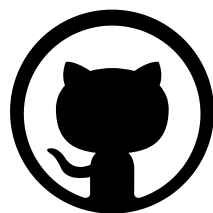


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DISCLAIMER



WORKING WITH SYSTEMD SERVICES

SYSTEMD

- An **Init system** and a **service manager** from boot to shutdown for **Linux OS**.
- Handle **services, processes, network, authentication, logging** etc...

SYSTEMD UNITS

- Entities or objects managed by **systemd**.
- Unit types that **systemd** can manage :
 - service
 - socket
 - device
 - mount or automount point
 - swap file
 - timer
 - startup target (runlevel)
 - path etc...

UNIT FILE LOCATIONS

/lib/systemd/system	standard systemd unit files
/usr/lib/systemd/system	from locally installed package
/etc/systemd/system	custom unit files

SYSTEMCTL

- To manage services on a **systemd** enabled server.

To list all units listed as "**active**"

\$ systemctl list-units

UNIT	LOAD	ACTIVE	SUB	DESCRIPTION
proc-sys-fs-binfmt_misc.automount	loaded	active	running	Arbitrary Executable File Formats File System Automount Point
sys-devices-LNXSYSTM:00-LNXYBUS:00-INTC6000:00-tpm-tpm0.device	loaded	active	plugged	/sys/devices/LNXSYSTM:00/LNXYBUS:00/INTC6000:00/tpm/tpm0
sys-devices-LNXSYSTM:00-LNXYBUS:00-INTC6000:00-tpmrm-tpmrm0.device	loaded	active	plugged	/sys/devices/LNXSYSTM:00/LNXYBUS:00/INTC6000:00/tpmrm/tpmrm0
sys-devices-pci0000:00-0000:00:02.0-drm-card0-card0\x2deDP\x2d1-intel_backlight.device	loaded	active	plugged	/sys/devices/pci0000:00/0000:00:02.0/drm/card0/card0-eDP-1/intel_backlight
sys-devices-pci0000:00-0000:00:0e.0-pci10000:e0-10000:e0:1c.4-10000:e1:00.0-nvme-nvme0-nvme0n1-nvme0n1p1.device	loaded	active	plugged	KBG40ZNS256G NVMe KIOXIA 256GB ESP
sys-devices-pci0000:00-0000:00:0e.0-pci10000:e0-10000:e0:1c.4-10000:e1:00.0-nvme-nvme0-nvme0n1-nvme0n1p2.device	loaded	active	plugged	KBG40ZNS256G NVMe KIOXIA 256GB Microsoft\x20reserved\x20partition
sys-devices-pci0000:00-0000:00:0e.0-pci10000:e0-10000:e0:1c.4-10000:e1:00.0-nvme-nvme0-nvme0n1-nvme0n1p3.device	loaded	active	plugged	KBG40ZNS256G NVMe KIOXIA 256GB OS
sys-devices-pci0000:00-0000:00:0e.0-pci10000:e0-10000:e0:1c.4-10000:e1:00.0-nvme-nvme0-nvme0n1-nvme0n1p4.device	loaded	active	plugged	KBG40ZNS256G NVMe KIOXIA 256GB 4
sys-devices-pci0000:00-0000:00:0e.0-pci10000:e0-10000:e0:1c.4-10000:e1:00.0-nvme-nvme0-nvme0n1-nvme0n1p5.device	loaded	active	plugged	KBG40ZNS256G NVMe KIOXIA 256GB Image
sys-devices-pci0000:00-0000:00:0e.0-pci10000:e0-10000:e0:1c.4-10000:e1:00.0-nvme-nvme0-nvme0n1-nvme0n1p6.device	loaded	active	plugged	KBG40ZNS256G NVMe KIOXIA 256GB DELLSUPPORT
sys-devices-pci0000:00-0000:00:0e.0-pci10000:e0-10000:e0:1c.4-10000:e1:00.0-nvme-nvme0-nvme0n1-nvme0n1p7.device	loaded	active	plugged	KBG40ZNS256G NVMe KIOXIA 256GB boot
sys-devices-pci0000:00-0000:00:0e.0-pci10000:e0-10000:e0:1c.4-10000:e1:00.0-nvme-nvme0-nvme0n1-nvme0n1p8.device	loaded	active	plugged	KBG40ZNS256G NVMe KIOXIA 256GB rootfs
sys-devices-pci0000:00-0000:00:0e.0-pci10000:e0-10000:e0:1c.4-10000:e1:00.0-nvme-nvme0-nvme0n1-nvme0n1p9.device	loaded	active	plugged	KBG40ZNS256G NVMe KIOXIA 256GB
sys-devices-pci0000:00-0000:00:14.0-usb1-1\x2d10-1\x2d10:1.0-bluetooth-hci0.device	loaded	active	plugged	/sys/devices/pci0000:00/0000:00:14.0/usb1/1-10/1-10:1.0/bluetooth/hci0
sys-devices-pci0000:00-0000:00:1d.0-0000:01:00.0-net-wlp1s0.device	loaded	active	plugged	RTL8821CE 802.11ac PCIe Wireless Network Adapter
sys-devices-pci0000:00-0000:00:1f.3-sound-card0-controlC0.device	loaded	active	plugged	/sys/devices/pci0000:00/0000:00:1f.3/sound/card0/controlC0
sys-devices-platform-serial8250-tty-ttyS0.device	loaded	active	plugged	/sys/devices/platform/serial8250/tty/ttyS0
sys-devices-platform-serial8250-tty-ttyS1.device	loaded	active	plugged	/sys/devices/platform/serial8250/tty/ttyS1
sys-devices-platform-serial8250-tty-ttyS10.device	loaded	active	plugged	/sys/devices/platform/serial8250/tty/ttyS10
sys-devices-platform-serial8250-tty-ttyS11.device	loaded	active	plugged	/sys/devices/platform/serial8250/tty/ttyS11
sys-devices-platform-serial8250-tty-ttyS12.device	loaded	active	plugged	/sys/devices/platform/serial8250/tty/ttyS12
sys-devices-platform-serial8250-tty-ttyS13.device	loaded	active	plugged	/sys/devices/platform/serial8250/tty/ttyS13
sys-devices-platform-serial8250-tty-ttyS14.device	loaded	active	plugged	/sys/devices/platform/serial8250/tty/ttyS14
sys-devices-platform-serial8250-tty-ttyS15.device	loaded	active	plugged	/sys/devices/platform/serial8250/tty/ttyS15
sys-devices-platform-serial8250-tty-ttyS16.device	loaded	active	plugged	/sys/devices/platform/serial8250/tty/ttyS16

lines 1-26

SYSTEMCTL

To list all units listed as "**active**" and "**inactive**"

\$ systemctl list-units -all

UNIT	LOAD	ACTIVE	SUB	DESCRIPTION
proc-sys-fs-binfmt_misc.automount	loaded	active	running	Arbitrary Executable File Formats File System Automount Point
dev-disk-by\x2ddiskseq-1.device	loaded	active	plugged	/dev/disk/by-diskseq/1
dev-disk-by\x2ddiskseq-13.device	loaded	active	plugged	/dev/disk/by-diskseq/13
dev-disk-by\x2ddiskseq-14.device	loaded	active	plugged	/dev/disk/by-diskseq/14
dev-disk-by\x2ddiskseq-15.device	loaded	active	plugged	/dev/disk/by-diskseq/15
dev-disk-by\x2ddiskseq-16.device	loaded	active	plugged	/dev/disk/by-diskseq/16
dev-disk-by\x2ddiskseq-17.device	loaded	active	plugged	/dev/disk/by-diskseq/17
dev-disk-by\x2ddiskseq-18.device	loaded	active	plugged	/dev/disk/by-diskseq/18
dev-disk-by\x2ddiskseq-19.device	loaded	active	plugged	/dev/disk/by-diskseq/19
dev-disk-by\x2ddiskseq-2.device	loaded	active	plugged	/dev/disk/by-diskseq/2
dev-disk-by\x2ddiskseq-20.device	loaded	active	plugged	/dev/disk/by-diskseq/20
dev-disk-by\x2ddiskseq-21.device	loaded	active	plugged	/dev/disk/by-diskseq/21
dev-disk-by\x2ddiskseq-22.device	loaded	active	plugged	/dev/disk/by-diskseq/22
dev-disk-by\x2ddiskseq-23.device	loaded	active	plugged	/dev/disk/by-diskseq/23
dev-disk-by\x2ddiskseq-24.device	loaded	active	plugged	/dev/disk/by-diskseq/24
dev-disk-by\x2ddiskseq-25.device	loaded	active	plugged	/dev/disk/by-diskseq/25
dev-disk-by\x2ddiskseq-26.device	loaded	active	plugged	/dev/disk/by-diskseq/26
dev-disk-by\x2ddiskseq-27.device	loaded	active	plugged	/dev/disk/by-diskseq/27
dev-disk-by\x2ddiskseq-28.device	loaded	active	plugged	/dev/disk/by-diskseq/28
dev-disk-by\x2ddiskseq-29.device	loaded	active	plugged	/dev/disk/by-diskseq/29
dev-disk-by\x2ddiskseq-3.device	loaded	active	plugged	/dev/disk/by-diskseq/3
dev-disk-by\x2ddiskseq-30.device	loaded	active	plugged	/dev/disk/by-diskseq/30
dev-disk-by\x2ddiskseq-31.device	loaded	active	plugged	/dev/disk/by-diskseq/31
dev-disk-by\x2ddiskseq-32.device	loaded	active	plugged	/dev/disk/by-diskseq/32
dev-disk-by\x2ddiskseq-33.device	loaded	active	plugged	/dev/disk/by-diskseq/33

SYSTEMCTL

To list all unit installed on the system and also in a **BEAUTIFUL** way
\$ systemctl list-unit-files

UNIT FILE	STATE	PRESET
proc-sys-fs-binfmt_misc.automount	static	-
-.mount	generated	-
boot-efi.mount	generated	-
boot.mount	generated	-
dev-hugepages.mount	static	-
dev-mqueue.mount	static	-
proc-sys-fs-binfmt_misc.mount	disabled	disabled
snap-bare-5.mount	enabled	enabled
snap-core-15419.mount	enabled	enabled
snap-core-15511.mount	enabled	enabled
snap-core18-2751.mount	enabled	enabled
snap-core18-2785.mount	enabled	enabled
snap-core20-1950.mount	enabled	enabled
snap-core20-1974.mount	enabled	enabled
snap-core22-806.mount	enabled	enabled
snap-core22-817.mount	enabled	enabled
snap-dbeaver\x2dce-241.mount	enabled	enabled
snap-dbeaver\x2dce-243.mount	enabled	enabled
snap-drawio-180.mount	enabled	enabled
snap-drawio-181.mount	enabled	enabled
snap-firefox-2880.mount	enabled	enabled
snap-firefox-2908.mount	enabled	enabled
snap-gnome\x2d3\x2d28\x2d1804-198.mount	enabled	enabled
snap-gnome\x2d3\x2d34\x2d1804-93.mount	enabled	enabled
snap-gnome\x2d3\x2d38\x2d2004-140.mount	enabled	enabled

lines 1-26

SYSTEMCTL STATUS COMMAND

To check if a service is running

\$ sudo systemctl status <service_name>

Output:

```
● apache2.service - The Apache HTTP Server
   Loaded: loaded (/lib/systemd/system/apache2.service; enabled; preset: enabled)
   Active: active (running) since Sat 2023-07-15 12:10:48 +04; 13s ago
     Docs: https://httpd.apache.org/docs/2.4/
  Main PID: 13601 (apache2)
    Tasks: 55 (limit: 9059)
   Memory: 5.4M
      CPU: 20ms
   CGroup: /system.slice/apache2.service
           └─13601 /usr/sbin/apache2 -k start
             └─13602 /usr/sbin/apache2 -k start
               └─13603 /usr/sbin/apache2 -k start

zil 15 12:10:48 dodoadmin-Inspiron-15-3511 systemd[1]: Starting The Apache HTTP Server...
zil 15 12:10:48 dodoadmin-Inspiron-15-3511 apachectl[13600]: AH00558: apache2: Could not reli
zil 15 12:10:48 dodoadmin-Inspiron-15-3511 systemd[1]: Started The Apache HTTP Server.
```

SYSTEMCTL COMMANDS

To start a service

\$ systemctl status <service_name>

To stop a service

\$ systemctl stop <service_name>

To restart a service

\$ systemctl restart <service_name>

To reload a service

\$ systemctl reload <service_name>

SYSTEMCTL ENABLE/DISABLE COMMAND

To enable the service to start at boot

\$ systemctl enable <service_name>

To disable the service to start at boot

\$ systemctl disable <service_name>

MINIMAL SERVICE UNIT FILE EXAMPLE

[Unit]

Description=A very simple service

After=network.target

[Service]

Type=simple

ExecStart=/usr/local/bin/exampleProgram

[Install]

WantedBy=multi-user.target

SYSTEMCTL

To make systemd re-read all unit files

\$ systemctl daemon-reload

DEMO

CREATING A CUSTOM UNIT FILE

JOURNALCTL

- Log information from applications and the kernel

To see all log entries from the general system state

\$ journalctl

Flags:

- -b (current boot)
- -k (only kernel message)
- -k -b (only kernel message of current boot)

JOURNALCTL

```
zil 20 15:10:31 dodoadmin-Inspiron-15-3511 kernel: microcode: microcode updated early to revision 0xa6, date = 2022-06-28
zil 20 15:10:31 dodoadmin-Inspiron-15-3511 kernel: Linux version 5.19.0-46-generic (buildd@lcy02-amd64-061) (x86_64-linux-gnu-gcc-12 (Ubuntu 12.2.0-3ubuntu1) 12.2.0, GNU ld (GNU Binutils for Ubuntu) 2.39) #47-U
zil 20 15:10:31 dodoadmin-Inspiron-15-3511 kernel: Command line: BOOT_IMAGE=/vmlinuz-5.19.0-46-generic root=/dev/mapper/ubuntu--vg-root ro quiet splash vt.handoff=7
zil 20 15:10:31 dodoadmin-Inspiron-15-3511 kernel: KERNEL supported cpus:
zil 20 15:10:31 dodoadmin-Inspiron-15-3511 kernel:   Intel GenuineIntel
zil 20 15:10:31 dodoadmin-Inspiron-15-3511 kernel:   AMD AuthenticAMD
zil 20 15:10:31 dodoadmin-Inspiron-15-3511 kernel:   Hygon HygonGenuine
zil 20 15:10:31 dodoadmin-Inspiron-15-3511 kernel:   Centaur CentaurHauls
zil 20 15:10:31 dodoadmin-Inspiron-15-3511 kernel:   zhaoxin   Shanghai
zil 20 15:10:31 dodoadmin-Inspiron-15-3511 kernel: x86/split lock detection: #AC: crashing the kernel on kernel split_locks and warning on user-space split_locks
zil 20 15:10:31 dodoadmin-Inspiron-15-3511 kernel: x86/fpu: Supporting XSAVE feature 0x001: 'x87 floating point registers'
zil 20 15:10:31 dodoadmin-Inspiron-15-3511 kernel: x86/fpu: Supporting XSAVE feature 0x002: 'SSE registers'
zil 20 15:10:31 dodoadmin-Inspiron-15-3511 kernel: x86/fpu: Supporting XSAVE feature 0x004: 'AVX registers'
zil 20 15:10:31 dodoadmin-Inspiron-15-3511 kernel: x86/fpu: Supporting XSAVE feature 0x020: 'AVX-512 opmask'
zil 20 15:10:31 dodoadmin-Inspiron-15-3511 kernel: x86/fpu: Supporting XSAVE feature 0x040: 'AVX-512 Hi256'
zil 20 15:10:31 dodoadmin-Inspiron-15-3511 kernel: x86/fpu: Supporting XSAVE feature 0x080: 'AVX-512 ZMM_Hi256'
zil 20 15:10:31 dodoadmin-Inspiron-15-3511 kernel: x86/fpu: Supporting XSAVE feature 0x200: 'Protection Keys User registers'
zil 20 15:10:31 dodoadmin-Inspiron-15-3511 kernel: x86/fpu: xstate_offset[2]: 576, xstate_sizes[2]: 256
zil 20 15:10:31 dodoadmin-Inspiron-15-3511 kernel: x86/fpu: xstate_offset[5]: 832, xstate_sizes[5]: 64
zil 20 15:10:31 dodoadmin-Inspiron-15-3511 kernel: x86/fpu: xstate_offset[6]: 896, xstate_sizes[6]: 512
zil 20 15:10:31 dodoadmin-Inspiron-15-3511 kernel: x86/fpu: xstate_offset[7]: 1408, xstate_sizes[7]: 1024
zil 20 15:10:31 dodoadmin-Inspiron-15-3511 kernel: x86/fpu: xstate_offset[9]: 2432, xstate_sizes[9]: 8
zil 20 15:10:31 dodoadmin-Inspiron-15-3511 kernel: x86/fpu: Enabled xstate features 0x2e7, context size is 2440 bytes, using 'compact' format.
zil 20 15:10:31 dodoadmin-Inspiron-15-3511 kernel: signal: max sigframe size: 3632
zil 20 15:10:31 dodoadmin-Inspiron-15-3511 kernel: BIOS-provided physical RAM map:
zil 20 15:10:31 dodoadmin-Inspiron-15-3511 kernel: BIOS-e820: [mem 0x0000000000000000-0x0000000000009eff] usable
```

lines 1-26

JOURNALCTL

QUERYING UNIT STATES AND LOGS

To see log entries for a specific unit

\$ journalctl -u <service_name>

To see log entries for a specific unit of the current boot

\$ journalctl -b -u <service_name>

To see updated log entries for a specific unit as they are generated

\$ journalctl -u <service_name> -f