DERECK LAM HON WAH

3rd Year BSc. Computer Science (System Engineering)
Student from Middlesex University Mauritius

Dereck Lam Hon Wah

derecklhw

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-LNXSYBUS:00-INTC6000:00-tpm-tpm0.device                                    loaded active plugged   /sys/devices/LNXSYSTM:00/LNXSYBUS:00/INTC6000:00/tpm/tpm0
sys-devices-LNXSYSTM:00-LNXSYBUS:00-INTC6000:00-tpmrm-tpmrm0.device                                loaded active plugged   /sys/devices/LNXSYSTM:00/LNXSYBUS: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_backlig>
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.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
lines 1-26
```

SYSTEMCTL

To list all unit installed on the system and also in a BEAUTIFUL way

$ systemctl list-unit-files

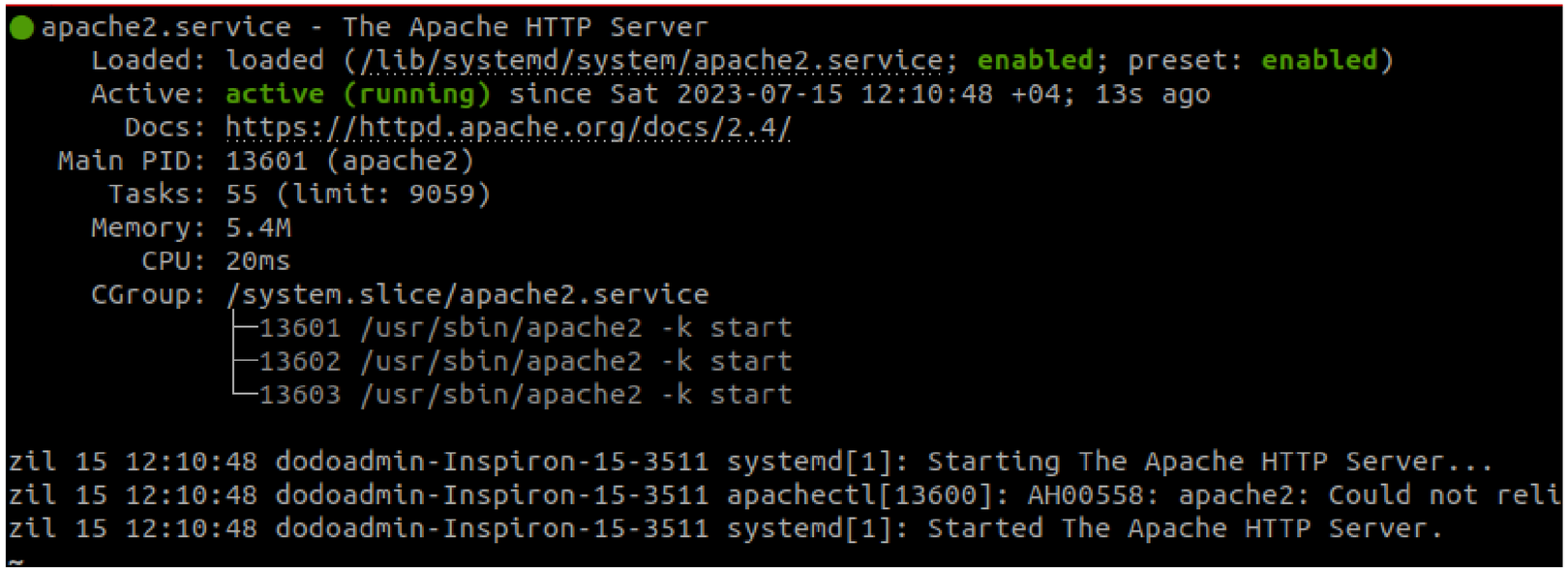
```
UNIT FILE                                                  STATE           PRESET
proc-sys-fs-binfmt_misc.automount                          static          -
-.mount                                                    generated       -
boot-efi.mount                                             generated       -
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:



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

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 'compacted' 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 0x0000000000000000-0x000000000009efff] 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