



INDIAN INSTITUTE OF INFORMATION TECHNOLOGY DESIGN AND MANUFACTURING KANCHEEPURAM

REPORT
ON

Write a C program, compile it as module, insert into kernel,
check message in log, remove module from kernel.

SUBMITTED BY

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TO

DR. SANKARAN VAIDYANATHAN

Activities Terminal Mar 20 17:08

```
amar@amarkr:~/Desktop/dd/lab5
amar@amarkr:~/Desktop$ cd dd
amar@amarkr:~/Desktop/dd$ ls
lab5
amar@amarkr:~/Desktop/dd$ cd lab5
amar@amarkr:~/Desktop/dd/lab5$ ls
amarkumar.c  Makefile
amar@amarkr:~/Desktop/dd/lab5$ make
make -C /lib/modules/5.8.0-44-generic/build M=/home/amar/Desktop/dd/lab5 modules
make[1]: Entering directory '/usr/src/linux-headers-5.8.0-44-generic'
  CC [M]  /home/amar/Desktop/dd/lab5/amarkumar.o
  MODPOST /home/amar/Desktop/dd/lab5/Module.symvers
WARNING: modpost: missing MODULE_LICENSE() in /home/amar/Desktop/dd/lab5/amarkumar.o
  CC [M]  /home/amar/Desktop/dd/lab5/amarkumar.mod.o
  LD [M]  /home/amar/Desktop/dd/lab5/amarkumar.ko
make[1]: Leaving directory '/usr/src/linux-headers-5.8.0-44-generic'
amar@amarkr:~/Desktop/dd/lab5$
```

A photograph of a man with dark hair and a beard, wearing a blue and red plaid shirt under a grey hoodie, standing next to the front of a white car. The car's headlights are on, and the background shows a blurred city street at night.

Making the kernel object file using **make** command

Activities Terminal Mar 20 17:09

```
amar@amarkr:~/Desktop/dd/lab5$ lsmod
WARNING: modpost: missing MODULE_LICENSE() in /home/amar/Desktop/dd/lab5/amarkumar.o
CC [M] /home/amar/Desktop/dd/labs/amarkumar.mod.o
LD [M] /home/amar/Desktop/dd/labs/amarkumar.ko
make[1]: Leaving directory '/usr/src/linux-headers-5.8.0-44-generic'
amar@amarkr:~/Desktop/dd/lab5$ lsmod
Module           Size Used by
rfcomm            81920  4
usbhid            57344  0
ccm               20480  3
cnac              16384  3
algif_hash        16384  1
algif_skcipher   16384  1
af_alg             28672  6 algif_hash,algif_skcipher
bnep              24576  2
nls_iso8859_1    16384  1
snd_soc_pci       24576  0
snd_soc_intel_byt 20480  1 snd_soc_pci
uvccvideo         98304  0
snd_soc_intel_ipc 20480  1 snd_soc_intel_byt
snd_soc_intel_hda_common 77824  1 snd_soc_pci
snd_soc_hdac_hda 24576  1 snd_soc_intel_hda_common
snd_soc_xtensa_dsp 16384  2 snd_soc_intel_hda_common,snd_soc_intel_byt
snd_soc_intel_hda 20480  1 snd_soc_intel_hda_common
snd_soc            122880  4 snd_soc_pci,snd_soc_intel_hda_common,snd_soc_intel_byt,snd_soc_intel_ipc
snd_hda_ext_core  32768  3 snd_soc_intel_hda_common,snd_soc_hdac_hda,snd_soc_intel_hda
snd_soc_acpi_intel_match 45856  2 snd_soc_pci,snd_soc_intel_hda_common
snd_soc_acpi       16384  3 snd_soc_acpi_intel_match,snd_soc_intel_hda_common,snd_soc_intel_byt
nvidia_uvm        1011712  0
snd_soc_core       270336  3 snd_soc,snd_soc_intel_hda_common,snd_soc_hdac_hda
nvidia_drm         49152  10
nvidia_modeset    1183744  14 nvidia_drm
snd_hda_codec_realtek 126976  1
snd_hda_codec_generic 81920  1 snd_hda_codec_realtek
snd_compress        28672  1 snd_soc_core
ac97_bus            16384  1 snd_soc_core
ledtrig_audio      16384  2 snd_hda_codec_generic,snd_soc
snd_pcm_dmaengine  16384  1 snd_soc_core
nvidia             19746816  655 nvidia_uvm,nvidia_modeset
l915              2195456  6
x86_pkg_temp_thermal 20480  0
intel_powerclamp   20480  0
coretemp            20480  0
iwlvnm             393216  0
kvm_intel          286720  0
snd_hda_codec_hdmi 61440  2
drm_kms_helper     217088  2 nvidia_drm,l915
i2c_algo_bit        16384  1 l915
mac80211          905216  1 iwlvnm
llbarc4            16384  1 mac80211
cec                53248  2 drm_kms_helper,l915
kvm                712704  1 kvm_intel
met_hdcp            24576  0
rc_core             57344  1 cec
snd_hda_intel       53248  11
fb_sys_fops         16384  1 drm_kms_helper
```



Listing the module using **lsmod** command

Activities Terminal amar@amarckr: ~/Desktop/dd/labs Mar 20 17:10

```

i2c_hid      28672  0
libahci     36864  1 ahci
virt_dma    20480  1 idma64
xhci_pci_renesas 20480  1 xhci_pci
hid        135168  4 i2c_hid,usbhid,hid_generic,hid_rmi
wmi        32768  3 intel_wmi_thunderbolt,wmi_bmof,ideapad_laptop
video      49152  2 ideapad_laptop,i915
pinctrl_cannonlake 36864  0
pinctrl_intel 28672  1 pinctrl_cannonlake
amar@amarckr:~/Desktop/dd/labs$ sudo insmod amarkumar.ko
[sudo] password for amar:
amar@amarckr:~/Desktop/dd/labs$ lsmod
Module           Size Used by
amarkumar       16384  0
rfcomm          81920  4
usbhid         57344  0
ccm            20480  3
cnac           16384  3
algif_hash     16384  1
algif_skcipher 16384  1
af_alg         28672  6 algif_hash,algif_skcipher
bnef          24576  2
nls_iso8859_1 16384  1
snd_soc_pci    24576  0
snd_soc_intel_byt 20480  1 snd_soc_pci
uvccvideo     98304  0
snd_soc_intel_ipc 20480  1 snd_soc_intel_byt
snd_soc_intel_hda_common 77824  1 snd_soc_pci
snd_soc_hdac_hda 24576  1 snd_soc_intel_hda_common
snd_soc_xtensa_dsp 16384  2 snd_soc_intel_hda_common,snd_soc_intel_byt
snd_soc_intel_hda 20480  1 snd_soc_intel_hda_common
snd_soc           122880  4 snd_soc_pci,snd_soc_intel_hda_common,snd_soc_intel_byt,snd_soc_intel_ipc
snd_hda_ext_core 32768  3 snd_soc_intel_hda_common,snd_soc_hdac_hda,snd_soc_intel_hda
snd_soc_acpi_intel_match 45056  2 snd_soc_pci,snd_soc_intel_hda_common
snd_soc_acpi     16384  3 snd_soc_acpi_intel_match,snd_soc_intel_hda_common,snd_soc_intel_byt
nvidia_uvm     1011712  0
snd_soc_core    270336  3 snd_soc,snd_soc_intel_hda_common,snd_soc_hdac_hda
nvidia_drm      49152  10
nvidia_modeset 1183744  14 nvidia_drm
snd_hda_codec_realtek 126976  1
snd_hda_codec_generic 81920  1 snd_hda_codec_realtek
snd_compress    28672  1 snd_soc_core
ac97_bus       16384  1 snd_soc_core
ledtrig_audio   16384  2 snd_hda_codec_generic,snd_soc
snd_pcm_daenglne 16384  1 snd_soc_core
nvidia        19746816  655 nvidia_uvm,nvidia_modeset
i915        2195456  6
x86_pkg_temp_thermal 20480  0
intel_powerclamp 20480  0
coretemp       20480  0
iwlwnm        393216  0
kvm_intel      286720  0
snd_hda_codec_hdmi 61440  2
drm_kms_helper 217088  2 nvidia_drm,i915
i2c_algo_bit    16384  1 i915

```

Inserting the module object named amarkumar.ko using command **sudo insmod amarkumar.ko**

Activities Text Editor

Open Mar 20 17:11

syslog [Read-Only] /var/log

Mar 20 17:08:19 amarkr tracker-store[8199]: OK

3479 Mar 20 17:08:16 amarkr systemd[2240]: tracker-store.service: Succeeded.

3480 Mar 20 17:08:33 amarkr systemd[1]: systemd-hostnamed.service: Succeeded.

3481 Mar 20 17:08:46 amarkr dbus-daemon[2253]: [session uid=1000 pid=2253] Activating via systemd: service name='org.freedesktop.Tracker1' unit='tracker-store.service' requested by ':1.1' (uid=1000 pid=2249 comm="/usr/libexec/tracker-miner-fs " label="unconfined")

3482 Mar 20 17:08:46 amarkr systemd[2240]: Starting Tracker metadata database store and lookup manager...

3483 Mar 20 17:08:46 amarkr dbus-daemon[2253]: [session uid=1000 pid=2253] Successfully activated service 'org.freedesktop.Tracker1'

3484 Mar 20 17:08:46 amarkr systemd[2240]: Started Tracker metadata database store and lookup manager.

3485 Mar 20 17:08:46 amarkr dbus-daemon[2253]: [session uid=1000 pid=2253] Activating via systemd: service name='org.freedesktop.Tracker1.Miner.Extract' unit='tracker-extract.service' requested by ':1.1' (uid=1000 pid=2249 comm="/usr/libexec/tracker-miner-fs " label="unconfined")

3486 Mar 20 17:08:46 amarkr tracker-extract[8296]: Set scheduler policy to SCHED_IDLE

3488 Mar 20 17:08:46 amarkr tracker-extract[8296]: Setting priority nice level to 19

3489 Mar 20 17:08:46 amarkr dbus-daemon[2253]: [session uid=1000 pid=2253] Successfully activated service 'org.freedesktop.Tracker1.Miner.Extract'

3490 Mar 20 17:08:46 amarkr systemd[2240]: Started Tracker metadata extractor.

3491 Mar 20 17:08:51 amarkr systemd[2240]: tracker-extract.service: Succeeded.

3492 Mar 20 17:09:11 amarkr tracker-store[8289]: OK

3493 Mar 20 17:09:11 amarkr systemd[2240]: tracker-store.service: Succeeded.

3494 Mar 20 17:09:21 amarkr dbus-daemon[2253]: [session uid=1000 pid=2253] Activating via systemd: service name='org.freedesktop.Tracker1' unit='tracker-store.service' requested by ':1.1' (uid=1000 pid=2249 comm="/usr/libexec/tracker-miner-fs " label="unconfined")

3495 Mar 20 17:09:21 amarkr systemd[2240]: Starting Tracker metadata database store and lookup manager...

3496 Mar 20 17:09:21 amarkr dbus-daemon[2253]: [session uid=1000 pid=2253] Successfully activated service 'org.freedesktop.Tracker1'

3497 Mar 20 17:09:21 amarkr systemd[2240]: Started Tracker metadata database store and lookup manager.

3498 Mar 20 17:09:21 amarkr dbus-daemon[2253]: [session uid=1000 pid=2253] Activating via systemd: service name='org.freedesktop.Tracker1.Miner.Extract' unit='tracker-extract.service' requested by ':1.1' (uid=1000 pid=2249 comm="/usr/libexec/tracker-miner-fs " label="unconfined")

3499 Mar 20 17:09:21 amarkr systemd[2240]: Starting Tracker metadata extractor...

3500 Mar 20 17:09:21 amarkr tracker-extract[8332]: Set scheduler policy to SCHED_IDLE

3501 Mar 20 17:09:21 amarkr tracker-extract[8332]: Setting priority nice level to 19

3502 Mar 20 17:09:21 amarkr dbus-daemon[2253]: [session uid=1000 pid=2253] Successfully activated service 'org.freedesktop.Tracker1.Miner.Extract'

3503 Mar 20 17:09:21 amarkr systemd[2240]: Started Tracker metadata extractor.

3504 Mar 20 17:09:32 amarkr systemd[2240]: tracker-extract.service: Succeeded.

3505 Mar 20 17:09:49 amarkr kernel: [5228 991633] Loading **Hello** module...

3506 Mar 20 17:09:49 amarkr kernel: [5228 991635] **Hello** world

3507 Mar 20 17:09:52 amarkr tracker-store[8325]: OK

3508 Mar 20 17:09:52 amarkr systemd[2240]: tracker-store.service: Succeeded.

3509 Mar 20 17:10:10 amarkr dbus-daemon[2253]: [session uid=1000 pid=2253] Activating via systemd: service name='org.freedesktop.Tracker1' unit='tracker-store.service' requested by ':1.1' (uid=1000 pid=2249 comm="/usr/libexec/tracker-miner-fs " label="unconfined")

3510 Mar 20 17:10:10 amarkr systemd[2240]: Starting Tracker metadata database store and lookup manager...

3511 Mar 20 17:10:10 amarkr dbus-daemon[2253]: [session uid=1000 pid=2253] Successfully activated service 'org.freedesktop.Tracker1'

3512 Mar 20 17:10:10 amarkr systemd[2240]: Started Tracker metadata database store and lookup manager.

3513 Mar 20 17:10:10 amarkr dbus-daemon[2253]: [session uid=1000 pid=2253] Activating via systemd: service name='org.freedesktop.Tracker1.Miner.Extract' unit='tracker-extract.service' requested by ':1.1' (uid=1000 pid=2249 comm="/usr/libexec/tracker-miner-fs " label="unconfined")

3514 Mar 20 17:10:10 amarkr systemd[2240]: Starting Tracker metadata extractor...

3515 Mar 20 17:10:10 amarkr tracker-extract[8389]: Set scheduler policy to SCHED_IDLE

3516 Mar 20 17:10:10 amarkr tracker-extract[8389]: Setting priority nice level to 19

3517 Mar 20 17:10:10 amarkr dbus-daemon[2253]: [session uid=1000 pid=2253] Successfully activated service 'org.freedesktop.Tracker1.Miner.Extract'

3518 Mar 20 17:10:10 amarkr systemd[2240]: Started Tracker metadata extractor.

3519 Mar 20 17:10:21 amarkr systemd[2240]: tracker-extract.service: Succeeded.

3520 Mar 20 17:10:40 amarkr tracker-store[8382]: OK

3521 Mar 20 17:10:41 amarkr systemd[2240]: tracker-store.service: Succeeded.

3522 Mar 20 17:10:44 amarkr nautilus[8249]: called "net usershare info" but it failed: Failed to execute child process "net" (No such file or directory)

3523 Mar 20 17:10:56 amarkr dbus-daemon[2253]: [session uid=1000 pid=2253] Activating service name='org.gnome.gedit' requested by ':1.242' (uid=1000 pid=8249 comm="/usr/bin/nautilus --application-service " label="unconfined")

3524 Mar 20 17:10:56 amarkr dbus-daemon[2253]: [session uid=1000 pid=2253] Successfully activated service 'org.gnome.gedit'

Plain Text Tab Width: 8 Ln 3505, Col 55 INS

Message Loading hello module... and Hello world is shown in the log file which had been written in the c file

Activities Visual Studio Code Mar 20 17:54 amarkumar.c - dd - Visual Studio Code

File Edit Selection View Go Run Terminal Help

C amarkumar.c

```
1 #include <linux/module.h>
2 /* Needed by all modules */
3 #include <linux/kernel.h>
4 /* Needed for KERN_INFO */
5 #include <linux/init.h>
6 /* Needed for the macros */
7 static int __init hello_start(void)
8 {
9     printk(KERN_INFO "Loading hello module...\n");
10    printk(KERN_INFO "Hello world\n");
11    return 0;
12 }
13 static void __exit hello_end(void)
14 {
15     printk(KERN_INFO "Goodbye Mr.\n");
16 }
17 module_init(hello_start);
18 module_exit(hello_end);
```

Ln 1, Col 1 Spaces:4 UTF-8 C ⚙️

C file

Activities Terminal Mar 20 17:12 amar@amar�: ~/Desktop/dd/labs

```
realtek      24576  1
intel_lpss_pci 20480  0
intel_lpss      16384  1 intel_lpss_pci
ahci          40960  3
idma64         20480  0
xhci_pci       20480  0
i2c_hid        28672  0
libahci        36864  1 ahci
virt_dma       20480  1 idma64
xhci_pci_renesas 20480  1 xhci_pci
hid           135168  4 i2c_hid,usbhid,hid_generic,hid_rmi
wmi           32768  3 intel_wmi_thunderbolt,wmi_bmof,ideapad_laptop
video          49152  2 ideapad_laptop,1915
pinctrl_cannonlake 36864  0
pinctrl_intel   28672  1 pinctrl_cannonlake
amar@amar�:~/Desktop/dd/lab$5
amar@amar�:~/Desktop/dd/lab$5 sudo rmmod amarkumar
amar@amar�:~/Desktop/dd/lab$5 lsmod
Module           Size Used by
rfcomm          81920  4
usbhid          57344  0
ccm            20480  3
cnac            16384  3
algif_hash      16384  1
algif_skcipher  16384  1
af_alg          28672  6 algif_hash,algif_skcipher
bnef            24576  2
nls_iso8859_1   16384  1
snd_sof_pci     24576  0
snd_sof_intel_byt 20480  1 snd_sof_pci
uvctveo         98304  0
snd_sof_intel_ipc 20480  1 snd_sof_intel_byt
snd_intel_hda_common 77824  1 snd_sof_pci
snd_soc_hdac_hda 24576  1 snd_sof_intel_hda_common
snd_soc_xtensa_dsp 16384  2 snd_sof_intel_hda_common,snd_sof_intel_byt
snd_sof_intel_hda 20480  1 snd_sof_intel_hda_common
snd_sof           122880  4 snd_sof_pci,snd_sof_intel_hda_common,snd_sof_intel_byt,snd_sof_intel
tpc             32768  3 snd_sof_intel_hda_common,snd_soc_hdac_hda,snd_sof_intel_hda
snd_soc_acpl_intel_match 45056  2 snd_sof_pci,snd_sof_intel_hda_common
snd_soc_acpl      16384  3 snd_soc_acpl_intel_match,snd_intel_hda_common,snd_sof_intel_byt
nvidia_uvm      1011712  0
snd_soc_core     270336  3 snd_sof,snd_sof_intel_hda_common,snd_soc_hdac_hda
nvidia_drm      49152  10
nvidia_modeset  1183744  14 nvidia_drm
snd_hda_codec_realtek 128976  1
snd_hda_codec_Generic 81920  1 snd_hda_codec_realtek
snd_compress     28672  1 snd_soc_core
ac97_bus         16384  1 snd_soc_core
led_igl_audio    16384  2 snd_hda_codec_Generic,snd_soc
snd_pcm_dmaengine 16384  1 snd_soc_core
nvidia          1976816  655 nvidia_uvm,nvidia_modeset
i915          2195456  6
x86_pkg_temp_thermal 20480  0
intel_powerclamp 20480  0
```



Removing module from kernel using command **sudo rmmod amarkumar**