

Lesson 3: /sbin/init and system (Assignment 3)

Command - ps aux ()

```
cxr1020@raspberrypi:~/Documents/EmbeddedLinuxRepo/CSR-EmbeddedLinux/Assignment03-Code $ ps aux
USER      PID %CPU %MEM    VSZ   RSS TTY      STAT START   TIME COMMAND
root      1  0.0  0.1 164948 10024 ?        Ss   12:21  0:03 /sbin/init splash
root      2  0.0  0.0     0   0 ?        S     12:21  0:00 [kthreadd]
root      3  0.0  0.0     0   0 ?        I<  12:21  0:00 [rcu_gp]
root      4  0.0  0.0     0   0 ?        I<  12:21  0:00 [rcu_par_gp]
root      5  0.0  0.0     0   0 ?        I<  12:21  0:00 [slub_flushwq]
root      6  0.0  0.0     0   0 ?        I<  12:21  0:00 [netns]
root      10 0.0  0.0     0   0 ?       I<  12:21  0:00 [mm_percpu_wq]
root     11 0.0  0.0     0   0 ?       I     12:21  0:00 [rcu_tasks_kthread]
root     12 0.0  0.0     0   0 ?       I     12:21  0:00 [rcu_tasks_rude_kthread]
root     13 0.0  0.0     0   0 ?       I     12:21  0:00 [rcu_tasks_trace_kthread]
root     14 0.0  0.0     0   0 ?       S     12:21  0:00 [ksoftirqd/0]
root     15 0.0  0.0     0   0 ?       I     12:21  0:01 [rcu_preempt]
root     16 0.0  0.0     0   0 ?       S     12:21  0:00 [migration/0]
root     17 0.0  0.0     0   0 ?       S     12:21  0:00 [cpuhp/0]
root     18 0.0  0.0     0   0 ?       S     12:21  0:00 [cpuhp/1]
root     19 0.0  0.0     0   0 ?       S     12:21  0:00 [migration/1]
root     20 0.0  0.0     0   0 ?       S     12:21  0:00 [ksoftirqd/1]
root     23 0.0  0.0     0   0 ?       S     12:21  0:00 [cpuhp/2]
root     24 0.0  0.0     0   0 ?       S     12:21  0:00 [migration/2]
root     25 0.0  0.0     0   0 ?       S     12:21  0:00 [ksoftirqd/2]
root     28 0.0  0.0     0   0 ?       S     12:21  0:00 [cpuhp/3]
root     29 0.0  0.0     0   0 ?       S     12:21  0:00 [migration/3]
root     30 0.0  0.0     0   0 ?       S     12:21  0:00 [ksoftirqd/3]
root     33 0.0  0.0     0   0 ?       S     12:21  0:00 [kdevtmpfs]
root     34 0.0  0.0     0   0 ?       I<  12:21  0:00 [inet_frag_wq]
root     36 0.0  0.0     0   0 ?       S     12:21  0:00 [kaudittd]
root     38 0.0  0.0     0   0 ?       S     12:21  0:00 [khungtaskd]
root     40 0.0  0.0     0   0 ?       S     12:21  0:00 [oom_reaper]
root     41 0.0  0.0     0   0 ?       I<  12:21  0:00 [writeback]
root     42 0.0  0.0     0   0 ?       S     12:21  0:02 [kcompactd0]
root     43 0.0  0.0     0   0 ?       I<  12:21  0:00 [kintegrityd]
root     44 0.0  0.0     0   0 ?       I<  12:21  0:00 [kblockd]
root     45 0.0  0.0     0   0 ?       I<  12:21  0:00 [blkcg_punt_bio]
root     46 0.0  0.0     0   0 ?       S     12:21  0:00 [watchdogd]
root     50 0.0  0.0     0   0 ?       I<  12:21  0:00 [rpciod]
root     51 0.0  0.0     0   0 ?       I<  12:21  0:00 [xprtiod]
```

Command – ls -l sbin/init

```
cxr1020@raspberrypi:~/Documents/EmbeddedLinuxRepo/CSR-EmbeddedLinux/Assignment03-Code $ ls -l /sbin/init
lrwxrwxrwx 1 root root 20 Jun 18 07:55 /sbin/init -> /lib/systemd/systemd
cxr1020@raspberrypi:~/Documents/EmbeddedLinuxRepo/CSR-EmbeddedLinux/Assignment03-Code $
```

Command - ls /etc/systemd/

```
cxr1020@raspberrypi:~/Documents/EmbeddedLinuxRepo/CSR-EmbeddedLinux/Assignment03-Code $ ls /etc/systemd/
journald.conf  network      pstore.conf    sleep.conf   system.conf    user
logind.conf    networkd.conf resolved.conf  system      timesyncd.conf user.conf
cxr1020@raspberrypi:~/Documents/EmbeddedLinuxRepo/CSR-EmbeddedLinux/Assignment03-Code $
```

Command - cat /etc/systemd/system.conf

```
cxr1020@raspberrypi:~/Documents/EmbeddedLinuxRepo/CSR-EmbeddedLinux/Assignment03-Code $ ls /etc/systemd/
journald.conf  network      pstore.conf    sleep.conf   system.conf    user
logind.conf    networkd.conf resolved.conf  system      timesyncd.conf user.conf
cxr1020@raspberrypi:~/Documents/EmbeddedLinuxRepo/CSR-EmbeddedLinux/Assignment03-Code $ cat /etc/systemd/system.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 systemd-system.conf(5) for details.

[Manager]
#LogLevel=info
#LogTarget=journal-or-kmsg
#LogColor=yes
#LogLocation=no
#LogTime=no
#DumpCore=yes
#ShowStatus=yes
#CrashChangeVT=no
#CrashShell=no
#CrashReboot=no
#CtrlAAltDelBurstAction=reboot-force
#CPUAffinity=1 2
#NUMAPolicy=default
#NUMAMask=
#RuntimeWatchdogSec=0
#RebootWatchdogSec=10min
#ShutdownWatchdogSec=10min
#KexecWatchdogSec=0
#WatchdogDevice=
#CapabilityBoundingSet=
```

Command - ls /etc/systemd/system

```
cxr1020@raspberrypi:~/Documents/EmbeddedLinuxRepo/CSR-EmbeddedLinux/Assignment03-Code $ ls /etc/systemd/system
bluetooth.target.wants          default.target.wants    halt.target.wants      remote-fs.target.wants
dbus-fi.wl.wpa_supplicant1.service dev-serial1.device.wants multi-user.target.wants  sockets.target.wants
dbus-org.bluez.service          dhcpcd.service.d      network-online.target.wants sshd.service
dbus-org.freedesktop.Avahi.service display-manager.service poweroff.target.wants   sysinit.target.wants
dbus-org.freedesktop.ModemManager1.service getty.target.wants  printer.target.wants    syslog.service
dbus-org.freedesktop.timesync1.service getty@tty1.service.d  rc-local.service.d     timers.target.wants
default.target                  graphical.target.wants  reboot.target.wants
cxr1020@raspberrypi:~/Documents/EmbeddedLinuxRepo/CSR-EmbeddedLinux/Assignment03-Code $
```

Command – systemctl

UNIT	LOAD	ACTIVE	SUB	DESCR>
proc-sys-fs-binfmt_misc.automount	loaded	active	waiting	Arbitrarily selected unit to be started at system boot.
sys-devices-platform-emmc2bus-fe340000 mmc-mmc_host mmc0:mmc0:59b4-block-mmcb1k0-mmcb1k0p1.device	loaded	active	plugged	/sys/>
sys-devices-platform-emmc2bus-fe340000 mmc-mmc_host mmc0:mmc0:59b4-block-mmcb1k0-mmcb1k0p2.device	loaded	active	plugged	/sys/>
sys-devices-platform-emmc2bus-fe340000 mmc-mmc_host mmc0:mmc0:59b4-block-mmcb1k0-mmcb1k0p5.device	loaded	active	plugged	/sys/>
sys-devices-platform-emmc2bus-fe340000 mmc-mmc_host mmc0:mmc0:59b4-block-mmcb1k0-mmcb1k0p6.device	loaded	active	plugged	/sys/>
sys-devices-platform-emmc2bus-fe340000 mmc-mmc_host mmc0:mmc0:59b4-block-mmcb1k0-mmcb1k0p7.device	loaded	active	plugged	/sys/>
sys-devices-platform-emmc2bus-fe340000 mmc-mmc_host mmc0:mmc0:59b4-block-mmcb1k0-mmcb1k0.device	loaded	active	plugged	/sys/>
sys-devices-platform-scb-fd580000 ethernet-net-eth0.device	loaded	active	plugged	/sys/>
sys-devices-platform-soc-fe00b840.mailbox-bcm2835_audio-sound-card0-controlC0.device	loaded	active	plugged	/sys/>
sys-devices-platform-soc-fe201000.serial-tty-ttyAMA0-hci0.device	loaded	active	plugged	/sys/>
sys-devices-platform-soc-fe201000.serial-tty-ttyAMA0.device	loaded	active	plugged	/sys/>
sys-devices-platform-soc-fe300000.mmcnr-mmc_host mmc1:mmc1:0001-mmci1:0001:1-net-wlan0.device	loaded	active	plugged	/sys/>
sys-devices-platform-soc-fef00700.hdmi-sound-card1-controlC1.device	loaded	active	plugged	/sys/>
sys-devices-platform-soc-fef05700.hdmi-sound-card2-controlC2.device	loaded	active	plugged	/sys/>
sys-devices-virtual-block-ram0.device	loaded	active	plugged	/sys/>
sys-devices-virtual-block-ram1.device	loaded	active	plugged	/sys/>
sys-devices-virtual-block-ram10.device	loaded	active	plugged	/sys/>
sys-devices-virtual-block-ram11.device	loaded	active	plugged	/sys/>
sys-devices-virtual-block-ram12.device	loaded	active	plugged	/sys/>
sys-devices-virtual-block-ram13.device	loaded	active	plugged	/sys/>
sys-devices-virtual-block-ram14.device	loaded	active	plugged	/sys/>
sys-devices-virtual-block-ram15.device	loaded	active	plugged	/sys/>
sys-devices-virtual-block-ram2.device	loaded	active	plugged	/sys/>
sys-devices-virtual-block-ram3.device	loaded	active	plugged	/sys/>
sys-devices-virtual-block-ram4.device	loaded	active	plugged	/sys/>
sys-devices-virtual-block-ram5.device	loaded	active	plugged	/sys/>
sys-devices-virtual-block-ram6.device	loaded	active	plugged	/sys/>
sys-devices-virtual-block-ram7.device	loaded	active	plugged	/sys/>
sys-devices-virtual-block-ram8.device	loaded	active	plugged	/sys/>
sys-devices-virtual-block-ram9.device	loaded	active	plugged	/sys/>
sys-devices-virtual-misc-rfkill.device	loaded	active	plugged	/sys/>
sys-devices-virtual-tty-ttyprintk.device	loaded	active	plugged	/sys/>
sys-module-configfs.device	loaded	active	plugged	/sys/>
sys-module-fuse.device	loaded	active	plugged	/sys/>
sys-subsystem-bluetooth-devices-hci0.device	loaded	active	plugged	/sys/>
sys-subsystem-net-devices-eth0.device	loaded	active	plugged	/sys/>

Command - systemctl Bluetooth

```
cxr1020@raspberrypi:~/Documents/EmbeddedLinuxRepo/CSR-EmbeddedLinux/Assignment03-Code $ systemctl status bluetooth
● bluetooth.service - Bluetooth service
  Loaded: loaded (/lib/systemd/system/bluetooth.service; enabled; vendor preset: enabled)
  Active: active (running) since Wed 2023-11-22 12:17:13 PST; 11h ago
    Docs: man:bluetoothd(8)
   Main PID: 762 (bluetoothd)
     Status: "Running"
       Tasks: 1 (limit: 8755)
      CPU: 80ms
     CGroup: /system.slice/bluetooth.service
             └─762 /usr/libexec/bluetooth/bluetoothd

Nov 22 12:17:13 raspberrypi systemd[1]: Started Bluetooth service.
Nov 22 12:17:13 raspberrypi bluetoothd[762]: Starting SDP server
Nov 22 12:17:13 raspberrypi bluetoothd[762]: Bluetooth management interface 1.22 initialized
Nov 22 12:17:13 raspberrypi bluetoothd[762]: profiles/sap/server.c:sap_server_register() Sap driver initialization failed.
Nov 22 12:17:13 raspberrypi bluetoothd[762]: sap-server: Operation not permitted (1)
Nov 22 12:17:13 raspberrypi bluetoothd[762]: Endpoint registered: sender=:1.32 path=/MediaEndpoint/A2DPSSink/sbc
Nov 22 12:17:13 raspberrypi bluetoothd[762]: Endpoint registered: sender=:1.32 path=/MediaEndpoint/A2DPSource/sbc
Nov 22 12:17:13 raspberrypi bluetoothd[762]: Failed to set privacy: Rejected (0x0b)
Nov 22 12:17:13 raspberrypi bluetoothd[762]: Set device flags return status: Invalid Parameters
Nov 22 12:17:13 raspberrypi bluetoothd[762]: Set device flags return status: Invalid Parameters
cxr1020@raspberrypi:~/Documents/EmbeddedLinuxRepo/CSR-EmbeddedLinux/Assignment03-Code $
```

Command - systemctl show Bluetooth

```
cxr1020@raspberrypi:~/Documents/EmbeddedLinuxRepo/CSR-EmbeddedLinux/Assignment03-Code $ systemctl show bluetooth
Type=dbus
Restart=no
NotifyAccess=main
RestartUSec=100ms
TimeoutStartUSec=1min 30s
TimeoutStopUSec=1min 30s
TimeoutAbortUSec=1min 30s
TimeoutStartFailureMode=terminate
TimeoutStopFailureMode=terminate
RuntimeMaxUSec=infinity
WatchdogUSec=0
WatchdogTimestampMonotonic=0
RootDirectoryStartOnly=no
RemainAfterExit=no
GuessMainPID=yes
MainPID=762
ControlPID=0
BusName=org.bluez
FileDescriptorStoreMax=0
NfileDescriptorStore=0
StatusText=Running
StatusErrno=0
Result=success
ReloadResult=success
CleanResult=success
UID=[not set]
GID=[not set]
NRestarts=0
OOMPolicy=stop
ExecMainStartTimestamp=Wed 2023-11-22 12:17:13 PST
ExecMainStartTimestampMonotonic=15820384
ExecMainExitTimestampMonotonic=0
ExecMainPID=762
ExecMainCode=0
ExecMainStatus=0
ExecStart={ path=/usr/libexec/bluetooth/bluetoothd ; argv[]=/usr/libexec/bluetooth/bluetoothd ; ignore_errors=no ; start_time=[Wed 2023-11-22 12:17:13 PST] ; }
ExecStartEx={ path=/usr/libexec/bluetooth/bluetoothd ; argv[]=/usr/libexec/bluetooth/bluetoothd ; flags= ; start_time=[Wed 2023-11-22 12:17:13 PST] ; }
```

Command - systemctl cat Bluetooth

```
cxr1020@raspberrypi:~/Documents/EmbeddedLinuxRepo/CSR-EmbeddedLinux/Assignment03-Code $ systemctl cat bluetooth
# /lib/systemd/system/bluetooth.service
[Unit]
Description=Bluetooth service
Documentation=man:bluetoothd(8)
ConditionPathIsDirectory=/sys/class/bluetooth

[Service]
Type=dbus
BusName=org.bluez
ExecStart=/usr/libexec/bluetooth/bluetoothd
NotifyAccess=main
#WatchdogSec=10
#Restart=on-failure
CapabilityBoundingSet=CAP_NET_ADMIN CAP_NET_BIND_SERVICE
LimitNPROC=1
ProtectHome=true
ProtectSystem=full

[Install]
WantedBy=bluetooth.target
Alias=dbus-org.bluez.service
cxr1020@raspberrypi:~/Documents/EmbeddedLinuxRepo/CSR-EmbeddedLinux/Assignment03-Code $
```

Command - systemctl list-dependencies Bluetooth

```
cxr1020@raspberrypi:~/Documents/EmbeddedLinuxRepo/CSR-EmbeddedLinux/Assignment03-Code $ systemctl list-dependencies bluetooth
bluetooth.service
● └─dbus.socket
● └─system.slice
● └─sysinit.target
●   ├─dev-hugepages.mount
●   ├─dev-mqueue.mount
●   └─fake-hwclock.service
●   └─keyboard-setup.service
●   └─kmod-static-nodes.service
●   └─plymouth-read-write.service
●   └─plymouth-start.service
●   └─proc-sys-fs-binfmt_misc.automount
●   └─sys-fs-fuse-connections.mount
●   └─sys-kernel-config.mount
●   └─sys-kernel-debug.mount
●   └─sys-kernel-tracing.mount
●   └─systemd-ask-password-console.path
●   └─systemd-binfmt.service
●   └─systemd-boot-system-token.service
●   └─systemd-hwdb-update.service
●   └─systemd-journal-flush.service
●   └─systemd-journald.service
●   └─systemd-machine-id-commit.service
●   └─systemd-modules-load.service
●   └─systemd-pstore.service
●   └─systemd-random-seed.service
●   └─systemd-sysctl.service
●   └─systemd-sysusers.service
●   └─systemd-timesyncd.service
●   └─systemd-tmpfiles-setup-dev.service
●   └─systemd-tmpfiles-setup.service
●   └─systemd-udev-trigger.service
●   └─systemd-udevd.service
●   └─systemd-update-utmp.service
●   └─cryptsetup.target
●   └─local-fs.target
●     └─.mount
```

Command - systemctl list-dependencies Bluetooth

```
cxr1020@raspberrypi:~/Documents/EmbeddedLinuxRepo/CSR-EmbeddedLinux/Assignment03-Code $ sudo systemctl status bluetooth
● bluetooth.service - Bluetooth service
  Loaded: loaded (/lib/systemd/system/bluetooth.service; enabled; vendor preset: enabled)
  Active: active (running) since Wed 2023-11-22 12:17:13 PST; 11h ago
    Docs: man:bluetoothd(8)
   Main PID: 762 (bluetoothd)
     Status: "Running"
       Tasks: 1 (limit: 8755)
      CPU: 80ms
     CGroup: /system.slice/bluetooth.service
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Nov 22 12:17:13 raspberrypi bluetoothd[762]: sap-server: Operation not permitted (1)
Nov 22 12:17:13 raspberrypi bluetoothd[762]: Endpoint registered: sender=:1.32 path=/MediaEndpoint/A2DPSSink/sbc
Nov 22 12:17:13 raspberrypi bluetoothd[762]: Endpoint registered: sender=:1.32 path=/MediaEndpoint/A2DPSource/sbc
Nov 22 12:17:13 raspberrypi bluetoothd[762]: Failed to set privacy: Rejected (0x0b)
Nov 22 12:17:13 raspberrypi bluetoothd[762]: Set device flags return status: Invalid Parameters
Nov 22 12:17:13 raspberrypi bluetoothd[762]: Set device flags return status: Invalid Parameters
cxr1020@raspberrypi:~/Documents/EmbeddedLinuxRepo/CSR-EmbeddedLinux/Assignment03-Code $ sudo systemctl stop bluetooth
cxr1020@raspberrypi:~/Documents/EmbeddedLinuxRepo/CSR-EmbeddedLinux/Assignment03-Code $ sudo systemctl status bluetooth
● bluetooth.service - Bluetooth service
  Loaded: loaded (/lib/systemd/system/bluetooth.service; enabled; vendor preset: enabled)
  Active: inactive (dead) since Wed 2023-11-22 23:56:34 PST; 3s ago
    Docs: man:bluetoothd(8)
   Process: 762 ExecStart=/usr/libexec/bluetooth/bluetoothd (code=exited, status=0/SUCCESS)
  Main PID: 762 (code=exited, status=0/SUCCESS)
     Status: "Powering down"
      CPU: 90ms

Nov 22 12:17:13 raspberrypi bluetoothd[762]: Set device flags return status: Invalid Parameters
Nov 22 12:17:13 raspberrypi bluetoothd[762]: Set device flags return status: Invalid Parameters
Nov 22 23:56:34 raspberrypi bluetoothd[762]: Terminating
Nov 22 23:56:34 raspberrypi bluetoothd[762]: Endpoint unregistered: sender=:1.32 path=/MediaEndpoint/A2DPSSink/sbc
Nov 22 23:56:34 raspberrypi systemd[1]: Stopping Bluetooth service...
```

Command - systemctl list-timers

```
cxr1020@raspberrypi:~/Documents/EmbeddedLinuxRepo/CSR-EmbeddedLinux/Assignment03-Code $ systemctl list-timers
NEXT          LEFT          LAST          PASSED          UNIT          ACTIVATES
Thu 2023-11-23 01:53:42 PST 1h 51min left  Wed 2023-11-22 09:03:45 PST 14h ago  apt-daily.timer      apt-daily.service
Thu 2023-11-23 06:27:21 PST 6h left       Wed 2023-11-22 06:12:03 PST 17h ago  apt-daily-upgrade.timer  apt-daily-upgrade->
Thu 2023-11-23 12:37:06 PST 12h left      Wed 2023-11-22 12:37:05 PST 11h ago  systemd-tmpfiles-clean.timer  systemd-tmpfiles->
Fri 2023-11-24 00:00:00 PST 23h left      Thu 2023-11-23 00:00:05 PST 1min 42s ago logrotate.timer      logrotate.service
Fri 2023-11-24 00:00:00 PST 23h left      Thu 2023-11-23 00:00:05 PST 1min 42s ago man-db.timer        man-db.service
Sun 2023-11-26 03:10:08 PST 3 days left   Tue 2023-11-21 16:36:06 PST 1 day 7h ago e2scrub_all.timer    e2scrub_all.servi->
Mon 2023-11-27 00:42:59 PST 4 days left   Tue 2023-11-21 16:57:11 PST 1 day 7h ago fstrim.timer        fstrim.service

7 timers listed.
Pass --all to see loaded but inactive timers, too.
lines 1-11/11 (END)
```

Command - systemctl list-sockets

```
cxr1020@raspberrypi:~/Documents/EmbeddedLinuxRepo/CSR-EmbeddedLinux/Assignment03-Code $ systemctl list-sockets
LISTEN          UNIT                ACTIVATES
/dev/rfkill      systemd-rfkill.socket    systemd-rfkill.service
/run/avahi-daemon/socket avahi-daemon.socket    avahi-daemon.service
/run/cups/cups.sock   cups.socket        cups.service
/run/dbus/system_bus_socket dbus.socket       dbus.service
/run/initctl     systemd-initctl.socket  systemd-initctl.service
/run/systemd/fsck.progress  systemd-fsckd.socket  systemd-fsckd.service
/run/systemd/journal/dev-log  systemd-journald-dev-log.socket  systemd-journald.service
/run/systemd/journal/socket  systemd-journald.socket  systemd-journald.service
/run/systemd/journal/stdout   systemd-journald.socket  systemd-journald.service
/run/systemd/journal/syslog   syslog.socket      rsyslog.service
/run/thd.socket    triggerhappy.socket  triggerhappy.service
/run/udev/control   systemd-udevd-control.socket  systemd-udevd.service
audit 1          systemd-journald-audit.socket  systemd-journald.service
kobject-uevent 1   systemd-udevd-kernel.socket  systemd-udevd.service

14 sockets listed.
Pass --all to see loaded but inactive sockets, too.
cxr1020@raspberrypi:~/Documents/EmbeddedLinuxRepo/CSR-EmbeddedLinux/Assignment03-Code $
```

Command - journalctl --lines 20

```
cxr1020@raspberrypi:~/Documents/EmbeddedLinuxRepo/CSR-EmbeddedLinux/Assignment03-Code $ journalctl | tail
Nov 23 00:00:06 raspberrypi systemd[1]: Starting CUPS Scheduler...
Nov 23 00:00:06 raspberrypi systemd[1]: Started CUPS Scheduler.
Nov 23 00:00:06 raspberrypi systemd[1]: Started Make remote CUPS printers available locally.
Nov 23 00:00:06 raspberrypi systemd[1]: logrotate.service: Succeeded.
Nov 23 00:00:06 raspberrypi systemd[1]: Finished Rotate log files.
Nov 23 00:00:06 raspberrypi systemd[1]: man-db.service: Succeeded.
Nov 23 00:00:06 raspberrypi systemd[1]: Finished Daily man-db regeneration.
Nov 23 00:17:01 raspberrypi CRON[6183]: pam_unix(cron:session): session opened for user root(uid=0) by (uid=0)
Nov 23 00:17:01 raspberrypi CRON[6184]: (root) CMD ( cd / && run-parts --report /etc/cron.hourly)
Nov 23 00:17:01 raspberrypi CRON[6183]: pam_unix(cron:session): session closed for user root
cxr1020@raspberrypi:~/Documents/EmbeddedLinuxRepo/CSR-EmbeddedLinux/Assignment03-Code $ journalctl --lines 20
-- Journal begins at Mon 2022-04-04 07:52:30 PDT, ends at Thu 2023-11-23 00:17:01 PST. --
Nov 23 00:00:06 raspberrypi systemd[1]: cups.service: Succeeded.
Nov 23 00:00:06 raspberrypi systemd[1]: Stopped CUPS Scheduler.
Nov 23 00:00:06 raspberrypi systemd[1]: cups.path: Succeeded.
Nov 23 00:00:06 raspberrypi systemd[1]: Stopped CUPS Scheduler.
Nov 23 00:00:06 raspberrypi systemd[1]: Stopping CUPS Scheduler.
Nov 23 00:00:06 raspberrypi systemd[1]: Started CUPS Scheduler.
Nov 23 00:00:06 raspberrypi systemd[1]: cups.socket: Succeeded.
Nov 23 00:00:06 raspberrypi systemd[1]: Closed CUPS Scheduler.
Nov 23 00:00:06 raspberrypi systemd[1]: Stopping CUPS Scheduler.
Nov 23 00:00:06 raspberrypi systemd[1]: Listening on CUPS Scheduler.
Nov 23 00:00:06 raspberrypi systemd[1]: Starting CUPS Scheduler...
Nov 23 00:00:06 raspberrypi systemd[1]: Started CUPS Scheduler.
Nov 23 00:00:06 raspberrypi systemd[1]: Started Make remote CUPS printers available locally.
Nov 23 00:00:06 raspberrypi systemd[1]: logrotate.service: Succeeded.
Nov 23 00:00:06 raspberrypi systemd[1]: Finished Rotate log files.
Nov 23 00:00:06 raspberrypi systemd[1]: man-db.service: Succeeded.
Nov 23 00:00:06 raspberrypi systemd[1]: Finished Daily man-db regeneration.
Nov 23 00:17:01 raspberrypi CRON[6183]: pam_unix(cron:session): session opened for user root(uid=0) by (uid=0)
Nov 23 00:17:01 raspberrypi CRON[6184]: (root) CMD ( cd / && run-parts --report /etc/cron.hourly)
Nov 23 00:17:01 raspberrypi CRON[6183]: pam_unix(cron:session): session closed for user root
cxr1020@raspberrypi:~/Documents/EmbeddedLinuxRepo/CSR-EmbeddedLinux/Assignment03-Code $
```

SourceCode - hello-bash-service_sh

```
GNU nano 5.4                                     hello-bash-service.sh *

#!/bin/bash

COUNT=0
while true ; do
    COUNT=$((COUNT+1))
    echo "COUNT: $COUNT" > /tmp/hello-bash-service.txt
    sleep 10
done

exit 0
```

^G Help ^O Write Out ^W Where Is ^K Cut ^T Execute ^C Location M-U Undo M-A Set Mark
^X Exit ^R Read File ^\ Replace ^U Paste ^J Justify ^L Go To Line M-E Redo M-C Copy

Output - hello-bash-service

```
hello-bash-service.sh | cxr1020@raspberrypi:~ $ cat /tmp/hello-bash-service.txt
cxr1020@raspberrypi:~/Documents/EmbeddedLinuxRepo/CSR-EmbeddedLi COUNT: 12
nux/Assignment03-Code $ cp hello-bash-service.sh /usr/local/bin/ | cxr1020@raspberrypi:~ $ ps aux | grep hello
cp: cannot create regular file '/usr/local/bin/hello-bash-servic cxr1020  6296  0.0  0.0  6684  3300 pts/0  S+  00:32  0:
e.sh': Permission denied | cxr1020  6378  0.0  0.0  6040  644 pts/1  S+  00:37  0:
nux/Assignment03-Code $ sudo cp hello-bash-service.sh /usr/local | 00 grep --color=auto hello
/bin/ | cxr1020@raspberrypi:~ $ cat /tmp/hello-bash-service.txt
cxr1020@raspberrypi:~/Documents/EmbeddedLinuxRepo/CSR-EmbeddedLi COUNT: 30
nux/Assignment03-Code $ ls /usr/local/bin | cxr1020@raspberrypi:~ $ kill 6296
hello-bash-service.sh | cxr1020@raspberrypi:~ $
cxr1020@raspberrypi:~/Documents/EmbeddedLinuxRepo/CSR-EmbeddedLi nux/Assignment03-Code $ ls -l /usr/local/bin
nux/Assignment03-Code $ ls -l /usr/local/bin
total 4 | cxr1020@raspberrypi:~ $ cat /tmp/hello-bash-service.txt
-rwxr-xr-x 1 root root 134 Nov 23 00:30 hello-bash-service.sh | COUNT: 30
cxr1020@raspberrypi:~/Documents/EmbeddedLinuxRepo/CSR-EmbeddedLi nux/Assignment03-Code $ file /usr/local/bin
nux/Assignment03-Code $ file /usr/local/bin/hello-bash-service.s | Bourne-Again shell script,
h | ASCII text executable
cxr1020@raspberrypi:~/Documents/EmbeddedLinuxRepo/CSR-EmbeddedLi nux/Assignment03-Code $ ls
nux/Assignment03-Code $ ls
hello-bash-service.sh | cxr1020@raspberrypi:~/Documents/EmbeddedLinuxRepo/CSR-EmbeddedLi
nux/Assignment03-Code $ rm hello-bash-service.sh | nux/Assignment03-Code $ ls
cxr1020@raspberrypi:~/Documents/EmbeddedLinuxRepo/CSR-EmbeddedLi nux/Assignment03-Code $ ls
cxr1020@raspberrypi:~/Documents/EmbeddedLinuxRepo/CSR-EmbeddedLi nux/Assignment03-Code $ hello-bash-service.sh | Terminated
nux/Assignment03-Code $ | cxr1020@raspberrypi:~/Documents/EmbeddedLinuxRepo/CSR-EmbeddedLi
nux/Assignment03-Code $ | nux/Assignment03-Code $ |
```

SourceCode - hello-bash-service_service

```
GNU nano 5.4                                     hello-bash-service.service
[Unit]
Description=hello World Service

[Service]
Type=simple
ExecStart=/usr/local/bin/hello-bash-service.sh

[Install]
WantedBy=multi-user.target
```

[Read 9 lines]
^G Help ^O Write Out ^W Where Is ^K Cut ^T Execute ^C Location M-U Undo
^X Exit ^R Read File ^\ Replace ^U Paste ^J Justify ^A Go To Line M-E Redo M-A Set Mark
M-6 Copy

Output - hello-bash-service_service

```
cxr1020@raspberrypi:~/Documents/EmbeddedLinuxRepo/CSR-EmbeddedLinux/Assignment03-Code$ ls /etc/systemd/system
bluetooth.target.wants          halt.target.wants
dbus-fi.wl.wpa_supplicant1.service hello-bash-service.service
dbus-org.bluez.service          multi-user.target.wants
dbus-org.freedesktop.Avahi.service network-online.target.wants
dbus-org.freedesktop.ModemManager1.service poweroff.target.wants
dbus-org.freedesktop.timesync1.service printer.target.wants
default.target                  rc-local.service.d
default.target.wants             reboot.target.wants
dev-serial1.device.wants        remote-fs.target.wants
dhcpcd.service.d                sockets.target.wants
display-manager.service         sshd.service
getty.target.wants              sysinit.target.wants
getty@tty1.service.d            syslog.service
graphical.target.wants          timers.target.wants
cxr1020@raspberrypi:~/Documents/EmbeddedLinuxRepo/CSR-EmbeddedLinux/Assignment03-Code$ sudo systemctl start hello-bash-service.service
cxr1020@raspberrypi:~/Documents/EmbeddedLinuxRepo/CSR-EmbeddedLinux/Assignment03-Code$ sudo systemctl status hello-bash-service.service
● hello-bash-service.service - hello World Service
   Loaded: loaded (/etc/systemd/system/hello-bash-service.service; disabled; vendor)
   Active: active (running) since Thu 2023-11-23 01:18:54 PST; 5s ago
     Main PID: 7009 (hello-bash-serv)
        Tasks: 2 (limit: 8755)
       CPU: 12ms
      CGroup: /system.slice/hello-bash-service.service
              └─7009 /bin/bash /usr/local/bin/hello-bash-service.sh
                  ├─7010 sleep 10

Nov 23 01:18:54 raspberrypi systemd[1]: Started hello World Service.
lines 1-11/11 (END)
```