13:52 - 06/03/2021 10:20:02.028
```

```
Number of changes in configuration: 46
```

```
Number of changes to accounts, groups, or roles: 56
```

```
Number of logins: 21
```

```
Number of failed logins: 5
```

```
Number of authentications: 50
```

```
Number of failed authentications: 8
Number of users: 3
Number of terminals: 10
Number of host names: 4
Number of executables: 22
Number of commands: 11
Number of files: 0
Number of AVC's: 0
Number of MAC events: 35
Number of failed syscalls: 0
Number of anomaly events: 7
Number of responses to anomaly events: 0
Number of crypto events: 287
Number of integrity events: 0
Number of virt events: 0
Number of keys: 0
Number of process IDs: 616
Number of events: 6030
```

Command Line Switches

The command line switches for the aureport command are:

```
[root@centos8 ~]# aureport --help
usage: aureport [options]
  -a,--avc           Avc report
  -au,--auth        Authentication report
  --comm            Commands run report
  -c,--config       Config change report
  -cr,--crypto      Crypto report
  -e,--event        Event report
  -f,--file         File name report
  --failed          only failed events in report
```

```
-h,--host          Remote Host name report
--help            help
-i,--interpret     Interpretive mode
-if,--input <Input File name> use this file as input
--input-logs      Use the logs even if stdin is a pipe
--integrity       Integrity event report
-l,--login        Login report
-k,--key          Key report
-m,--mods         Modification to accounts report
-ma,--mac         Mandatory Access Control (MAC) report
-n,--anomaly      aNomaly report
-nc,--no-config   Don't include config events
--node <node name> Only events from a specific node
-p,--pid         Pid report
-r,--response     Response to anomaly report
-s,--syscall      Syscall report
--success        only success events in report
--summary        sorted totals for main object in report
-t,--log         Log time range report
-te,--end [end date] [end time] ending date & time for reports
-tm,--terminal    TerMinal name report
-ts,--start [start date] [start time] starting data & time for reports
--tty           Report about tty keystrokes
-u,--user        User name report
-v,--version     Version
--virt          Virtualization report
-x,--executable  eXecutable name report
If no report is given, the summary report will be displayed
```

The ausearch Command

This command can be used to search, amongst other data, for all events related to a specific user:

```
[root@centos8 ~]# ausearch -ui 1000 | more
----
time->Tue Sep  1 11:05:28 2020
type=USER_AUTH msg=audit(1598972728.209:77): pid=1633 uid=1000 auid=1000 ses=1
subj=unconfined_u:unconfined_r:unconfined_t:s0-s0:c0.c1023 msg='op=PAM:authentication grantors=pam_unix
acct="root" exe="/usr/bin/su" hostname=localhost.locald
omain addr=? terminal=pts/0 res=success'
----
time->Tue Sep  1 11:05:28 2020
type=USER_ACCT msg=audit(1598972728.214:78): pid=1633 uid=1000 auid=1000 ses=1
subj=unconfined_u:unconfined_r:unconfined_t:s0-s0:c0.c1023 msg='op=PAM:accounting grantors=pam_unix,pam_localuser
acct="root" exe="/usr/bin/su" hostname=localh
ost.localdomain addr=? terminal=pts/0 res=success'
----
time->Tue Sep  1 11:05:28 2020
type=CRED_ACQ msg=audit(1598972728.218:79): pid=1633 uid=1000 auid=1000 ses=1
subj=unconfined_u:unconfined_r:unconfined_t:s0-s0:c0.c1023 msg='op=PAM:setcred grantors=pam_unix acct="root"
exe="/usr/bin/su" hostname=localhost.localdomain ad
dr=? terminal=pts/0 res=success'
----
time->Tue Sep  1 11:05:28 2020
type=USER_START msg=audit(1598972728.223:80): pid=1633 uid=1000 auid=1000 ses=1
subj=unconfined_u:unconfined_r:unconfined_t:s0-s0:c0.c1023 msg='op=PAM:session_open
grantors=pam_keyinit,pam_keyinit,pam_limits,pam_systemd,pam_unix,pam_umask
,pam_xauth acct="root" exe="/usr/bin/su" hostname=localhost.localdomain addr=? terminal=pts/0 res=success'
----
time->Tue Sep  1 11:10:13 2020
type=USER_END msg=audit(1598973013.687:87): pid=1633 uid=1000 auid=1000 ses=1
subj=unconfined_u:unconfined_r:unconfined_t:s0-s0:c0.c1023 msg='op=PAM:session_close
grantors=pam_keyinit,pam_keyinit,pam_limits,pam_systemd,pam_unix,pam_umask,
pam_xauth acct="root" exe="/usr/bin/su" hostname=localhost.localdomain addr=? terminal=pts/0 res=success'
----
time->Tue Sep  1 11:10:13 2020
type=CRED_DISP msg=audit(1598973013.687:88): pid=1633 uid=1000 auid=1000 ses=1
```

```
subj=unconfined_u:unconfined_r:unconfined_t:s0-s0:c0.c1023 msg='op=PAM:setcred grantors=pam_unix acct="root"
exe="/usr/bin/su" hostname=localhost.localdomain a
ddr=? terminal=pts/0 res=success'
----
time->Mon Apr 19 11:48:01 2021
type=USER_AUTH msg=audit(1618847281.847:77): pid=1768 uid=1000 auid=1000 ses=1
subj=unconfined_u:unconfined_r:unconfined_t:s0-s0:c0.c1023 msg='op=PAM:authentication grantors=pam_unix
acct="root" exe="/usr/bin/su" hostname=centos8.ittraini
ng.loc addr=? terminal=pts/0 res=success'
----
time->Mon Apr 19 11:48:01 2021
type=USER_ACCT msg=audit(1618847281.847:78): pid=1768 uid=1000 auid=1000 ses=1
subj=unconfined_u:unconfined_r:unconfined_t:s0-s0:c0.c1023 msg='op=PAM:accounting grantors=pam_unix,pam_localuser
acct="root" exe="/usr/bin/su" hostname=centos
8.ittraining.loc addr=? terminal=pts/0 res=success'
----
time->Mon Apr 19 11:48:01 2021
type=CRED_ACQ msg=audit(1618847281.847:79): pid=1768 uid=1000 auid=1000 ses=1
subj=unconfined_u:unconfined_r:unconfined_t:s0-s0:c0.c1023 msg='op=PAM:setcred grantors=pam_unix acct="root"
exe="/usr/bin/su" hostname=centos8.ittraining.loc a
ddr=? terminal=pts/0 res=success'
----
time->Mon Apr 19 11:48:01 2021
type=USER_START msg=audit(1618847281.883:80): pid=1768 uid=1000 auid=1000 ses=1
subj=unconfined_u:unconfined_r:unconfined_t:s0-s0:c0.c1023 msg='op=PAM:session_open
grantors=pam_keyinit,pam_keyinit,pam_limits,pam_systemd,pam_unix,pam_umask
,pam_xauth acct="root" exe="/usr/bin/su" hostname=centos8.ittraining.loc addr=? terminal=pts/0 res=success'
----
time->Mon Apr 19 12:04:39 2021
type=USER_END msg=audit(1618848279.544:541): pid=1768 uid=1000 auid=1000 ses=1
subj=unconfined_u:unconfined_r:unconfined_t:s0-s0:c0.c1023 msg='op=PAM:session_close
grantors=pam_keyinit,pam_keyinit,pam_limits,pam_systemd,pam_unix,pam_umask
,pam_xauth acct="root" exe="/usr/bin/su" hostname=centos8.ittraining.loc addr=? terminal=pts/0 res=success'
----
```

```
time->Mon Apr 19 12:04:39 2021
type=CRED_DISP msg=audit(1618848279.544:542): pid=1768 uid=1000 auid=1000 ses=1
subj=unconfined_u:unconfined_r:unconfined_t:s0-s0:c0.c1023 msg='op=PAM:setcred grantors=pam_unix acct="root"
exe="/usr/bin/su" hostname=centos8.ittraining.loc
  addr=? terminal=pts/0 res=success'
----
time->Mon Apr 19 12:05:57 2021
type=USER_AUTH msg=audit(1618848357.204:69): pid=4892 uid=1000 auid=1000 ses=1
subj=unconfined_u:unconfined_r:unconfined_t:s0-s0:c0.c1023 msg='op=PAM:authentication grantors=? acct="root"
exe="/usr/bin/su" hostname=centos8.ittraining.loc
addr=? terminal=pts/0 res=failed'
----
time->Mon Apr 19 12:06:03 2021
type=USER_AUTH msg=audit(1618848363.134:70): pid=4901 uid=1000 auid=1000 ses=1
subj=unconfined_u:unconfined_r:unconfined_t:s0-s0:c0.c1023 msg='op=PAM:authentication grantors=pam_unix
acct="root" exe="/usr/bin/su" hostname=centos8.ittraini
ng.loc addr=? terminal=pts/0 res=success'
----
--More--
```

Command Line Switches

The command line switches for the ausearch command are:

```
[root@centos8 ~]# ausearch --help
usage: ausearch [options]
  -a,--event <Audit event id>    search based on audit event id
  --arch <CPU>                    search based on the CPU architecture
  -c,--comm <Comm name>          search based on command line name
  --checkpoint <checkpoint file> search from last complete event
  --debug                          Write malformed events that are skipped to stderr
  -e,--exit <Exit code or errno> search based on syscall exit code
  -f,--file <File name>         search based on file name
```

```
--format [raw|default|interpret|csv|text] results format options
-ga,--gid-all <all Group id> search based on All group ids
-ge,--gid-effective <effective Group id> search based on Effective
    group id
-gi,--gid <Group Id> search based on group id
-h,--help help
-hn,--host <Host Name> search based on remote host name
-i,--interpret Interpret results to be human readable
-if,--input <Input File name> use this file instead of current logs
--input-logs Use the logs even if stdin is a pipe
--just-one Emit just one event
-k,--key <key string> search based on key field
-l, --line-buffered Flush output on every line
-m,--message <Message type> search based on message type
-n,--node <Node name> search based on machine's name
-o,--object <SE Linux Object context> search based on context of object
-p,--pid <Process id> search based on process id
-pp,--ppid <Parent Process id> search based on parent process id
-r,--raw output is completely unformatted
-sc,--syscall <SysCall name> search based on syscall name or number
-se,--context <SE Linux context> search based on either subject or
    object
--session <login session id> search based on login session id
-su,--subject <SE Linux context> search based on context of the Subject
-sv,--success <Success Value> search based on syscall or event
    success value
-te,--end [end date] [end time] ending date & time for search
-ts,--start [start date] [start time] starting data & time for search
-tm,--terminal <TerMinal> search based on terminal
-ua,--uid-all <all User id> search based on All user id's
-ue,--uid-effective <effective User id> search based on Effective
    user id
-ui,--uid <User Id> search based on user id
-ul,--loginuid <login id> search based on the User's Login id
```

```
-uu,--uuid <guest UUID>      search for events related to the virtual
                               machine with the given UUID.
-v,--version                  version
-vm,--vm-name <guest name>    search for events related to the virtual
                               machine with the name.
-w,--word                     string matches are whole word
-x,--executable <executable name> search based on executable name
```



Important : Pour plus d'information concernant le système audit, consultez les manuels de **auditd**, **auditctl**, **auditpd**, **aureport** et **ausearch**.

The `/var/log/messages` file

This file contains the majority of system messages:

```
[root@centos8 ~]# tail -n 15 /var/log/messages
Jun  3 10:15:01 centos8 systemd[1]: session-76.scope: Succeeded.
Jun  3 10:16:01 centos8 systemd[1]: Started Session 77 of user trainee.
Jun  3 10:16:01 centos8 systemd[1]: session-77.scope: Succeeded.
Jun  3 10:17:01 centos8 systemd[1]: Started Session 78 of user trainee.
Jun  3 10:17:01 centos8 systemd[1]: session-78.scope: Succeeded.
Jun  3 10:18:01 centos8 systemd[1]: Started Session 79 of user trainee.
Jun  3 10:18:01 centos8 systemd[1]: session-79.scope: Succeeded.
Jun  3 10:19:01 centos8 systemd[1]: Started Session 80 of user trainee.
Jun  3 10:19:01 centos8 systemd[1]: session-80.scope: Succeeded.
Jun  3 10:20:02 centos8 systemd[1]: Started Session 81 of user trainee.
Jun  3 10:20:02 centos8 systemd[1]: session-81.scope: Succeeded.
Jun  3 10:21:01 centos8 systemd[1]: Started Session 82 of user trainee.
Jun  3 10:21:01 centos8 systemd[1]: session-82.scope: Succeeded.
```

```
Jun  3 10:22:01 centos8 systemd[1]: Started Session 83 of user trainee.  
Jun  3 10:22:01 centos8 systemd[1]: session-83.scope: Succeeded.
```

Applications

Certain applications manage their own log files directly, for example:

- cups,
- httpd,
- samba,
- ...

```
[root@centos8 ~]# ls -l /var/log  
total 2448  
drwxr-xr-x. 2 root  root    280 May  8  2020 anaconda  
drwx----- 2 root  root     23 Apr 23  2020 audit  
-rw----- 1 root  root      0 Jun  3 10:16 boot.log  
-rw----- 1 root  root  19710 Apr 19 13:44 boot.log-20210419  
-rw----- 1 root  root   9548 May 26 09:35 boot.log-20210526  
-rw----- 1 root  root   9491 Jun  2 07:40 boot.log-20210602  
-rw----- 1 root  root  38555 Jun  3 10:16 boot.log-20210603  
-rw-rw---- 1 root  utmp   1152 Jun  3 09:51 btmp  
-rw-rw---- 1 root  utmp    384 May 26 10:37 btmp-20210602  
drwxr-xr-x. 2 chrony chrony    6 Nov 19  2019 chrony  
-rw----- 1 root  root  35397 Jun  3 10:22 cron  
-rw----- 1 root  root   5652 Apr 19 13:01 cron-20210419  
-rw----- 1 root  root  16279 May 26 09:01 cron-20210526  
-rw----- 1 root  root   5117 Jun  2 07:01 cron-20210602  
-rw----- 1 root  root  13577 Jun  3 10:12 dnf.librepo.log  
-rw-r--r-- 1 root  root  43871 Apr 19 13:15 dnf.librepo.log-20210419  
-rw----- 1 root  root  89109 May 26 08:54 dnf.librepo.log-20210526  
-rw----- 1 root  root  17737 Jun  2 07:18 dnf.librepo.log-20210602
```

```
-rw-r--r--. 1 root root 749350 Jun 3 10:12 dnf.log
-rw-r--r--. 1 root root 138497 Jun 3 10:12 dnf.rpm.log
-rw-r-----. 1 root root 3808 Jun 3 09:01 firewalld
drwxr-xr-x. 2 root root 6 Nov 3 2020 glusterfs
-rw-----. 1 root root 510 Jun 3 09:58 hawkey.log
-rw-r--r--. 1 root root 561 Apr 19 12:13 hawkey.log-20210419
-rw-----. 1 root root 3927 May 26 08:54 hawkey.log-20210526
-rw-----. 1 root root 306 Jun 2 06:17 hawkey.log-20210602
-rw-rw-r--. 1 root utmp 293168 Jun 3 09:01 lastlog
drwx-----. 3 root root 18 Apr 19 12:07 libvirt
-rw-----. 1 root root 0 Jun 2 07:40 maillog
-rw-----. 1 root root 0 May 8 2020 maillog-20210419
-rw-----. 1 root root 0 Apr 19 13:44 maillog-20210526
-rw-----. 1 root root 0 May 26 09:35 maillog-20210602
-rw-----. 1 root root 452404 Jun 3 10:22 messages
-rw-----. 1 root root 397916 Apr 19 13:15 messages-20210419
-rw-----. 1 root root 173289 May 26 09:19 messages-20210526
-rw-----. 1 root root 123100 Jun 2 07:38 messages-20210602
drwx-----. 2 root root 6 May 8 2020 private
drwx-----. 3 root root 17 Aug 17 2020 samba
-rw-----. 1 root root 6554 Jun 3 09:51 secure
-rw-----. 1 root root 10835 Apr 19 12:07 secure-20210419
-rw-----. 1 root root 11884 May 26 08:49 secure-20210526
-rw-----. 1 root root 3633 Jun 2 06:40 secure-20210602
-rw-----. 1 root root 0 Jun 2 07:40 spooler
-rw-----. 1 root root 0 May 8 2020 spooler-20210419
-rw-----. 1 root root 0 Apr 19 13:44 spooler-20210526
-rw-----. 1 root root 0 May 26 09:35 spooler-20210602
drwxr-x---. 2 sssd sssd 270 Jun 3 10:16 sssd
drwxr-xr-x. 3 root root 21 Apr 19 12:07 swtpm
drwxr-xr-x. 2 root root 23 Jan 4 11:24 tuned
-rw-rw-r--. 1 root utmp 34176 Jun 3 09:51 wtmp
```

rsyslog

rsyslog, centralises system logs by using the **rsyslog** daemon.

rsyslog is an improved version of syslogd and adds additional functionality:

- the use of the TCP protocol,
- high availability,
- MySQL and PostgreSQL backends.

The messages sent to rsyslog are tagged with a **Facility** and a **Priority**. Together they are referred to as a **Selector**.

rsyslog decides what to do when it receives messages in accordance with its configuration file. rsyslog can:

- ignore the information,
- send the information to another machine (for example, **@machine2**),
- write the information to a file on disk (for example, **/var/log/messages**),
- send the information to a specific user (for example **root**),
- send the information to all connected users,
- send the information to another application via a tube.

The rsyslog daemon is configured by the **/etc/sysconfig/rsyslog** file:

```
[root@centos8 ~]# cat /etc/sysconfig/rsyslog
# Options for rsyslogd
# Syslogd options are deprecated since rsyslog v3.
# If you want to use them, switch to compatibility mode 2 by "-c 2"
# See rsyslogd(8) for more details
SYSLOGD_OPTIONS=""
```

The **SYSLOGD_OPTIONS** directive specifies the compatibility mode with older versions of syslogd:

Directive	Version
SYSLOGD_OPTIONS="-c 5"	Native mode - no compatibility

Directive	Version
SYSLOGD_OPTIONS="-c 2"	rsyslog V2 - compatibility mode
SYSLOGD_OPTIONS="-c 0"	syslogd mode

Priorities

Priorities indicate to rsyslog the importance of the message:

Level	Priority	Description
0	emerg/panic	Unusable system
1	alert	Immediate action required
2	crit	Critical condition
3	err/error	Errors found
4	warning/warn	Warnings present
5	notice	Normal condition - important message
6	info	Normal condition - normal message
7	debug	Normal condition - debug message

Facilities

Facilities indicate to rsyslog where the message originated:

Facility	Origin
auth/auth-priv	Security/Authentication sub-system
cron	cron or at
daemon	Daemons
kern	Kernel
lpr	Printing sub-system
mail	Mail sub-system
news	News sub-system
syslog	Internal rsyslog

Facility	Origin
user	Users
uucp	UUCP sub-system
local0 - local7	Applications

The `/etc/rsyslog.conf` File

rsyslog is configured by editing the `/etc/rsyslog.conf` file:

```
[root@centos8 ~]# cat /etc/rsyslog.conf
# rsyslog configuration file

# For more information see /usr/share/doc/rsyslog-*/rsyslog_conf.html
# or latest version online at http://www.rsyslog.com/doc/rsyslog_conf.html
# If you experience problems, see http://www.rsyslog.com/doc/troubleshoot.html

#### MODULES ####

module(load="imuxsock"      # provides support for local system logging (e.g. via logger command)
        SysSock.Use="off") # Turn off message reception via local log socket;
                           # local messages are retrieved through imjournal now.
module(load="imjournal"    # provides access to the systemd journal
        StateFile="imjournal.state") # File to store the position in the journal
#module(load="imklog") # reads kernel messages (the same are read from journald)
#module(load="immark") # provides --MARK-- message capability

# Provides UDP syslog reception
# for parameters see http://www.rsyslog.com/doc/imudp.html
#module(load="imudp") # needs to be done just once
#input(type="imudp" port="514")

# Provides TCP syslog reception
# for parameters see http://www.rsyslog.com/doc/имtcp.html
```

```
#module(load="imtcp") # needs to be done just once
#input(type="imtcp" port="514")

#### GLOBAL DIRECTIVES ####

# Where to place auxiliary files
global(workDirectory="/var/lib/rsyslog")

# Use default timestamp format
module(load="builtin:omfile" Template="RSYSLOG_TraditionalFileFormat")

# Include all config files in /etc/rsyslog.d/
include(file="/etc/rsyslog.d/*.conf" mode="optional")

#### RULES ####

# Log all kernel messages to the console.
# Logging much else clutters up the screen.
#kern.* /dev/console

# Log anything (except mail) of level info or higher.
# Don't log private authentication messages!
*.info;mail.none;authpriv.none;cron.none /var/log/messages

# The authpriv file has restricted access.
authpriv.* /var/log/secure

# Log all the mail messages in one place.
mail.* -/var/log/maillog

# Log cron stuff
cron.* /var/log/cron
```

```
# Everybody gets emergency messages
*.emerg                                :omusrmsg:*

# Save news errors of level crit and higher in a special file.
uucp,news.crit                          /var/log/spooler

# Save boot messages also to boot.log
local7.*                                /var/log/boot.log

# ### sample forwarding rule ###
#action(type="omfwd"
# An on-disk queue is created for this action. If the remote host is
# down, messages are spooled to disk and sent when it is up again.
#queue.filename="fwdRule1"             # unique name prefix for spool files
#queue.maxdiskspace="1g"               # 1gb space limit (use as much as possible)
#queue.saveonshutdown="on"            # save messages to disk on shutdown
#queue.type="LinkedList"              # run asynchronously
#action.resumeRetryCount="-1"         # infinite retries if host is down
# Remote Logging (we use TCP for reliable delivery)
# remote_host is: name/ip, e.g. 192.168.0.1, port optional e.g. 10514
#Target="remote_host" Port="XXX" Protocol="tcp")
```

This file is divided into three distinct sections:

- **MODULES,**
 - Contains directives that load modules that offer additional functionality to rsyslog,
- **GLOBAL DIRECTIVES,**
 - Contains the directives that configure the global aspects of rsyslog,
- **RULES,**
 - Contains the directives that tell rsyslog what to do with each selector. The rules compatible with syslogd use the same format as before such as **mail.* -/var/log/maillog** whereas rsyslog rules all start with a **\$** character.

<note important 50%> **Important** - An **Action** preceded by a minus sign takes place asynchronously. Synchronous actions produce more pertinent

logs but slow down the system. </note>

Modules

Since version three of rsyslog the data received, known as **inputs**, is managed by modules. Examples of modules are:

Module	Function
module(load="imuxsock" SysSock.Use="off")	Activates local message logging such as those received from the logger command (See below)
module(load="imklog")	Activates Kernel message logging
module(load="imudp")	Activates the UDP protocol
module(load="imtcp")	Activates the TCP protocol

In the `/etc/rsyslog.conf` file the **module(load="imuxsock" SysSock.Use="off")** and **module(load="imjournal" StateFile="imjournal.state")** modules are active:

```
...
#### MODULES ####

module(load="imuxsock"      # provides support for local system logging (e.g. via logger command)
        SysSock.Use="off") # Turn off message reception via local log socket;
        # local messages are retrieved through imjournal now.
module(load="imjournal"    # provides access to the systemd journal
        StateFile="imjournal.state") # File to store the position in the journal
#module(load="imklog") # reads kernel messages (the same are read from journald)
#module(load="immark") # provides --MARK-- message capability

# Provides UDP syslog reception
# for parameters see http://www.rsyslog.com/doc/imudp.html
#module(load="imudp") # needs to be done just once
#input(type="imudp" port="514")

# Provides TCP syslog reception
```

```
# for parameters see http://www.rsyslog.com/doc/imtcp.html
#module(load="imtcp") # needs to be done just once
#input(type="imtcp" port="514")
...
```

In order to receive rsyslog messages from other machines via UDP and TCP, the inactive modules concerned have to be activated. This is achieved by editing the **/etc/rsyslog.conf** file as follows and then restarting the rsyslog service:

```
...
# Provides UDP syslog reception
# for parameters see http://www.rsyslog.com/doc/imudp.html
module(load="imudp") # needs to be done just once
input(type="imudp" port="514")

# Provides TCP syslog reception
# for parameters see http://www.rsyslog.com/doc/imtcp.html
module(load="imtcp") # needs to be done just once
input(type="imtcp" port="514")
...
```



Important : By doing this, **Listeners** are created on port UDP/514 and on port TCP/514. Port 514 is the standard port for rsyslog Listeners. The system administrator can, if required, change this value - for example: **\$InputTCPServerRun 1514**.

To send all of the rsyslog messages to a remote-host, the lines in the in the sub-section called **begin forwarding rule** of the **/etc/rsyslog.conf** file need to be uncommented:

```
...
# ### sample forwarding rule ###
#action(type="omfwd"
# An on-disk queue is created for this action. If the remote host is
```

```
# down, messages are spooled to disk and sent when it is up again.
#queue.filename="fwdRule1"      # unique name prefix for spool files
#queue.maxdiskspace="1g"       # 1gb space limit (use as much as possible)
#queue.saveonshutdown="on"     # save messages to disk on shutdown
#queue.type="LinkedList"       # run asynchronously
#action.resumeRetryCount="-1"  # infinite retries if host is down
# Remote Logging (we use TCP for reliable delivery)
# remote_host is: name/ip, e.g. 192.168.0.1, port optional e.g. 10514
Target="remote_host" Port="514" Protocol="tcp")
...
```



Important : Messages are sent to the remote-host using the TCP protocol. For that reason the remote-host must be configured to accept TCP connexions. Finally the **Target="remote_host" Port="514" Protocol="tcp"** directive must be modified so it includes the remote-host's IP address.

Global Directives

Directives in this section configure rsyslog itself. For example, the following directive makes rsyslog log to file using the traditional date and time formats compatible with syslogd as opposed to the newer and more precise rsyslog format:

```
module(load="builtin:omfile" Template="RSYSLOG_TraditionalFileFormat")
```

Rules

Each rule is of the following format:

```
Selector[; ...] [-] Action
```

There are three types of Selector:

Facility.Priority

Messages of an equal or higher priority than that which is stipulated will be logged.

Facility!Priority

Messages of a lower priority than that which is stipulated will be logged.

Facility=Priority

Messages of a priority equal to that which is stipulated will be logged.

Using the * Wildcard

A Facility or Priority can also be a *. In this case, all of the values of the Facility or Priority are concerned by the rule. For example: **cron.***.

n Facilities with Identical Priorities

Several Facilities can have the same Priority. In this case the Facilities are separated by commas. For example: **uucp,news.crit**.

n Selectors with Identical Actions

An Action can apply to several Selectors. In this case the Selectors are separated by semi-colons. For example:
***.info;mail.none;authpriv.none;cron.none**.

The `/usr/bin/logger` Command

The `/usr/bin/logger` command is used to write user defined messages to rsyslog.

The command uses the following syntax:

```
logger -p Facility.Priority message
```

Enter the following command line into a terminal:

```
[root@centos ~]# logger -p user.info Linux is great
```

Now use **tail** to view the end of the `/var/log/messages` file:

```
[root@centos8 ~]# tail /var/log/messages
Jun  3 12:55:01 centos8 systemd[1]: session-237.scope: Succeeded.
Jun  3 12:56:01 centos8 systemd[1]: Started Session 238 of user trainee.
Jun  3 12:56:01 centos8 systemd[1]: session-238.scope: Succeeded.
Jun  3 12:57:01 centos8 systemd[1]: Started Session 239 of user trainee.
Jun  3 12:57:01 centos8 systemd[1]: session-239.scope: Succeeded.
Jun  3 12:58:01 centos8 systemd[1]: Started Session 240 of user trainee.
Jun  3 12:58:01 centos8 systemd[1]: session-240.scope: Succeeded.
Jun  3 12:58:55 centos8 trainee[5139]: Linux est super
Jun  3 12:59:01 centos8 systemd[1]: Started Session 241 of user trainee.
Jun  3 12:59:01 centos8 systemd[1]: session-241.scope: Succeeded.
```

Command Line Switches

The command line switches for the logger command are:

```
[root@centos8 ~]# logger --help
```

Usage:

```
logger [options] [<message>]
```

Enter messages into the system log.

Options:

```
-i                log the logger command's PID
  --id[=<id>]    log the given <id>, or otherwise the PID
-f, --file <file> log the contents of this file
-e, --skip-empty do not log empty lines when processing files
  --no-act       do everything except the write the log
-p, --priority <prio> mark given message with this priority
  --octet-count  use rfc6587 octet counting
  --prio-prefix  look for a prefix on every line read from stdin
-s, --stderr     output message to standard error as well
-S, --size <size> maximum size for a single message
-t, --tag <tag>  mark every line with this tag
-n, --server <name> write to this remote syslog server
-P, --port <port> use this port for UDP or TCP connection
-T, --tcp        use TCP only
-d, --udp        use UDP only
  --rfc3164      use the obsolete BSD syslog protocol
  --rfc5424[=<snip>] use the syslog protocol (the default for remote);
                  <snip> can be notime, or notq, and/or nohost
  --sd-id <id>   rfc5424 structured data ID
  --sd-param <data> rfc5424 structured data name=value
  --msgid <msgid> set rfc5424 message id field
-u, --socket <socket> write to this Unix socket
  --socket-errors[=<on|off|auto>]
                  print connection errors when using Unix sockets
  --journald[=<file>] write journald entry

-h, --help       display this help
-V, --version    display version
```

For more details see `logger(1)`.

The `/usr/sbin/logrotate` Command

Log files can grow quickly in size. The `/usr/sbin/logrotate` command is used to rotate log files in accordance with the configuration in the `/etc/logrotate.conf` file:

```
[root@centos8 ~]# cat /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

# RPM packages drop log rotation information into this directory
include /etc/logrotate.d

# system-specific logs may be also be configured here.
```

In the first part of this file can be found the directives to be applied to all log files except **wtmp** and **btmp**:

- **weekly** - rotate logs weekly,

- **rotate 4** - keep 4 weeks worth of backlogs,
- **create** - create new (empty) log files after rotating old ones,
- **dateext** - use date as a suffix of the rotated file,
- **include /etc/logrotate.d** - RPM packages drop log rotation information into this directory so that the configuration is appended to the **/etc/logrotate.conf** file.

The second part of this file concerns file specific configurations.



Important : Note that by default, file compression is not activated.

Command Line Switches

The command line switches for the logrotate command are:

```
[root@centos8 ~]# logrotate --help
Usage: logrotate [OPTION...] <configfile>
  -d, --debug                Don't do anything, just test and print debug
                             messages
  -f, --force                Force file rotation
  -m, --mail=command        Command to send mail (instead of `/bin/mail')
  -s, --state=statefile     Path of state file
  -v, --verbose             Display messages during rotation
  -l, --log=logfile         Log file or 'syslog' to log to syslog
  --version                 Display version information

Help options:
  -?, --help                Show this help message
  --usage                   Display brief usage message
```

Journald

As of RHEL/CentOS 7, rsyslog has been part of the logging system only for reasons of backward compatibility. All logs are now collected by **Journald** to be then distributed amongst the files in `/var/log`. Journald data is stored in one single file found in the `/run/log/journal` directory:

```
[root@centos8 ~]# ls -l /run/log/journal/
total 0
drwxr-s---+ 2 root systemd-journal 60 Jun  3 09:01 de79af4f226d480fa7d3fec4cabbf97a
```

By default, when the system goes down, the logs are deleted!

In order to make logs survive a reboot, you need to create the `/var/log/journal` directory:

```
[root@centos8 ~]# mkdir /var/log/journal
[root@centos8 ~]# ls -l /var/log/journal/
total 0
[root@centos8 ~]# systemctl restart systemd-journald
[root@centos8 ~]# ls -l /run/log/journal/
ls: cannot access '/run/log/journal/': No such file or directory
[root@centos8 ~]# ls -l /var/log/journal/
total 0
drwxr-xr-x. 2 root root 28 Jun  3 13:03 de79af4f226d480fa7d3fec4cabbf97a
```

Journald cannot currently send logs to a centralised logging server. To do this, journald relies on rsyslogd. This can be configured by setting **ForwardToSyslog=yes** in the `/etc/systemd/journald.conf` file and then configuring rsyslog as shown above:

```
[root@centos8 ~]# cat /etc/systemd/journald.conf
# This file is part of systemd.
#
# systemd is free software; you can redistribute it and/or modify it
# under the terms of the GNU Lesser General Public License as published by
# the Free Software Foundation; either version 2.1 of the License, or
# (at your option) any later version.
```

```
#  
# Entries in this file show the compile time defaults.  
# You can change settings by editing this file.  
# Defaults can be restored by simply deleting this file.  
#  
# See journald.conf(5) for details.
```

```
[Journal]  
#Storage=auto  
#Compress=yes  
#Seal=yes  
#SplitMode=uid  
#SyncIntervalSec=5m  
#RateLimitIntervalSec=30s  
#RateLimitBurst=10000  
#SystemMaxUse=  
#SystemKeepFree=  
#SystemMaxFileSize=  
#SystemMaxFiles=100  
#RuntimeMaxUse=  
#RuntimeKeepFree=  
#RuntimeMaxFileSize=  
#RuntimeMaxFiles=100  
#MaxRetentionSec=  
#MaxFileSec=1month  
#ForwardToSyslog=no  
ForwardToSyslog=yes  
#ForwardToKMsg=no  
#ForwardToConsole=no  
#ForwardToWall=yes  
#TTYPath=/dev/console  
#MaxLevelStore=debug  
#MaxLevelSyslog=debug  
#MaxLevelKMsg=notice
```

```
#MaxLevelConsole=info
#MaxLevelWall=emerg
#LineMax=48K
```

Using Journald

The **journalctl** command is used to consult journald data:

```
[root@centos8 ~]# journalctl
-- Logs begin at Thu 2021-06-03 09:01:10 EDT, end at Thu 2021-06-03 13:08:01 EDT. --
Jun 03 09:01:10 centos8.ittraining.loc kernel: Linux version 4.18.0-240.22.1.el8_3.x86_64
(mockbuild@kbuilder.bsys.centos.org) (gcc version 8.3.1 20191121 (Red Hat 8.3.1-5) (GCC)) #1 SMP Thu Apr 8
19:01:30 UTC 2021
Jun 03 09:01:10 centos8.ittraining.loc kernel: Command line:
BOOT_IMAGE=(hd0,msdos1)/vmlinuz-4.18.0-240.22.1.el8_3.x86_64 root=UUID=4c0cc28c-0d59-45be-bd73-d292b80be33c ro
crashkernel=auto resume=UUID=c8bb3f47-d67f-4b21-b781-766899dc83d4>
Jun 03 09:01:10 centos8.ittraining.loc kernel: x86/fpu: Supporting XSAVE feature 0x001: 'x87 floating point
registers'
Jun 03 09:01:10 centos8.ittraining.loc kernel: x86/fpu: Supporting XSAVE feature 0x002: 'SSE registers'
Jun 03 09:01:10 centos8.ittraining.loc kernel: x86/fpu: Supporting XSAVE feature 0x004: 'AVX registers'
Jun 03 09:01:10 centos8.ittraining.loc kernel: x86/fpu: xstate_offset[2]: 576, xstate_sizes[2]: 256
Jun 03 09:01:10 centos8.ittraining.loc kernel: x86/fpu: Enabled xstate features 0x7, context size is 832 bytes,
using 'standard' format.
Jun 03 09:01:10 centos8.ittraining.loc kernel: BIOS-provided physical RAM map:
Jun 03 09:01:10 centos8.ittraining.loc kernel: BIOS-e820: [mem 0x0000000000000000-0x0000000000009fbff] usable
Jun 03 09:01:10 centos8.ittraining.loc kernel: BIOS-e820: [mem 0x0000000000009fc00-0x0000000000009ffff] reserved
Jun 03 09:01:10 centos8.ittraining.loc kernel: BIOS-e820: [mem 0x000000000000f0000-0x000000000000ffffff] reserved
Jun 03 09:01:10 centos8.ittraining.loc kernel: BIOS-e820: [mem 0x00000000000100000-0x00000000000dffff] usable
Jun 03 09:01:10 centos8.ittraining.loc kernel: BIOS-e820: [mem 0x00000000000dfff0000-0x00000000000dfffffff] ACPI data
Jun 03 09:01:10 centos8.ittraining.loc kernel: BIOS-e820: [mem 0x00000000000fec00000-0x00000000000fec00fff] reserved
Jun 03 09:01:10 centos8.ittraining.loc kernel: BIOS-e820: [mem 0x00000000000fee00000-0x00000000000fee00fff] reserved
Jun 03 09:01:10 centos8.ittraining.loc kernel: BIOS-e820: [mem 0x00000000000ffc00000-0x00000000000fffffff] reserved
Jun 03 09:01:10 centos8.ittraining.loc kernel: BIOS-e820: [mem 0x00000000000100000000-0x0000000000011fffffff] usable
```

```
Jun 03 09:01:10 centos8.ittraining.loc kernel: NX (Execute Disable) protection: active
Jun 03 09:01:10 centos8.ittraining.loc kernel: SMBIOS 2.5 present.
Jun 03 09:01:10 centos8.ittraining.loc kernel: DMI: innotek GmbH VirtualBox/VirtualBox, BIOS VirtualBox
12/01/2006
Jun 03 09:01:10 centos8.ittraining.loc kernel: Hypervisor detected: KVM
Jun 03 09:01:10 centos8.ittraining.loc kernel: kvm-clock: Using msrs 4b564d01 and 4b564d00
Jun 03 09:01:10 centos8.ittraining.loc kernel: kvm-clock: cpu 0, msr 114801001, primary cpu clock
Jun 03 09:01:10 centos8.ittraining.loc kernel: kvm-clock: using sched offset of 5675771878 cycles
Jun 03 09:01:10 centos8.ittraining.loc kernel: clocksource: kvm-clock: mask: 0xffffffffffffffff max_cycles:
0x1cd42e4dffb, max_idle_ns: 881590591483 ns
Jun 03 09:01:10 centos8.ittraining.loc kernel: tsc: Detected 1190.400 MHz processor
Jun 03 09:01:10 centos8.ittraining.loc kernel: e820: update [mem 0x00000000-0x00000fff] usable ==> reserved
Jun 03 09:01:10 centos8.ittraining.loc kernel: e820: remove [mem 0x000a0000-0x000fffff] usable
Jun 03 09:01:10 centos8.ittraining.loc kernel: last_pfn = 0x120000 max_arch_pfn = 0x400000000
Jun 03 09:01:10 centos8.ittraining.loc kernel: MTRR default type: uncachable
Jun 03 09:01:10 centos8.ittraining.loc kernel: MTRR variable ranges disabled:
Jun 03 09:01:10 centos8.ittraining.loc kernel: Disabled
Jun 03 09:01:10 centos8.ittraining.loc kernel: x86/PAT: MTRRs disabled, skipping PAT initialization too.
Jun 03 09:01:10 centos8.ittraining.loc kernel: CPU MTRRs all blank - virtualized system.
Jun 03 09:01:10 centos8.ittraining.loc kernel: x86/PAT: Configuration [0-7]: WB WT UC- UC WB WT UC- UC
Jun 03 09:01:10 centos8.ittraining.loc kernel: last_pfn = 0xdfff0 max_arch_pfn = 0x400000000
Jun 03 09:01:10 centos8.ittraining.loc kernel: found SMP MP-table at [mem 0x0009fff0-0x0009ffff]
Jun 03 09:01:10 centos8.ittraining.loc kernel: kexec: Reserving the low 1M of memory for crashkernel
Jun 03 09:01:10 centos8.ittraining.loc kernel: BRK [0x114a01000, 0x114a01fff] PGTABLE
Jun 03 09:01:10 centos8.ittraining.loc kernel: BRK [0x114a02000, 0x114a02fff] PGTABLE
Jun 03 09:01:10 centos8.ittraining.loc kernel: BRK [0x114a03000, 0x114a03fff] PGTABLE
Jun 03 09:01:10 centos8.ittraining.loc kernel: BRK [0x114a04000, 0x114a04fff] PGTABLE
Jun 03 09:01:10 centos8.ittraining.loc kernel: BRK [0x114a05000, 0x114a05fff] PGTABLE
Jun 03 09:01:10 centos8.ittraining.loc kernel: BRK [0x114a06000, 0x114a06fff] PGTABLE
Jun 03 09:01:10 centos8.ittraining.loc kernel: BRK [0x114a07000, 0x114a07fff] PGTABLE
Jun 03 09:01:10 centos8.ittraining.loc kernel: BRK [0x114a08000, 0x114a08fff] PGTABLE
Jun 03 09:01:10 centos8.ittraining.loc kernel: BRK [0x114a09000, 0x114a09fff] PGTABLE
Jun 03 09:01:10 centos8.ittraining.loc kernel: RAMDISK: [mem 0x34e00000-0x366f7fff]
Jun 03 09:01:10 centos8.ittraining.loc kernel: ACPI: Early table checksum verification disabled
```

```
Jun 03 09:01:10 centos8.ittraining.loc kernel: ACPI: RSDP 0x000000000000E000 000024 (v02 VBOX )
Jun 03 09:01:10 centos8.ittraining.loc kernel: ACPI: XSDT 0x00000000DFFF0030 00003C (v01 VBOX VBOXXSDT 00000001
ASL 00000061)
Jun 03 09:01:10 centos8.ittraining.loc kernel: ACPI: FACP 0x00000000DFFF00F0 0000F4 (v04 VBOX VBOXFACP 00000001
ASL 00000061)
Jun 03 09:01:10 centos8.ittraining.loc kernel: ACPI: DSDT 0x00000000DFFF0480 002325 (v02 VBOX VBOXBIOS 00000002
INTL 20190509)
Jun 03 09:01:10 centos8.ittraining.loc kernel: ACPI: FACS 0x00000000DFFF0200 000040
Jun 03 09:01:10 centos8.ittraining.loc kernel: ACPI: FACS 0x00000000DFFF0200 000040
Jun 03 09:01:10 centos8.ittraining.loc kernel: ACPI: APIC 0x00000000DFFF0240 00006C (v02 VBOX VBOXAPIC 00000001
ASL 00000061)
lines 1-57
```



Important : Important messages, such as those flagged **notice** or **warning**, are in bold whereas critical messages are in **red**.

Application Specific Messages

To see application specific messages, pass the binary to journalctl as an argument:

```
[root@centos8 ~]# journalctl /sbin/anacron
-- Logs begin at Thu 2021-06-03 09:01:10 EDT, end at Thu 2021-06-03 13:10:01 EDT. --
Jun 03 10:01:01 centos8.ittraining.loc anacron[2575]: Anacron started on 2021-06-03
Jun 03 10:01:01 centos8.ittraining.loc anacron[2575]: Will run job `cron.daily' in 15 min.
Jun 03 10:01:01 centos8.ittraining.loc anacron[2575]: Jobs will be executed sequentially
Jun 03 10:16:01 centos8.ittraining.loc anacron[2575]: Job `cron.daily' started
Jun 03 10:16:01 centos8.ittraining.loc anacron[2575]: Job `cron.daily' terminated
Jun 03 10:16:01 centos8.ittraining.loc anacron[2575]: Normal exit (1 job run)
```

Boot Messages

To see boot messages, use journalctl with the **-b** switch:

```
[root@centos8 ~]# journalctl -b | more
-- Logs begin at Thu 2021-06-03 09:01:10 EDT, end at Thu 2021-06-03 13:11:01 EDT. --
Jun 03 09:01:10 centos8.ittraining.loc kernel: Linux version 4.18.0-240.22.1.el8_3.x86_64
(mockbuild@kbuilder.bsys.centos.org) (gcc version
 8.3.1 20191121 (Red Hat 8.3.1-5) (GCC)) #1 SMP Thu Apr 8 19:01:30 UTC 2021
Jun 03 09:01:10 centos8.ittraining.loc kernel: Command line:
BOOT_IMAGE=(hd0,msdos1)/vmlinuz-4.18.0-240.22.1.el8_3.x86_64 root=UUID=4c0cc28
c-0d59-45be-bd73-d292b80be33c ro crashkernel=auto resume=UUID=c8bb3f47-d67f-4b21-b781-766899dc83d4 rhgb quiet
Jun 03 09:01:10 centos8.ittraining.loc kernel: x86/fpu: Supporting XSAVE feature 0x001: 'x87 floating point
registers'
Jun 03 09:01:10 centos8.ittraining.loc kernel: x86/fpu: Supporting XSAVE feature 0x002: 'SSE registers'
Jun 03 09:01:10 centos8.ittraining.loc kernel: x86/fpu: Supporting XSAVE feature 0x004: 'AVX registers'
Jun 03 09:01:10 centos8.ittraining.loc kernel: x86/fpu: xstate_offset[2]: 576, xstate_sizes[2]: 256
Jun 03 09:01:10 centos8.ittraining.loc kernel: x86/fpu: Enabled xstate features 0x7, context size is 832 bytes,
using 'standard' format.
Jun 03 09:01:10 centos8.ittraining.loc kernel: BIOS-provided physical RAM map:
Jun 03 09:01:10 centos8.ittraining.loc kernel: BIOS-e820: [mem 0x0000000000000000-0x000000000009fbff] usable
Jun 03 09:01:10 centos8.ittraining.loc kernel: BIOS-e820: [mem 0x000000000009fc00-0x000000000009ffff] reserved
Jun 03 09:01:10 centos8.ittraining.loc kernel: BIOS-e820: [mem 0x00000000000f0000-0x00000000000fffff] reserved
Jun 03 09:01:10 centos8.ittraining.loc kernel: BIOS-e820: [mem 0x0000000000100000-0x00000000dfffffff] usable
Jun 03 09:01:10 centos8.ittraining.loc kernel: BIOS-e820: [mem 0x00000000dffff000-0x00000000dfffffff] ACPI data
Jun 03 09:01:10 centos8.ittraining.loc kernel: BIOS-e820: [mem 0x00000000fec00000-0x00000000fec00fff] reserved
Jun 03 09:01:10 centos8.ittraining.loc kernel: BIOS-e820: [mem 0x00000000fee00000-0x00000000fee00fff] reserved
Jun 03 09:01:10 centos8.ittraining.loc kernel: BIOS-e820: [mem 0x00000000fffc0000-0x00000000ffffffff] reserved
Jun 03 09:01:10 centos8.ittraining.loc kernel: BIOS-e820: [mem 0x0000000100000000-0x000000011fffffff] usable
Jun 03 09:01:10 centos8.ittraining.loc kernel: NX (Execute Disable) protection: active
Jun 03 09:01:10 centos8.ittraining.loc kernel: SMBIOS 2.5 present.
Jun 03 09:01:10 centos8.ittraining.loc kernel: DMI: innotek GmbH VirtualBox/VirtualBox, BIOS VirtualBox
12/01/2006
```

```
Jun 03 09:01:10 centos8.ittraining.loc kernel: Hypervisor detected: KVM
Jun 03 09:01:10 centos8.ittraining.loc kernel: kvm-clock: Using msrs 4b564d01 and 4b564d00
Jun 03 09:01:10 centos8.ittraining.loc kernel: kvm-clock: cpu 0, msr 114801001, primary cpu clock
Jun 03 09:01:10 centos8.ittraining.loc kernel: kvm-clock: using sched offset of 5675771878 cycles
Jun 03 09:01:10 centos8.ittraining.loc kernel: clocksource: kvm-clock: mask: 0xffffffffffffffff max_cycles:
0x1cd42e4dffb, max_idle_ns: 881
590591483 ns
Jun 03 09:01:10 centos8.ittraining.loc kernel: tsc: Detected 1190.400 MHz processor
Jun 03 09:01:10 centos8.ittraining.loc kernel: e820: update [mem 0x00000000-0x00000fff] usable ==> reserved
--More--
```



Important : You can see previous boot messages by using **-b 1**, **-b 2** etc.

Priority Specific Messages

To see priority specific messages, pass the priority to journalctl as an argument of the **-p** switch:

```
[root@centos8 ~]# journalctl -p warning
-- Logs begin at Thu 2021-06-03 09:01:10 EDT, end at Thu 2021-06-03 13:12:01 EDT. --
Jun 03 09:01:10 centos8.ittraining.loc kernel: #2
Jun 03 09:01:10 centos8.ittraining.loc kernel: #3
Jun 03 09:01:10 centos8.ittraining.loc kernel: acpi PNP0A03:00: fail to add MMCONFIG information, can't access
extended PCI configuration >
Jun 03 09:01:12 centos8.ittraining.loc kernel: e1000: E1000 MODULE IS NOT SUPPORTED
Jun 03 09:01:12 centos8.ittraining.loc kernel: [drm:vmw_host_log [vmwgfx]] *ERROR* Failed to send host log
message.
Jun 03 09:01:12 centos8.ittraining.loc kernel: [drm:vmw_host_log [vmwgfx]] *ERROR* Failed to send host log
message.
Jun 03 09:01:18 centos8.ittraining.loc kernel: printk: systemd: 19 output lines suppressed due to ratelimiting
Jun 03 09:01:20 centos8.ittraining.loc firewalld[874]: WARNING: AllowZoneDrifting is enabled. This is considered
```

```
an insecure configuration>
```

```
Jun 03 09:01:21 centos8.ittraining.loc systemd[1]: iscsi.service: Unit cannot be reloaded because it is inactive.
Jun 03 09:01:24 centos8.ittraining.loc systemd[1]: iscsi.service: Unit cannot be reloaded because it is inactive.
Jun 03 09:01:24 centos8.ittraining.loc systemd[1]: iscsi.service: Unit cannot be reloaded because it is inactive.
Jun 03 09:01:26 centos8.ittraining.loc chronyd[850]: System clock wrong by 1.753498 seconds, adjustment started
Jun 03 09:01:28 centos8.ittraining.loc chronyd[850]: System clock was stepped by 1.753498 seconds
Jun 03 12:46:31 centos8.ittraining.loc chronyd[850]: System clock wrong by 47255.336542 seconds, adjustment
started
lines 1-15/15 (END)
```

Journald priorities are as follows:

Level	Priority	Description
0	emerg	Unusable system
1	alert	Immediate action required
2	crit	Critical condition
3	err	Errors found
4	warning	Warnings present
5	notice	Normal condition - important message
6	info	Normal condition - normal message
7	debug	Normal condition - debug message

Messages from a Specific Date Range

To see messages from a specific date range, use the appropriate switches as shown below:

```
[root@centos8 ~]# journalctl --since 12:00 --until now
-- Logs begin at Thu 2021-06-03 09:01:10 EDT, end at Thu 2021-06-03 13:14:01 EDT. --
Jun 03 12:00:01 centos8.ittraining.loc systemd[1]: Started Session 181 of user trainee.
Jun 03 12:00:01 centos8.ittraining.loc CROND[4238]: (trainee) CMD (/bin/pwd > pwd.txt)
Jun 03 12:00:01 centos8.ittraining.loc systemd[1]: session-181.scope: Succeeded.
Jun 03 12:01:01 centos8.ittraining.loc CROND[4251]: (root) CMD (run-parts /etc/cron.hourly)
Jun 03 12:01:01 centos8.ittraining.loc systemd[1]: Started Session 182 of user trainee.
```

```
Jun 03 12:01:01 centos8.ittraining.loc run-parts[4255]: (/etc/cron.hourly) starting 0anacron
Jun 03 12:01:01 centos8.ittraining.loc CROND[4260]: (trainee) CMD (/bin/pwd > pwd.txt)
Jun 03 12:01:01 centos8.ittraining.loc run-parts[4262]: (/etc/cron.hourly) finished 0anacron
Jun 03 12:01:01 centos8.ittraining.loc systemd[1]: session-182.scope: Succeeded.
Jun 03 12:02:01 centos8.ittraining.loc systemd[1]: Started Session 183 of user trainee.
Jun 03 12:02:01 centos8.ittraining.loc CROND[4275]: (trainee) CMD (/bin/pwd > pwd.txt)
Jun 03 12:02:01 centos8.ittraining.loc systemd[1]: session-183.scope: Succeeded.
Jun 03 12:03:01 centos8.ittraining.loc systemd[1]: Started Session 184 of user trainee.
Jun 03 12:03:01 centos8.ittraining.loc CROND[4289]: (trainee) CMD (/bin/pwd > pwd.txt)
Jun 03 12:03:01 centos8.ittraining.loc systemd[1]: session-184.scope: Succeeded.
Jun 03 12:04:01 centos8.ittraining.loc systemd[1]: Started Session 185 of user trainee.
Jun 03 12:04:01 centos8.ittraining.loc CROND[4303]: (trainee) CMD (/bin/pwd > pwd.txt)
Jun 03 12:04:01 centos8.ittraining.loc systemd[1]: session-185.scope: Succeeded.
Jun 03 12:05:01 centos8.ittraining.loc systemd[1]: Started Session 186 of user trainee.
Jun 03 12:05:01 centos8.ittraining.loc CROND[4319]: (trainee) CMD (/bin/pwd > pwd.txt)
Jun 03 12:05:01 centos8.ittraining.loc systemd[1]: session-186.scope: Succeeded.
Jun 03 12:06:02 centos8.ittraining.loc systemd[1]: Started Session 187 of user trainee.
Jun 03 12:06:02 centos8.ittraining.loc CROND[4332]: (trainee) CMD (/bin/pwd > pwd.txt)
Jun 03 12:06:02 centos8.ittraining.loc systemd[1]: session-187.scope: Succeeded.
Jun 03 12:07:01 centos8.ittraining.loc systemd[1]: Started Session 188 of user trainee.
Jun 03 12:07:01 centos8.ittraining.loc CROND[4346]: (trainee) CMD (/bin/pwd > pwd.txt)
Jun 03 12:07:01 centos8.ittraining.loc systemd[1]: session-188.scope: Succeeded.
Jun 03 12:08:01 centos8.ittraining.loc systemd[1]: Started Session 189 of user trainee.
Jun 03 12:08:01 centos8.ittraining.loc CROND[4360]: (trainee) CMD (/bin/pwd > pwd.txt)
Jun 03 12:08:01 centos8.ittraining.loc systemd[1]: session-189.scope: Succeeded.
lines 1-31
```



Important : Journalctl allows the use of certain key words such as: **yesterday, today, tomorrow, now.**

Real Time Messages

To see real time messages, use journalctl with the **-f** switch:

```
[root@centos8 ~]# journalctl -f
-- Logs begin at Thu 2021-06-03 09:01:10 EDT. --
Jun 03 13:13:08 centos8.ittraining.loc systemd[1]: Started dnf makecache.
Jun 03 13:14:01 centos8.ittraining.loc systemd[1]: Started Session 256 of user trainee.
Jun 03 13:14:01 centos8.ittraining.loc CROND[5391]: (trainee) CMD (/bin/pwd > pwd.txt)
Jun 03 13:14:01 centos8.ittraining.loc systemd[1]: session-256.scope: Succeeded.
Jun 03 13:15:01 centos8.ittraining.loc systemd[1]: Started Session 257 of user trainee.
Jun 03 13:15:01 centos8.ittraining.loc CROND[5407]: (trainee) CMD (/bin/pwd > pwd.txt)
Jun 03 13:15:01 centos8.ittraining.loc systemd[1]: session-257.scope: Succeeded.
Jun 03 13:16:02 centos8.ittraining.loc systemd[1]: Started Session 258 of user trainee.
Jun 03 13:16:02 centos8.ittraining.loc CROND[5420]: (trainee) CMD (/bin/pwd > pwd.txt)
Jun 03 13:16:02 centos8.ittraining.loc systemd[1]: session-258.scope: Succeeded.
^C
```

Open a second terminal and execute the following command:

```
[trainee@centos8 ~]$ logger -p user.info Linux est super
```

Go back to the first terminal:

```
[root@centos8 ~]# journalctl -f
-- Logs begin at Thu 2021-06-03 09:01:10 EDT. --
Jun 03 13:13:08 centos8.ittraining.loc systemd[1]: Started dnf makecache.
Jun 03 13:14:01 centos8.ittraining.loc systemd[1]: Started Session 256 of user trainee.
Jun 03 13:14:01 centos8.ittraining.loc CROND[5391]: (trainee) CMD (/bin/pwd > pwd.txt)
Jun 03 13:14:01 centos8.ittraining.loc systemd[1]: session-256.scope: Succeeded.
Jun 03 13:15:01 centos8.ittraining.loc systemd[1]: Started Session 257 of user trainee.
Jun 03 13:15:01 centos8.ittraining.loc CROND[5407]: (trainee) CMD (/bin/pwd > pwd.txt)
Jun 03 13:15:01 centos8.ittraining.loc systemd[1]: session-257.scope: Succeeded.
```

```

Jun 03 13:16:02 centos8.ittraining.loc systemd[1]: Started Session 258 of user trainee.
Jun 03 13:16:02 centos8.ittraining.loc CROND[5420]: (trainee) CMD (/bin/pwd > pwd.txt)
Jun 03 13:16:02 centos8.ittraining.loc systemd[1]: session-258.scope: Succeeded.
Jun 03 13:17:01 centos8.ittraining.loc systemd[1]: Started Session 259 of user trainee.
Jun 03 13:17:01 centos8.ittraining.loc CROND[5436]: (trainee) CMD (/bin/pwd > pwd.txt)
Jun 03 13:17:01 centos8.ittraining.loc systemd[1]: session-259.scope: Succeeded.
Jun 03 13:17:19 centos8.ittraining.loc sshd[5439]: Accepted password for trainee from 10.0.2.2 port 39906 ssh2
Jun 03 13:17:19 centos8.ittraining.loc systemd-logind[880]: New session 260 of user trainee.
Jun 03 13:17:19 centos8.ittraining.loc systemd[1]: Started Session 260 of user trainee.
Jun 03 13:17:19 centos8.ittraining.loc sshd[5439]: pam_unix(sshd:session): session opened for user trainee by
(uid=0)
Jun 03 13:17:34 centos8.ittraining.loc trainee[5470]: Linux est super
Jun 03 13:17:34 centos8.ittraining.loc rsyslogd[1113]: imjournal: journal files changed, reloading...
[v8.1911.0-6.el8 try https://www.rsyslog.com/e/0 ]
Jun 03 13:18:01 centos8.ittraining.loc systemd[1]: Started Session 261 of user trainee.
Jun 03 13:18:01 centos8.ittraining.loc CROND[5481]: (trainee) CMD (/bin/pwd > pwd.txt)
Jun 03 13:18:01 centos8.ittraining.loc systemd[1]: session-261.scope: Succeeded.
^C

```



Important : In the above example, note the presence of the **Jun 03 13:17:34 centos8.ittraining.loc trainee[5470]: Linux est super** line.

Searching with Key Words

To see a list of key words, type **journalctl** then push the **Tab ↵** **twice**:

```

[root@centos8 ~]# journalctl [tab] [tab]
_AUDIT_LOGINUID=          _HOSTNAME=              NM_DEVICE=              _SYSTEMD_SESSION=
_AUDIT_SESSION=         INITRD_USEC=            NM_LOG_DOMAINS=        _SYSTEMD_SLICE=
AVAILABLE=              INVOCATION_ID=         NM_LOG_LEVEL=          _SYSTEMD_UNIT=

```

AVAILABLE_PRETTY=	JOB_ID=	N_RESTARTS=	_SYSTEMD_USER_SLICE=
_BOOT_ID=	JOB_RESULT=	_PID=	_SYSTEMD_USER_UNIT=
_CAP_EFFECTIVE=	JOB_TYPE=	PRIORITY=	TIMESTAMP_BOOTTIME=
_CMDLINE=	JOURNAL_NAME=	SEAT_ID=	TIMESTAMP_MONOTONIC=
CODE_FILE=	JOURNAL_PATH=	_SELINUX_CONTEXT=	_TRANSPORT=
CODE_FUNC=	_KERNEL_DEVICE=	SESSION_ID=	_UDEV_DEVNODE=
CODE_LINE=	_KERNEL_SUBSYSTEM=	_SOURCE_MONOTONIC_TIMESTAMP=	_UDEV_SYSNAME=
_COMM=	KERNEL_USEC=	_SOURCE_REALTIME_TIMESTAMP=	_UID=
CURRENT_USE=	LEADER=	SSSD_DOMAIN=	UNIT=
CURRENT_USE_PRETTY=	LIMIT=	_STREAM_ID=	USER_ID=
DISK_AVAILABLE=	LIMIT_PRETTY=	SYSLOG_FACILITY=	USER_INVOCATION_ID=
DISK_AVAILABLE_PRETTY=	_MACHINE_ID=	SYSLOG_IDENTIFIER=	USERSPACE_USEC=
DISK_KEEP_FREE=	MAX_USE=	SYSLOG_PID=	USER_UNIT=
DISK_KEEP_FREE_PRETTY=	MAX_USE_PRETTY=	_SYSTEMD_CGROUP=	
_EXE=	MESSAGE=	_SYSTEMD_INVOCATION_ID=	
_GID=	MESSAGE_ID=	_SYSTEMD_OWNER_UID=	

Use the same process to see what each key word can show you:

```
[root@centos8 ~]# journalctl _UID=
0      1000  81    983   990   992   998
[root@centos8 ~]# journalctl _COMM=
anacron      dbus-daemon      kdumpctl      NetworkManager  smartd          sssd_nss        systemd-
hiberna
auditd       dnf               logger         polkitd         sm-notify       su              systemd-
journal
augenrules   dnsmasq          login          rngd            sshd            (systemd)       systemd-
logind
chronyd      dracut-cmdline   lvm            rsyslogd       sssd            systemd         systemd-
udevd
crond        firewallld       netcf-transacti sh              sssd_be        systemd-fsck
```

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