

# Team: Priya Gupta and Phani Sai Ram Munipalli

## Course: CMPE283 - Virtual Technologies

Remote Desktop Pin: 123456

Inner VM:

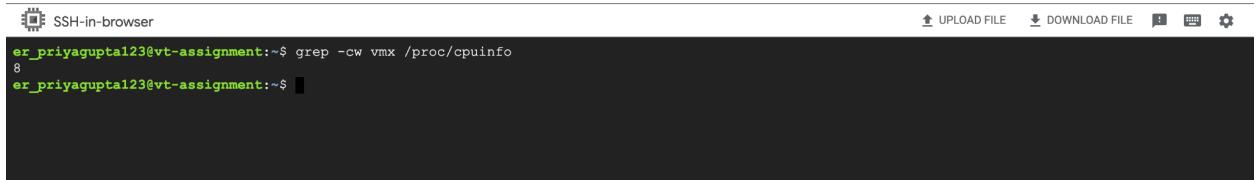
User: Priya

Password: abc123

## Setup GCP VM with Nested Virtualization enabled

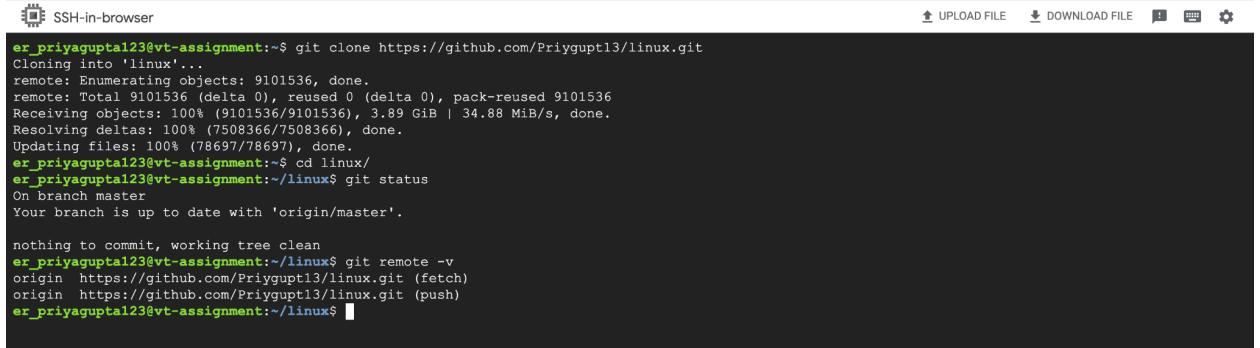
```
 priyagupta@priyas-air ~ % gcloud compute instances create vt-assignment --project=boxwood-coil-367404 --zone=us-west4-b --machine-type=n2-standard-4 --network-interface=network-tier=PREMIUM,subnet=default  
--maintenance-policy=MIGRATE --provisioning-model=STANDARD --service-account=211258441763-compute@developer.gserviceaccount.com --scopes=https://www.googleapis.com/auth/cloud-platform --tags=http-server,  
https-server --create-disk=auto-delete=yes,boot=yes,device-name=vt-assignment,image=projects/ubuntu-os-cloud/global/images/ubuntu-2204-jammy-v20221201,mode=rw,size=150,type=projects/boxwood-coil-367404/zones/us-west4-b/diskTypes/pd-ssd --no-shielded-secure-boot --shielded-vtvm --shielded-integrity-monitoring --reservation-affinity=any --enable-nested-virtualization --in-cpu-platform="Intel Cascade Lake"  
Created [https://www.googleapis.com/compute/v1/projects/boxwood-coil-367404/zones/us-west4-b/instances/vt-assignment].  
WARNING: Some requests generated warnings:  
- Disk size: '150 GB' is larger than image size: '10 GB'. You might need to resize the root repartition manually if the operating system does not support automatic resizing. See https://cloud.google.com/compute/docs/disks/add-persistent-disk#resize_pd for details.  
 NAME          ZONE      MACHINE_TYPE  PREEMPTIBLE INTERNAL_IP  EXTERNAL_IP    STATUS  
vt-assignment  us-west4-b  n2-standard-4   10.182.0.7   34.125.71.132  RUNNING  
priyagupta@priyas-air ~ %
```

## Ensure Nested virtualization is enabled



```
SSH-in-browser  
 priyagupta@vt-assignment:~$ grep -cw vmx /proc/cpuinfo  
8  
priyagupta@vt-assignment:~$
```

## Clone Linux git repo to build kernel



```
SSH-in-browser  
 priyagupta@vt-assignment:~$ git clone https://github.com/Priyagupt13/linux.git  
Cloning into 'linux'...  
remote: Enumerating objects: 9101536, done.  
remote: Total 9101536 (delta 0), reused 0 (delta 0), pack-reused 9101536  
Receiving objects: 100% (9101536/9101536), 3.89 GiB | 34.88 MiB/s, done.  
Resolving deltas: 100% (7508366/7508366), done.  
Updating files: 100% (78697/78697), done.  
priyagupta@vt-assignment:~$ cd linux/  
priyagupta@vt-assignment:~/linux$ git status  
On branch master  
Your branch is up to date with 'origin/master'.  
  
nothing to commit, working tree clean  
priyagupta@vt-assignment:~/linux$ git remote -v  
origin https://github.com/Priyagupt13/linux.git (fetch)  
origin https://github.com/Priyagupt13/linux.git (push)  
priyagupta@vt-assignment:~/linux$
```

## Build the linux kernel

- Copy the config file in the linux repo
  - cp /boot/config-5.15.0-1025-gcp ~/linux/.config
- Install build dependencies
  - sudo apt-get install build-essential bionic ccache flex bison libssl-dev libelf-dev
- make prepare
- make -j 4 modules
- [To do]make -j 4
- [To do] sudo make -j 4 INSTALL\_MOD\_STRIP=1 modules\_install

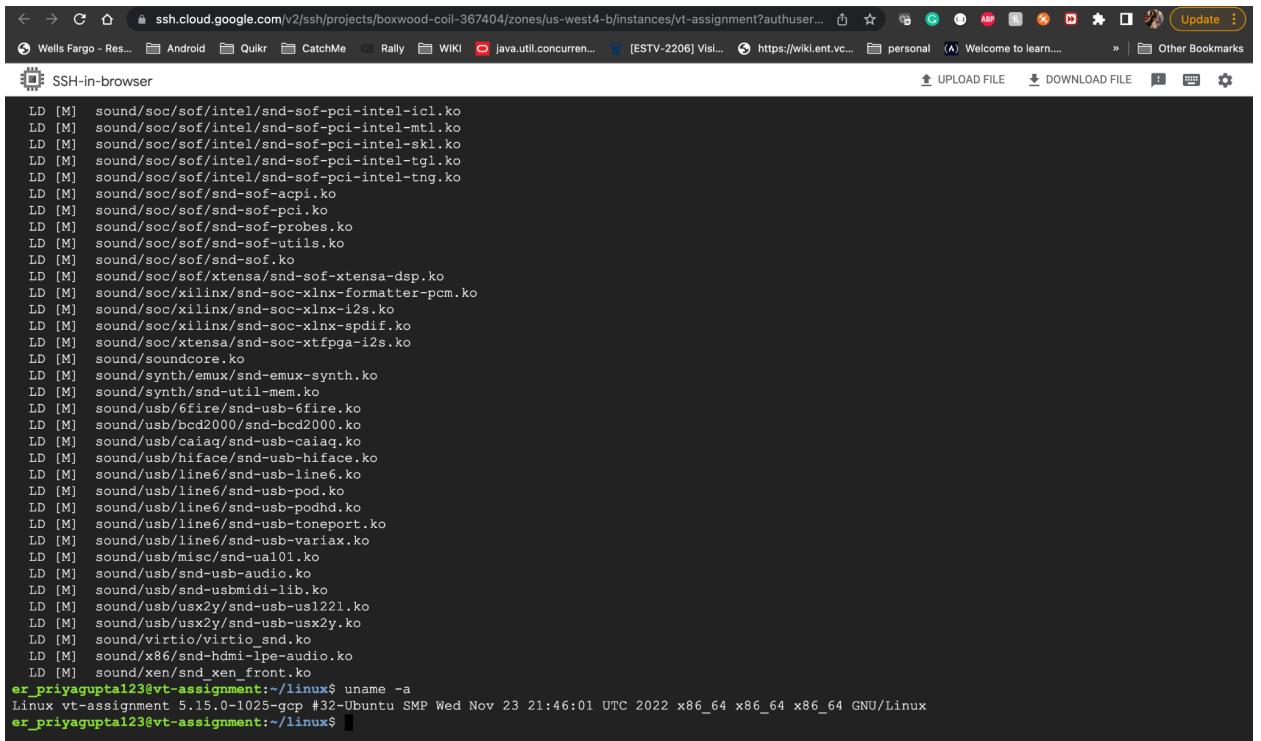
Install kernel

- sudo make -j 4 install

Verify kernel installation

- old uname: uname -a
  - new uname: uname -a
- 
- uname -a
  - make -j 4
  - sudo make -j 4 INSTALL\_MOD\_STRIP=1 modules\_install
  - sudo make -j 4 install
  - sudo reboot

- `uname -a`



```

< → C ⌂ ssh.cloud.google.com/v2/ssh/projects/boxwood-coil-367404/zones/us-west4-b/instances/vt-assignment?authuser...
Wells Fargo - Res... Android Quirk CatchMe Rally WIKI java.util.concurrent [ESTV-2206] Visi... https://wiki.ent.vc... personal (A) Welcome to learn... » | Other Bookmarks
SSH-in-browser
LD [M] sound/soc/sof/intel/snd-sof-pci-intel-icl.ko
LD [M] sound/soc/sof/intel/snd-sof-pci-intel-mtl.ko
LD [M] sound/soc/sof/intel/snd-sof-pci-intel-skl.ko
LD [M] sound/soc/sof/intel/snd-sof-pci-intel-tgl.ko
LD [M] sound/soc/sof/intel/snd-sof-pci-intel-tng.ko
LD [M] sound/soc/sof/snd-sof-acpi.ko
LD [M] sound/soc/sof/snd-sof-pci.ko
LD [M] sound/soc/sof/snd-sof-probes.ko
LD [M] sound/soc/sof/snd-sof-utils.ko
LD [M] sound/soc/sof/snd-sof.ko
LD [M] sound/soc/sof/xtensa/snd-sof-xtensa-dsp.ko
LD [M] sound/soc/xilinx/snd-soc-xlnx-formatter-pcm.ko
LD [M] sound/soc/xilinx/snd-soc-xlnx-i2s.ko
LD [M] sound/soc/xilinx/snd-soc-xlnx-spdif.ko
LD [M] sound/soc/xtensa/snd-soc-xtfpca-i2s.ko
LD [M] sound/soundcore.ko
LD [M] sound/synth/emux/snd-emux-synth.ko
LD [M] sound/synth/snd-util-mem.ko
LD [M] sound/usb/6fire/snd-usb-6fire.ko
LD [M] sound/usb/bcd2000/snd-bcd2000.ko
LD [M] sound/usb/caiaq/snd-usb-caiaq.ko
LD [M] sound/usb/hiface/snd-usb-hiface.ko
LD [M] sound/usb/line6/snd-usb-line6.ko
LD [M] sound/usb/line6/snd-usb-pod.ko
LD [M] sound/usb/line6/snd-usb-podhd.ko
LD [M] sound/usb/line6/snd-usb-toneport.ko
LD [M] sound/usb/line6/snd-usb-variax.ko
LD [M] sound/usb/misc/snd-ua01.ko
LD [M] sound/usb/snd-usb-audio.ko
LD [M] sound/usb/snd-usbmidi-lib.ko
LD [M] sound/usb/usx2y/snd-usb-usl221.ko
LD [M] sound/usb/usx2y/snd-usb-usx2y.ko
LD [M] sound/virtio/virtio_snd.ko
LD [M] sound/x86/snd-hdmi-lpe-audio.ko
LD [M] sound/xen/snd_xen_front.ko
er_priyagupta123@vt-assignment:~/linux$ uname -a
Linux vt-assignment 5.15.0-1025-gcp #32-Ubuntu SMP Wed Nov 23 21:46:01 UTC 2022 x86_64 x86_64 x86_64 GNU/Linux
er_priyagupta123@vt-assignment:~/linux$ 
```

```

sb [M] sound/soc/sof/intel/snd-sof-pci-intel-icl.ko
LD [M] sound/soc/sof/intel/snd-sof-pci-intel-mtl.ko
LD [M] sound/soc/sof/intel/snd-sof-pci-intel-skl.ko
LD [M] sound/soc/sof/intel/snd-sof-pci-intel-tgl.ko
LD [M] sound/soc/sof/intel/snd-sof-pci-intel-tng.ko
LD [M] sound/soc/sof/snd-sof-acpi.ko
LD [M] sound/soc/sof/snd-sof-pci.ko
LD [M] sound/soc/sof/snd-sof-probes.ko
LD [M] sound/soc/sof/snd-sof-utils.ko
LD [M] sound/soc/sof/snd-sof.ko
LD [M] sound/soc/sof/xtensa/snd-sof-xtensa-dsp.ko
LD [M] sound/soc/xilinx/snd-soc-xlnx-formatter-pcm.ko
LD [M] sound/soc/xilinx/snd-soc-xlnx-i2s.ko
LD [M] sound/soc/xilinx/snd-soc-xlnx-spdif.ko
LD [M] sound/soc/xtensa/snd-soc-xtfpca-i2s.ko
LD [M] sound/soundcore.ko
LD [M] sound/synth/emux/snd-emux-synth.ko
LD [M] sound/synth/snd-util-mem.ko
LD [M] sound/usb/6fire/snd-usb-6fire.ko
LD [M] sound/usb/bcd2000/snd-bcd2000.ko
LD [M] sound/usb/caiaq/snd-usb-caiaq.ko
LD [M] sound/usb/hiface/snd-usb-hiface.ko
LD [M] sound/usb/line6/snd-usb-line6.ko
LD [M] sound/usb/line6/snd-usb-pod.ko
LD [M] sound/usb/line6/snd-usb-podhd.ko
LD [M] sound/usb/line6/snd-usb-toneport.ko
LD [M] sound/usb/line6/snd-usb-variax.ko
LD [M] sound/usb/misc/snd-ua01.ko
LD [M] sound/usb/snd-usb-audio.ko
LD [M] sound/usb/snd-usbmidi-lib.ko
LD [M] sound/usb/usx2y/snd-usb-usl221.ko
LD [M] sound/usb/usx2y/snd-usb-usx2y.ko
LD [M] sound/virtio/virtio_snd.ko
LD [M] sound/x86/snd-hdmi-lpe-audio.ko
LD [M] sound/xen/snd_xen_front.ko
er_priyagupta123@vt-assignment:~/linux$ uname -a
Linux vt-assignment 5.15.0-1025-gcp #32-Ubuntu SMP Wed Nov 23 21:46:01 UTC 2022 x86_64 x86_64 x86_64 GNU/Linux
er_priyagupta123@vt-assignment:~/linux$
er_priyagupta123@vt-assignment:~/linux$
er_priyagupta123@vt-assignment:~/linux$
er_priyagupta123@vt-assignment:~/linux$ make -j 4
DESCEND objtool
CALL scripts/checksyscalls.sh
GEN scripts/gdb/linux/constants.py
CHK kernel/kheaders_data.tar.xz
CC .vmlinux.export.o
UPD include/generated/utsversion.h
CC init/version-timestamp.o
LD .tmp_vmlinux.kallsyms1
NM .tmp_vmlinux.kallsyms1.syms
KSYMS .tmp_vmlinux.kallsyms1.S
AS .tmp_vmlinux.kallsyms1.S
LD .tmp_vmlinux.kallsyms2
NM .tmp_vmlinux.kallsyms2.syms
KSYMS .tmp_vmlinux.kallsyms2.S
AS .tmp_vmlinux.kallsyms2.S
LD vmlinux
NM System.map
SORTTAB vmlinux
CC arch/x86/boot/a20.o
AS arch/x86/boot/bioscall.o
CC arch/x86/boot/cmdline.o
AS arch/x86/boot/copy.o
HOSTCC arch/x86/boot/mkcpustr
CC arch/x86/boot/cpuflags.o
CC arch/x86/boot/cpuchek.o
CC arch/x86/boot/early_serial_console.o

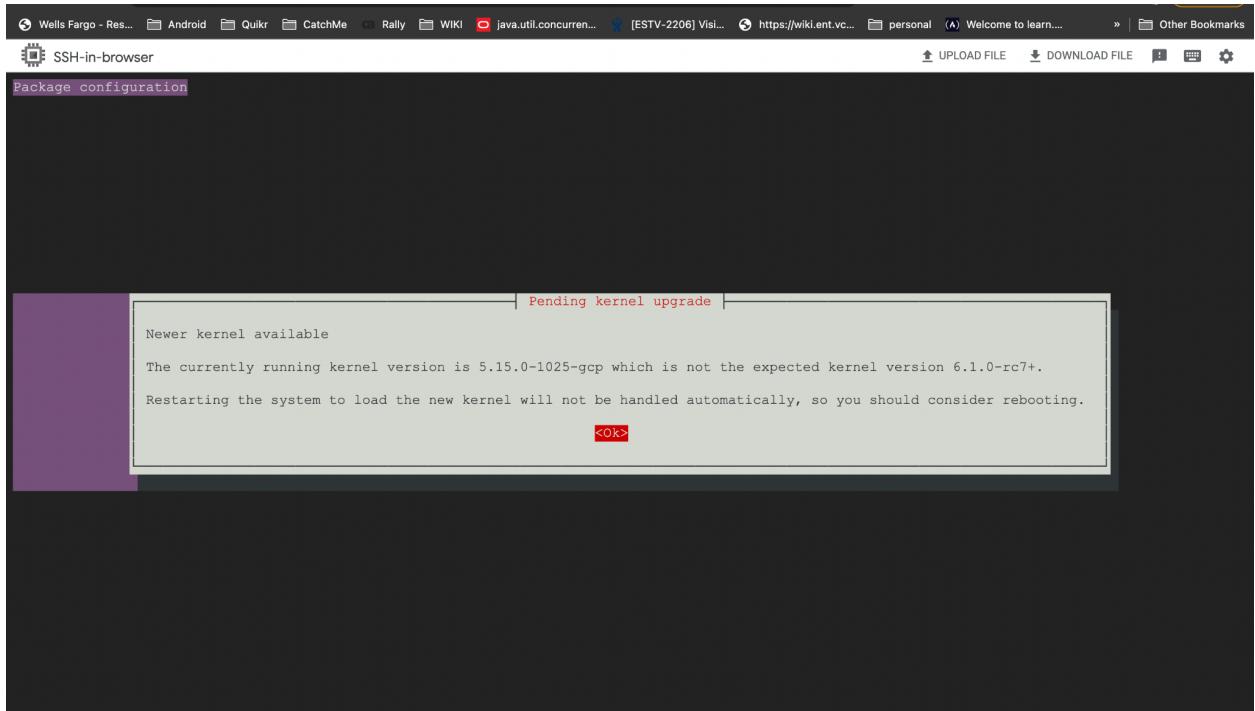
```

```
INSTALLED /lib/modules/6.1.0-rc7+/kernel/sound/usb/line6/snd-usb-podhd.ko
STRIP  /lib/modules/6.1.0-rc7+/kernel/sound/usb/line6/snd-usb-podhd.ko
INSTALL /lib/modules/6.1.0-rc7+/kernel/sound/usb/line6/snd-usb-toneport.ko
SIGN   /lib/modules/6.1.0-rc7+/kernel/sound/usb/line6/snd-usb-podhd.ko
STRIP  /lib/modules/6.1.0-rc7+/kernel/sound/usb/line6/snd-usb-toneport.ko
INSTALL /lib/modules/6.1.0-rc7+/kernel/sound/usb/line6/snd-usb-variax.ko
SIGN   /lib/modules/6.1.0-rc7+/kernel/sound/usb/line6/snd-usb-toneport.ko
STRIP  /lib/modules/6.1.0-rc7+/kernel/sound/usb/line6/snd-usb-variax.ko
INSTALL /lib/modules/6.1.0-rc7+/kernel/sound/usb/misc/snd-ua101.ko
SIGN   /lib/modules/6.1.0-rc7+/kernel/sound/usb/line6/snd-usb-variax.ko
STRIP  /lib/modules/6.1.0-rc7+/kernel/sound/usb/misc/snd-ua101.ko
SIGN   /lib/modules/6.1.0-rc7+/kernel/sound/usb/misc/snd-ua101.ko
INSTALL /lib/modules/6.1.0-rc7+/kernel/sound/usb/snd-usb-midi.ko
STRIP  /lib/modules/6.1.0-rc7+/kernel/sound/usb/snd-usb-midi.ko
INSTALL /lib/modules/6.1.0-rc7+/kernel/sound/usb/usx2y/snd-usb-audio.ko
STRIP  /lib/modules/6.1.0-rc7+/kernel/sound/usb/usx2y/snd-usb-audio.ko
INSTALL /lib/modules/6.1.0-rc7+/kernel/sound/usb/usx2y/snd-usb-us1221.ko
STRIP  /lib/modules/6.1.0-rc7+/kernel/sound/usb/snd-usbmidi-lib.ko
SIGN   /lib/modules/6.1.0-rc7+/kernel/sound/usb/snd-usbmidi-lib.ko
STRIP  /lib/modules/6.1.0-rc7+/kernel/sound/usb/usx2y/snd-usb-us1221.ko
INSTALL /lib/modules/6.1.0-rc7+/kernel/sound/usb/usx2y/snd-usb-usx2y.ko
SIGN   /lib/modules/6.1.0-rc7+/kernel/sound/usb/usx2y/snd-usb-audio.ko
SIGN   /lib/modules/6.1.0-rc7+/kernel/sound/usb/usx2y/snd-usb-us1221.ko
STRIP  /lib/modules/6.1.0-rc7+/kernel/sound/usb/usx2y/snd-usb-usx2y.ko
SIGN   /lib/modules/6.1.0-rc7+/kernel/sound/usb/usx2y/snd-usb-usx2y.ko
INSTALL /lib/modules/6.1.0-rc7+/kernel/sound/virtio/virtio_snd.ko
STRIP  /lib/modules/6.1.0-rc7+/kernel/sound/virtio/virtio_snd.ko
INSTALL /lib/modules/6.1.0-rc7+/kernel/sound/x86/snd-hdmi-lpe-audio.ko
INSTALL /lib/modules/6.1.0-rc7+/kernel/sound/xen/snd_xen_front.ko
SIGN   /lib/modules/6.1.0-rc7+/kernel/sound/xen/snd_xen_front.ko
STRIP  /lib/modules/6.1.0-rc7+/kernel/sound/x86/snd-hdmi-lpe-audio.ko
STRIP  /lib/modules/6.1.0-rc7+/kernel/sound/xen/snd_xen_front.ko
SIGN   /lib/modules/6.1.0-rc7+/kernel/sound/x86/snd-hdmi-lpe-audio.ko
SIGN   /lib/modules/6.1.0-rc7+/kernel/sound/xen/snd_xen_front.ko
DEPMOD /lib/modules/6.1.0-rc7+
er_priyagupta123@vt-assignment:~/linux$
```

```
INSTALLED /lib/modules/6.1.0-rc7+/kernel/sound/usb/line6/snd-usb-podhd.ko
STRIP  /lib/modules/6.1.0-rc7+/kernel/sound/usb/line6/snd-usb-podhd.ko
INSTALL /lib/modules/6.1.0-rc7+/kernel/sound/usb/line6/snd-usb-toneport.ko
SIGN   /lib/modules/6.1.0-rc7+/kernel/sound/usb/line6/snd-usb-podhd.ko
STRIP  /lib/modules/6.1.0-rc7+/kernel/sound/usb/line6/snd-usb-toneport.ko
INSTALL /lib/modules/6.1.0-rc7+/kernel/sound/usb/line6/snd-usb-variax.ko
SIGN   /lib/modules/6.1.0-rc7+/kernel/sound/usb/line6/snd-usb-toneport.ko
STRIP  /lib/modules/6.1.0-rc7+/kernel/sound/usb/line6/snd-usb-variax.ko
INSTALL /lib/modules/6.1.0-rc7+/kernel/sound/usb/misc/snd-ua101.ko
SIGN   /lib/modules/6.1.0-rc7+/kernel/sound/usb/line6/snd-usb-variax.ko
STRIP  /lib/modules/6.1.0-rc7+/kernel/sound/usb/misc/snd-ua101.ko
SIGN   /lib/modules/6.1.0-rc7+/kernel/sound/usb/misc/snd-ua101.ko
INSTALL /lib/modules/6.1.0-rc7+/kernel/sound/usb/snd-usb-midi.ko
STRIP  /lib/modules/6.1.0-rc7+/kernel/sound/usb/snd-usbmidi-lib.ko
SIGN   /lib/modules/6.1.0-rc7+/kernel/sound/usb/usx2y/snd-usb-us1221.ko
STRIP  /lib/modules/6.1.0-rc7+/kernel/sound/usb/usx2y/snd-usbmidi-lib.ko
SIGN   /lib/modules/6.1.0-rc7+/kernel/sound/usb/usx2y/snd-usb-us1221.ko
STRIP  /lib/modules/6.1.0-rc7+/kernel/sound/usb/usx2y/snd-usb-usx2y.ko
SIGN   /lib/modules/6.1.0-rc7+/kernel/sound/usb/usx2y/snd-usb-audio.ko
SIGN   /lib/modules/6.1.0-rc7+/kernel/sound/usb/usx2y/snd-usb-us1221.ko
STRIP  /lib/modules/6.1.0-rc7+/kernel/sound/virtio/virtio_snd.ko
STRIP  /lib/modules/6.1.0-rc7+/kernel/sound/x86/snd-hdmi-lpe-audio.ko
INSTALL /lib/modules/6.1.0-rc7+/kernel/sound/xen/snd_xen_front.ko
SIGN   /lib/modules/6.1.0-rc7+/kernel/sound/xen/snd_xen_front.ko
STRIP  /lib/modules/6.1.0-rc7+/kernel/sound/x86/snd-hdmi-lpe-audio.ko
STRIP  /lib/modules/6.1.0-rc7+/kernel/sound/xen/snd_xen_front.ko
SIGN   /lib/modules/6.1.0-rc7+/kernel/sound/x86/snd-hdmi-lpe-audio.ko
SIGN   /lib/modules/6.1.0-rc7+/kernel/sound/xen/snd_xen_front.ko
DEPMOD /lib/modules/6.1.0-rc7+
er_priyagupta123@vt-assignment:~/linux$ sudo make -j 4 install
```

```
HOSTCC arch/x86/boot/compressed/mm-piggy.o
CC      arch/x86/boot/compressed/cpuflags.o
CC      arch/x86/boot/video.o
CC      arch/x86/boot/compressed/early_serial_console.o
CC      arch/x86/boot/compressed/kaslr.o
CC      arch/x86/boot/video-mode.o
CC      arch/x86/boot/version.o
CC      arch/x86/boot/video-vga.o
CC      arch/x86/boot/video-vesa.o
CC      arch/x86/boot/compressed/ident_map_64.o
CC      arch/x86/boot/video-bios.o
HOSTCC arch/x86/boot/tools/build
CC      arch/x86/boot/compressed/idt_64.o
AS      arch/x86/boot/compressed/idt_handlers_64.o
AS      arch/x86/boot/compressed/mem_encrypt.o
CC      arch/x86/boot/compressed/pgtable_64.o
CPUSTR arch/x86/boot/cpustr.h
CC      arch/x86/boot/cpu.o
CC      arch/x86/boot/compressed/sev.o
CC      arch/x86/boot/compressed/acpi.o
AS      arch/x86/boot/compressed/efi_thunk_64.o
CC      arch/x86/boot/compressed/efi.o
CC      arch/x86/boot/compressed/misc.o
ZSTD22 arch/x86/boot/compressed/vmlinux.bin.zst
MKPIGGY arch/x86/boot/compressed/piggy.S
AS      arch/x86/boot/compressed/piggy.o
LD      arch/x86/boot/compressed/vmlinux
ZOFFSET arch/x86/boot/zoffset.h
OBJCOPY arch/x86/boot/vmlinuz.bin
AS      arch/x86/boot/header.o
LD      arch/x86/boot/setup.elf
OBJCOPY arch/x86/boot/setup.bin
BUILD  arch/x86/boot/bzImage
Kernel: arch/x86/boot/bzImage is ready (#1)
er_priyagupta123@vt-assignment:~/linux$
```

```
INSTALLED /lib/modules/6.1.0-rc7+/kernel/sound/virtio/virtio_snd.ko
STRIP   /lib/modules/6.1.0-rc7+/kernel/sound/virtio/virtio_snd.ko
INSTALL  /lib/modules/6.1.0-rc7+/kernel/sound/snd-hdmi-lpe-audio.ko
INSTALL  /lib/modules/6.1.0-rc7+/kernel/sound/xen/snd_xen_front.ko
SIGN    /lib/modules/6.1.0-rc7+/kernel/sound/virtio/virtio_snd.ko
STRIP   /lib/modules/6.1.0-rc7+/kernel/sound/x86/snd-hdmi-lpe-audio.ko
SIGN    /lib/modules/6.1.0-rc7+/kernel/sound/xen/snd_xen_front.ko
SIGN    /lib/modules/6.1.0-rc7+/kernel/sound/x86/snd-hdmi-lpe-audio.ko
SIGN    /lib/modules/6.1.0-rc7+/kernel/sound/xen/snd_xen_front.ko
DEFMOD  /lib/modules/6.1.0-rc7+
er_priyagupta123@vt-assignment:~/linux$ sudo make -j 4 install
INSTALL /boot
run-parts: executing /etc/kernel/postinst.d/initramfs-tools 6.1.0-rc7+ /boot/vmlinuz-6.1.0-rc7+
update-initramfs: Generating /boot/initrd.img-6.1.0-rc7+
run-parts: executing /etc/kernel/postinst.d/unattended-upgrades 6.1.0-rc7+ /boot/vmlinuz-6.1.0-rc7+
run-parts: executing /etc/kernel/postinst.d/update-notifier 6.1.0-rc7+ /boot/vmlinuz-6.1.0-rc7+
run-parts: executing /etc/kernel/postinst.d/xx-update-initrd-links 6.1.0-rc7+ /boot/vmlinuz-6.1.0-rc7+
I: /boot/initrd.img is now a symlink to initrd.img-6.1.0-rc7+
run-parts: executing /etc/kernel/postinst.d/zz-update-grub 6.1.0-rc7+ /boot/vmlinuz-6.1.0-rc7+
Sourcing file '/etc/default/grub'
Sourcing file '/etc/default/grub.d/40-force-partuuid.cfg'
Sourcing file '/etc/default/grub.d/50-cloudimg-settings.cfg'
Sourcing file '/etc/default/grub.d/init-select.cfg'
Generating grub configuration file ...
GRUB_FORCE_PARTUUID is set, will attempt initrdless boot
Found linux image: /boot/vmlinuz-6.1.0-rc7+
Found initrd image: /boot/initrd.img-6.1.0-rc7+
Found linux image: /boot/vmlinuz-5.15.0-1025-gcp
Found initrd image: /boot/initrd.img-5.15.0-1025-gcp
Warning: os-prober will not be executed to detect other bootable partitions.
Systems on them will not be added to the GRUB boot configuration.
Check GRUB_DISABLE_OS_PROBER documentation entry.
Adding boot menu entry for UEFI Firmware Settings ...
done
er_priyagupta123@vt-assignment:~/linux$
```



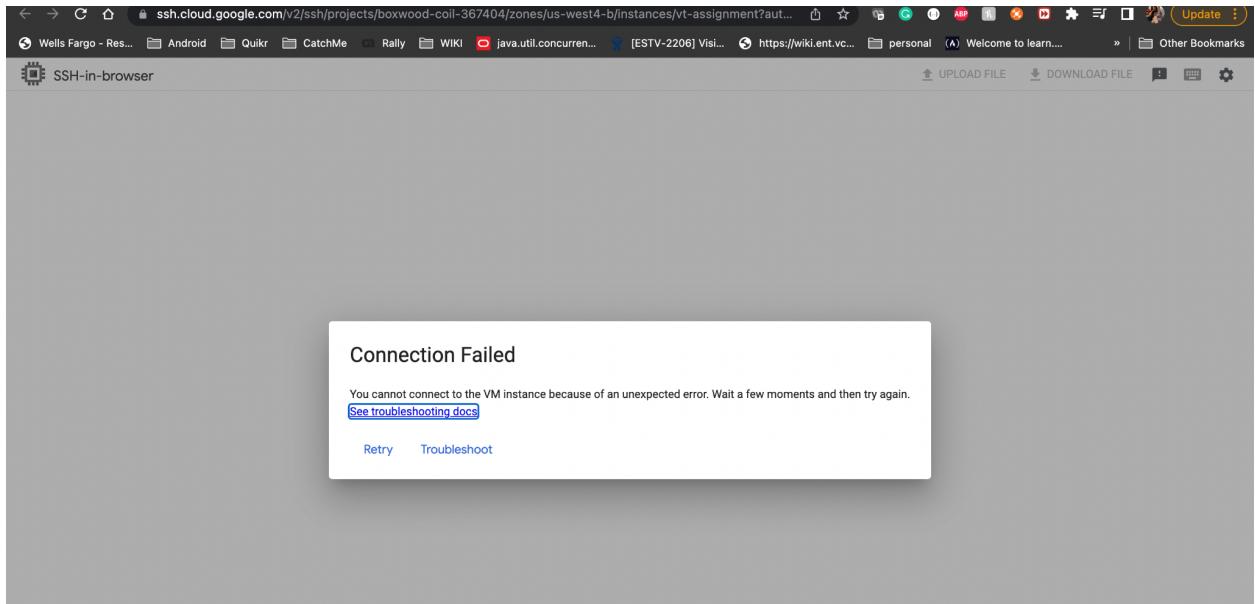
```
er_priyagupta123@vt-assignment:~/linux$ sudo apt install gitlab-shell
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following packages were automatically installed and are no longer required:
  libatasmart4 libblockdev-fs2 libblockdev-loop2 libblockdev-part-err2 libblockdev-part2 libblockdev-swap2 libblockdev-utils2 libblockdev2
  libmbim-glib4 libmbim-proxy libmm-glib0 libnsspr4 libnss3 libnumal libparted-fs-resize0 libqmi-glib5 libqmi-proxy libtcl8.6 libudisks2-0 tcl
  tcl8.6 usb-modeswitch usb-modeswitch-data
Use 'sudo apt autoremove' to remove them.
The following NEW packages will be installed:
  gitlab-shell
0 upgraded, 1 newly installed, 0 to remove and 0 not upgraded.
Need to get 18.4 MB of archives.
After this operation, 71.9 MB of additional disk space will be used.
Get:1 http://us-west4.gce.archive.ubuntu.com/ubuntu jammy/universe amd64 gitlab-shell amd64 13.19.1-2 [18.4 MB]
Fetched 18.4 MB in 2s (10.2 MB/s)
Selecting previously unselected package gitlab-shell.
(Reading database ... 68996 files and directories currently installed.)
Preparing to unpack .../gitlab-shell_13.19.1-2_amd64.deb ...
Unpacking gitlab-shell (13.19.1-2) ...
Setting up gitlab-shell (13.19.1-2) ...
Scanning processes...
Scanning linux images...

No services need to be restarted.

No containers need to be restarted.

No user sessions are running outdated binaries.

No VM guests are running outdated hypervisor (qemu) binaries on this host.
er_priyagupta123@vt-assignment:~/linux$
```



```
Welcome to Ubuntu 22.04.1 LTS (GNU/Linux 6.1.0-rc7+ x86_64)

 * Documentation: https://help.ubuntu.com
 * Management: https://landscape.canonical.com
 * Support: https://ubuntu.com/advantage

System information as of Sun Dec  4 23:37:27 UTC 2022

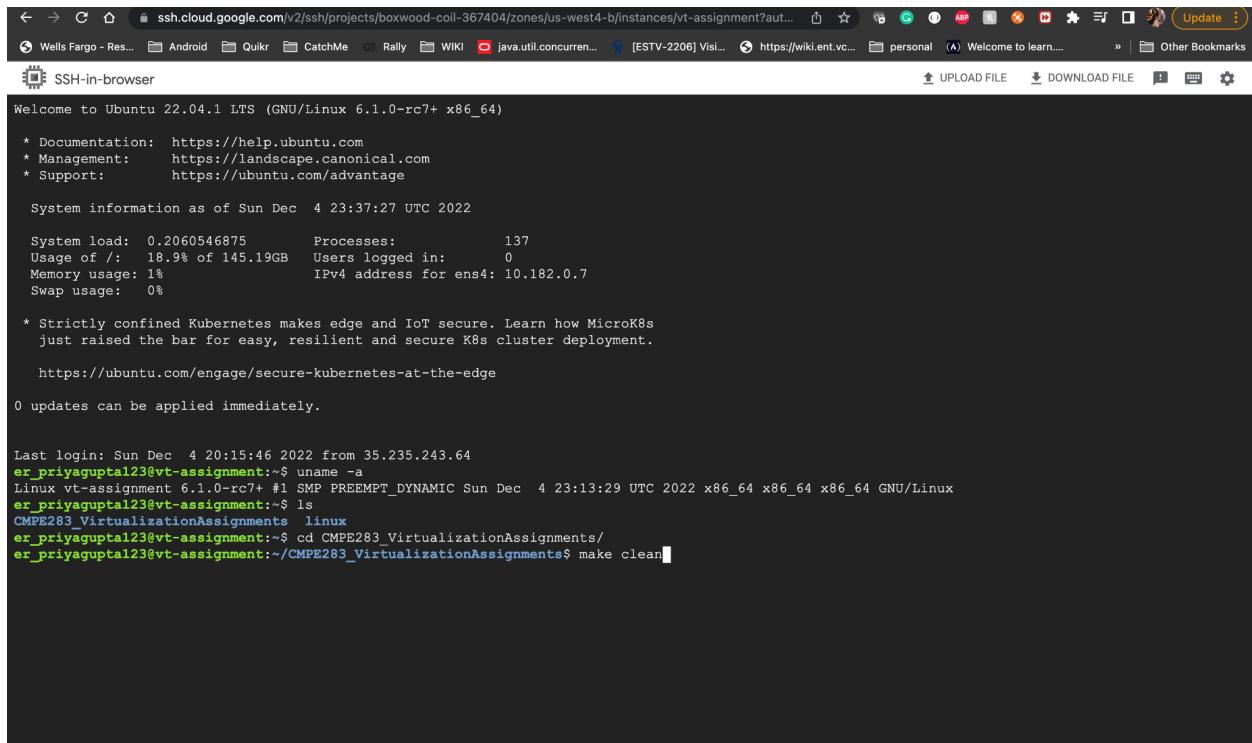
System load: 0.2060546875      Processes:          137
Usage of /: 18.9% of 145.19GB  Users logged in:      0
Memory usage: 1%                IPv4 address for ens4: 10.182.0.7
Swap usage: 0%

* Strictly confined Kubernetes makes edge and IoT secure. Learn how MicroK8s
just raised the bar for easy, resilient and secure K8s cluster deployment.

https://ubuntu.com/engage/secure-kubernetes-at-the-edge

0 updates can be applied immediately.

Last login: Sun Dec  4 20:15:46 2022 from 35.235.243.64
er_priyagupta123@vt-assignment:~$ uname -a
Linux vt-assignment 6.1.0-rc7+ #1 SMP PREEMPT_DYNAMIC Sun Dec  4 23:13:29 UTC 2022 x86_64 x86_64 x86_64 GNU/Linux
er_priyagupta123@vt-assignment:~$
```



← → 🔍 ssh.cloud.google.com/v2/ssh/projects/boxwood-coil-367404/zones/us-west4-b/instances/vt-assignment?aut... 🔍 [ESTV-2206] Visi... 🔍 https://wiki.ent.vc... 🔍 personal 🔍 Welcome to learn... 🔍 Other Bookmarks

SSH-in-browser

Welcome to Ubuntu 22.04.1 LTS (GNU/Linux 6.1.0-rc7+ x86\_64)

\* Documentation: <https://help.ubuntu.com>  
\* Management: <https://landscape.canonical.com>  
\* Support: <https://ubuntu.com/advantage>

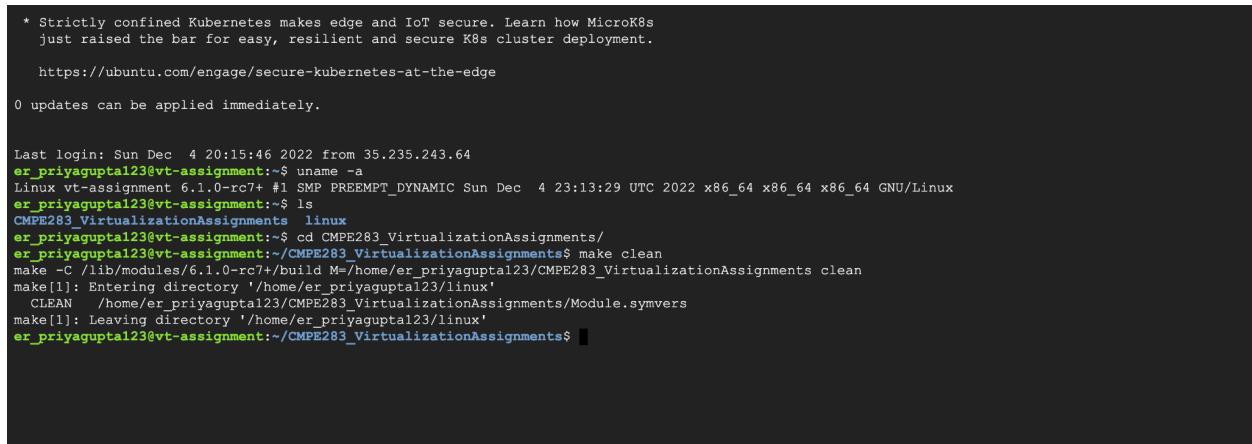
System information as of Sun Dec 4 23:37:27 UTC 2022

System load: 0.2060546875 Processes: 137  
Usage of /: 18.9% of 145.19GB Users logged in: 0  
Memory usage: 1% IPv4 address for ens4: 10.182.0.7  
Swap usage: 0%

\* Strictly confined Kubernetes makes edge and IoT secure. Learn how MicroK8s just raised the bar for easy, resilient and secure K8s cluster deployment.  
<https://ubuntu.com/engage/secure-kubernetes-at-the-edge>

0 updates can be applied immediately.

Last login: Sun Dec 4 20:15:46 2022 from 35.235.243.64  
**er\_priyagupta123@vt-assignment:**\$ uname -a  
Linux vt-assignment 6.1.0-rc7+ #1 SMP PREEMPT\_DYNAMIC Sun Dec 4 23:13:29 UTC 2022 x86\_64 x86\_64 x86\_64 GNU/Linux  
**er\_priyagupta123@vt-assignment:**\$ ls  
CMPE283\_VirtualizationAssignments linux  
**er\_priyagupta123@vt-assignment:**\$ cd CMPE283\_VirtualizationAssignments/  
**er\_priyagupta123@vt-assignment:**~/CMPE283\_VirtualizationAssignments\$ make clean



```
* Strictly confined Kubernetes makes edge and IoT secure. Learn how MicroK8s just raised the bar for easy, resilient and secure K8s cluster deployment.  
https://ubuntu.com/engage/secure-kubernetes-at-the-edge  
0 updates can be applied immediately.
```

```
Last login: Sun Dec 4 20:15:46 2022 from 35.235.243.64  
er_priyagupta123@vt-assignment:$ uname -a  
Linux vt-assignment 6.1.0-rc7+ #1 SMP PREEMPT_DYNAMIC Sun Dec 4 23:13:29 UTC 2022 x86_64 x86_64 x86_64 GNU/Linux  
er_priyagupta123@vt-assignment:$ ls  
CMPE283_VirtualizationAssignments linux  
er_priyagupta123@vt-assignment:$ cd CMPE283_VirtualizationAssignments/  
er_priyagupta123@vt-assignment:~/CMPE283_VirtualizationAssignments$ make clean  
make -C /lib/modules/6.1.0-rc7+/build M=/home/er_priyagupta123/CMPE283_VirtualizationAssignments clean  
make[1]: Entering directory '/home/er_priyagupta123/linux'  
  CLEAN  /home/er_priyagupta123/CMPE283_VirtualizationAssignments/Module.symvers  
make[1]: Leaving directory '/home/er_priyagupta123/linux'  
er_priyagupta123@vt-assignment:~/CMPE283_VirtualizationAssignments$
```

```
* Strictly confined Kubernetes makes edge and IoT secure. Learn how MicroK8s
just raised the bar for easy, resilient and secure K8s cluster deployment.

https://ubuntu.com/engage/secure-kubernetes-at-the-edge

0 updates can be applied immediately.

Last login: Sun Dec  4 20:15:46 2022 from 35.235.243.64
er_priyagupta123@vt-assignment:~$ uname -a
Linux vt-assignment 6.1.0-rc7+ #1 SMP PREEMPT_DYNAMIC Sun Dec  4 23:13:29 UTC 2022 x86_64 x86_64 x86_64 GNU/Linux
er_priyagupta123@vt-assignment:~$ ls
CMPE283_VirtualizationAssignments linux
er_priyagupta123@vt-assignment:~$ cd CMPE283_VirtualizationAssignments/
er_priyagupta123@vt-assignment:~/CMPE283_VirtualizationAssignments$ make clean
make -C /lib/modules/6.1.0-rc7+/build M=/home/er_priyagupta123/CMPE283_VirtualizationAssignments clean
make[1]: Entering directory '/home/er_priyagupta123/linux'
      CLEAN  /home/er_priyagupta123/CMPE283_VirtualizationAssignments/Module.symvers
make[1]: Leaving directory '/home/er_priyagupta123/linux'
er_priyagupta123@vt-assignment:~/CMPE283_VirtualizationAssignments$ make all
er_priyagupta123@vt-assignment:~/CMPE283_VirtualizationAssignments$
```

```
https://ubuntu.com/engage/secure-kubernetes-at-the-edge

0 updates can be applied immediately.

Last login: Sun Dec  4 20:15:46 2022 from 35.235.243.64
er_priyagupta123@vt-assignment:~$ uname -a
Linux vt-assignment 6.1.0-rc7+ #1 SMP PREEMPT_DYNAMIC Sun Dec  4 23:13:29 UTC 2022 x86_64 x86_64 x86_64 GNU/Linux
er_priyagupta123@vt-assignment:~$ ls
CMPE283_VirtualizationAssignments linux
er_priyagupta123@vt-assignment:~$ cd CMPE283_VirtualizationAssignments/
er_priyagupta123@vt-assignment:~/CMPE283_VirtualizationAssignments$ make clean
make -C /lib/modules/6.1.0-rc7+/build M=/home/er_priyagupta123/CMPE283_VirtualizationAssignments clean
make[1]: Entering directory '/home/er_priyagupta123/linux'
      CLEAN  /home/er_priyagupta123/CMPE283_VirtualizationAssignments/Module.symvers
make[1]: Leaving directory '/home/er_priyagupta123/linux'
er_priyagupta123@vt-assignment:~/CMPE283_VirtualizationAssignments$ make all
make -C /lib/modules/6.1.0-rc7+/build M=/home/er_priyagupta123/CMPE283_VirtualizationAssignments modules
make[1]: Entering directory '/home/er_priyagupta123/linux'
  CC [M]  /home/er_priyagupta123/CMPE283_VirtualizationAssignments/cmpe283-1.o
  MODPOST /home/er_priyagupta123/CMPE283_VirtualizationAssignments/Module.symvers
  CC [M]  /home/er_priyagupta123/CMPE283_VirtualizationAssignments/cmpe283-1.mod.o
  LD [M]  /home/er_priyagupta123/CMPE283_VirtualizationAssignments/cmpe283-1.ko
make[1]: Leaving directory '/home/er_priyagupta123/linux'
er_priyagupta123@vt-assignment:~/CMPE283_VirtualizationAssignments$
```

SSH-in-browser

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```
[ 554.662334] MONITOR exiting: Can set=Yes, Can clear=Yes
[ 554.662335] Pause exiting: Can set=Yes, Can clear=Yes
[ 554.662335] Activate secondary controls: Can set=Yes, Can clear=Yes
[ 554.662337] Secondary Processor based Controls MSR: 0x51ff00000000
[ 554.662338] Virtualize APIC accesses: Can set=Yes, Can clear=Yes
[ 554.662338] Enable EPT: Can set=Yes, Can clear=Yes
[ 554.662339] Descriptor-table exiting: Can set=Yes, Can clear=Yes
[ 554.662339] Enable RDTSCP: Can set=Yes, Can clear=Yes
[ 554.662340] Virtualize x2APIC mode: Can set=Yes, Can clear=Yes
[ 554.662340] Enable VPID: Can set=Yes, Can clear=Yes
[ 554.662341] WBINVD exiting: Can set=Yes, Can clear=Yes
[ 554.662342] Unrestricted guest: Can set=Yes, Can clear=Yes
[ 554.662342] APIC-register virtualization: Can set=Yes, Can clear=Yes
[ 554.662343] Virtual-interrupt delivery: Can set=No, Can clear=Yes
[ 554.662343] PAUSE-loop exiting: Can set=No, Can clear=Yes
[ 554.662344] RDAND exiting: Can set=No, Can clear=Yes
[ 554.662344] Enable INVPCLID: Can set=Yes, Can clear=Yes
[ 554.662345] Enable VM functions: Can set=No, Can clear=Yes
[ 554.662346] VMCS shadowing: Can set=Yes, Can clear=Yes
[ 554.662346] Enable ENCLS exiting: Can set=No, Can clear=Yes
[ 554.662347] RDSEED exiting: Can set=No, Can clear=Yes
[ 554.662347] Enable PML: Can set=No, Can clear=Yes
[ 554.662348] EPT-violation #VE: Can set=No, Can clear=Yes
[ 554.662349] Conceal VMX from PT: Can set=No, Can clear=Yes
[ 554.662349] Enable XSAVES/XRSTORS: Can set=No, Can clear=Yes
[ 554.662350] Mode-based execute control for EPT: Can set=No, Can clear=Yes
[ 554.662350] Sub-page write permissions for EPT: Can set=No, Can clear=Yes
[ 554.662351] Intel PT uses guest physical addresses: Can set=No, Can clear=Yes
[ 554.662352] Use TSC scaling: Can set=Yes, Can clear=Yes
[ 554.662352] Enable user wait and pause: Can set=No, Can clear=Yes
[ 554.662353] Enable ENCLV exiting: Can set=No, Can clear=Yes
[ 554.662353] (null): Can set=Yes, Can clear=Yes
[ 554.662355] Exit Controls MSR: 0x3fefff00003dff
[ 554.662356] Save debug controls: Can set=Yes, Can clear=No
[ 554.662357] Host address-space size: Can set=Yes, Can clear=Yes
[ 554.662357] Load IA32_PERF_GLOBAL_CTRL: Can set=No, Can clear=Yes
[ 554.662358] Acknowledge interrupt on exit: Can set=Yes, Can clear=Yes
[ 554.662359] Save IA32_PAT: Can set=Yes, Can clear=Yes
```

SSH-in-browser

UPLOAD FILE DOWNLOAD FILE

```
[ 554.662316] External Interrupt Exiting: Can set=Yes, Can clear=Yes
[ 554.662317] NMI Exiting: Can set=Yes, Can clear=Yes
[ 554.662318] Virtual NMIs: Can set=Yes, Can clear=Yes
[ 554.662318] Activate VMX Preemption Timer: Can set=No, Can clear=Yes
[ 554.662319] Process Posted Interrupts: Can set=No, Can clear=Yes
[ 554.662321] Primary Processor based Controls MSR: 0xf7fb9ffe0401e172
[ 554.662322] Interrupt-window existing: Can set=Yes, Can clear=Yes
[ 554.662322] Use TSC offsetting: Can set=Yes, Can clear=Yes
[ 554.662323] HLT exiting: Can set=Yes, Can clear=Yes
[ 554.662324] INVLPG exiting: Can set=Yes, Can clear=Yes
[ 554.662324] MWAIT exiting: Can set=Yes, Can clear=Yes
[ 554.662325] RDPMC exiting: Can set=Yes, Can clear=Yes
[ 554.662326] RDTSC exiting: Can set=Yes, Can clear=Yes
[ 554.662326] CR3-load exiting: Can set=Yes, Can clear=No
[ 554.662327] CR3-store exiting: Can set=Yes, Can clear=No
[ 554.662328] Activate tertiary controls: Can set=No, Can clear=Yes
[ 554.662329] CR8-load exiting: Can set=Yes, Can clear=Yes
[ 554.662329] CR8-store exiting: Can set=Yes, Can clear=Yes
[ 554.662330] Use TPR shadow: Can set=Yes, Can clear=Yes
[ 554.662330] NMI-Window exiting: Can set=No, Can clear=Yes
[ 554.662331] MOV-DR exiting: Can set=Yes, Can clear=Yes
[ 554.662332] Unconditional I/O exiting: Can set=Yes, Can clear=Yes
[ 554.662332] Use I/O bitmap: Can set=Yes, Can clear=Yes
[ 554.662333] Monitor Trap Flag: Can set=No, Can clear=Yes
[ 554.662333] Use MSR bitmap: Can set=Yes, Can clear=Yes
[ 554.662334] MONITOR exiting: Can set=Yes, Can clear=Yes
[ 554.662335] Pause exiting: Can set=Yes, Can clear=Yes
[ 554.662335] Activate secondary controls: Can set=Yes, Can clear=Yes
[ 554.662337] Secondary Processor based Controls MSR: 0x51ff00000000
[ 554.662338] Virtualize APIC accesses: Can set=Yes, Can clear=Yes
[ 554.662338] Enable EPT: Can set=Yes, Can clear=Yes
[ 554.662339] Descriptor-table exiting: Can set=Yes, Can clear=Yes
[ 554.662339] Enable RDTSCP: Can set=Yes, Can clear=Yes
[ 554.662340] Virtualize x2APIC mode: Can set=Yes, Can clear=Yes
[ 554.662340] Enable VPID: Can set=Yes, Can clear=Yes
[ 554.662341] WBINVD exiting: Can set=Yes, Can clear=Yes
[ 554.662342] Unrestricted guest: Can set=Yes, Can clear=Yes
[ 554.662342] APIC-register virtualization: Can set=Yes, Can clear=Yes
```

SSH-in-browser

UPLOAD FILE DOWNLOAD FILE

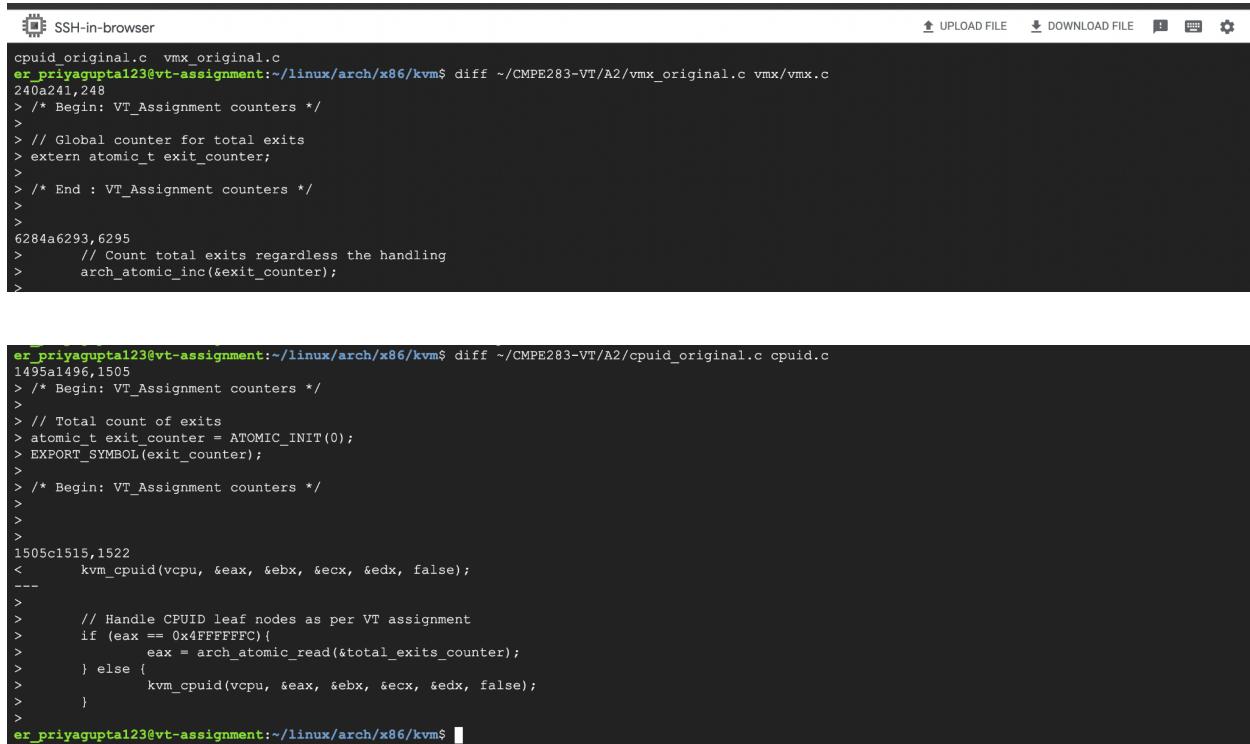
```
[ 554.662358] Acknowledge interrupt on exit: Can set=Yes, Can clear=Yes
[ 554.662359] Save IA32_PAT: Can set=Yes, Can clear=Yes
[ 554.662359] Load IA32_PAT: Can set=Yes, Can clear=Yes
[ 554.662360] Save IA32_EFER: Can set=Yes, Can clear=Yes
[ 554.662361] Load IA32_EFER: Can set=Yes, Can clear=Yes
[ 554.662361] Save VMX-preemption timer value: Can set=No, Can clear=Yes
[ 554.662362] Clear IA32_BNDCFGS: Can set=No, Can clear=Yes
[ 554.662363] Conceal VMX from PT: Can set=No, Can clear=Yes
[ 554.662363] Clear IA32_RTIT_CTL: Can set=No, Can clear=Yes
[ 554.662364] Clear IA32_LBR_CTL: Can set=No, Can clear=Yes
[ 554.662365] Load CET state: Can set=No, Can clear=Yes
[ 554.662365] Load PKRS: Can set=No, Can clear=Yes
[ 554.662366] Activate secondary controls: Can set=No, Can clear=Yes
[ 554.662367] Entry Controls MSR: 0xd3ff000011ff
[ 554.662368] Load debug controls: Can set=Yes, Can clear=No
[ 554.662369] IA-32e mode guest: Can set=Yes, Can clear=Yes
[ 554.662369] Entry to SMM: Can set=No, Can clear=Yes
[ 554.662370] Deactivate dual monitor treatment: Can set=No, Can clear=Yes
[ 554.662371] Load IA32_PERF_GLOBA_L_CTRL: Can set=No, Can clear=Yes
[ 554.662371] Load IA32_PAT: Can set=Yes, Can clear=Yes
[ 554.662372] Load IA32_EFER: Can set=Yes, Can clear=Yes
[ 554.662372] Load IA32_BNDCFGS: Can set=No, Can clear=Yes
[ 554.662373] Conceal VMX from PT: Can set=No, Can clear=Yes
[ 554.662374] Load IA32_RTIT_CTL: Can set=No, Can clear=Yes
[ 554.662374] Load CET state: Can set=No, Can clear=Yes
[ 554.662375] Load guest IA32_LBR_CTL: Can set=No, Can clear=Yes
[ 554.662375] Load PKRS: Can set=No, Can clear=Yes
[ 554.662446] unchecked MSR access error: RDMSR from 0x492 at rIP: 0xfffffffffb0898c58 (native_read_msr+0x8/0x40)
Call Trace:
[ 554.662452] <TASK>
[ 554.662453] detect_vmx_features+0x13c/0x177 [cmpe283_1]
[ 554.662456] ? report_capability.cold+0x111/0x111 [cmpe283_1]
[ 554.662460] init_module+0x1a/0x22 [cmpe283_1]
[ 554.662464] do_one_initcall+0x46/0x210
[ 554.662468] ? kmalloc_trace+0x2a/0xa0
[ 554.662472] do_init_module+0x52/0x210
[ 554.662476] do_init_module+0x52/0x210
[ 554.662479] load_module+0x1fa8/0x23e0
[ 554.662483] __do_sys_finit_module+0xc8/0x140
[ 554.662485] ? __do_sys_finit_module+0xcb8/0x140
[ 554.662487] x64_sys_finit_module+0x18/0x20
[ 554.662489] do_syscall_64+0x59/0x90
[ 554.662493] ? exit_to_user_mode_prepare+0x49/0x1a0
[ 554.662496] ? syscall_exit_to_user_mode+0x26/0x50
[ 554.662498] ? x64_sys_mmap+0x33/0x50
[ 554.662500] ? do_syscall_64+0x69/0x90
[ 554.662502] ? exit_to_user_mode_prepare+0x49/0x1a0
[ 554.662504] ? syscall_exit_to_user_mode+0x26/0x50
[ 554.662506] ? x64_sys_newfstatat+0x1c/0x30
[ 554.662508] ? do_syscall_64+0x69/0x90
[ 554.662510] ? do_syscall_64+0x69/0x90
[ 554.662512] ? irqentry_exit_to_user_mode+0x9/0x20
[ 554.662514] ? irqentry_exit+0x3b/0x50
[ 554.662515] ? exc_page_fault+0x87/0x180
[ 554.662516] entry_SYSCALL_64_after_hwframe+0x63/0xcd
[ 554.662520] RIP: 0033:0x7f6decf1ea3d
[ 554.662522] Code: 5b 41 5c c3 66 0f 1f 84 00 00 00 00 f3 0f 1e fa 48 89 f8 48 89 f7 48 89 d6 48 89 ca 4d 89 c2 4d 89 c8 4c 8b 4c 24 08 0f 05
<48> 3d 01 f0 ff ff 73 01 c3 48 8b od c3 a3 0f 00 f7 d8 64 89 01 48
[ 554.662524] RSP: 002b:00007ffc4f4b08218 RFLAGS: 00000246 ORIG RAX: 00000000000000139
[ 554.662526] RAX: ffffffff0fffffd4 RBX: 0000560dac8ac7a0 RCX: 00007f6decf1ea3d
[ 554.662527] RDX: 0000000000000000 RSI: 0000560dabf3bcd2 RDI: 0000000000000003
[ 554.662528] RBP: 0000000000000000 R08: 0000000000000000 R09: 0000000000000000
[ 554.662529] R10: 0000000000000003 R11: 0000000000000246 R12: 0000560dabf3bcd2
[ 554.662530] R13: 0000560dac8ac750 R14: 0000560dabf3a888 R15: 0000560dac8ac8b0
[ 554.662532] </TASK>
[ 554.662533] Tertiary Processor based Controls MSR: 0x0
[ 554.662534] LOADIKEY exiting: Can set=No, Can clear=Yes
[ 554.662534] Enable HLAT: Can set=No, Can clear=Yes
[ 554.662535] EPT paging-write control: Can set=No, Can clear=Yes
```

SSH-in-browser

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```
[ 554.662456] detect_vmx_features+0x13c/0x177 [cmpe283_1]
[ 554.662460] ? report_capability.cold+0x111/0x111 [cmpe283_1]
[ 554.662464] init_module+0x1a/0x22 [cmpe283_1]
[ 554.662468] do_one_initcall+0x46/0x210
[ 554.662472] ? kmalloc_trace+0x2a/0xa0
[ 554.662476] do_init_module+0x52/0x210
[ 554.662479] load_module+0x1fa8/0x23e0
[ 554.662483] __do_sys_finit_module+0xc8/0x140
[ 554.662485] ? __do_sys_finit_module+0xcb8/0x140
[ 554.662487] x64_sys_finit_module+0x18/0x20
[ 554.662489] do_syscall_64+0x59/0x90
[ 554.662493] ? exit_to_user_mode_prepare+0x49/0x1a0
[ 554.662496] ? syscall_exit_to_user_mode+0x26/0x50
[ 554.662498] ? x64_sys_mmap+0x33/0x50
[ 554.662500] ? do_syscall_64+0x69/0x90
[ 554.662502] ? exit_to_user_mode_prepare+0x49/0x1a0
[ 554.662504] ? syscall_exit_to_user_mode+0x26/0x50
[ 554.662506] ? x64_sys_newfstatat+0x1c/0x30
[ 554.662508] ? do_syscall_64+0x69/0x90
[ 554.662510] ? do_syscall_64+0x69/0x90
[ 554.662512] ? irqentry_exit_to_user_mode+0x9/0x20
[ 554.662514] ? irqentry_exit+0x3b/0x50
[ 554.662515] ? exc_page_fault+0x87/0x180
[ 554.662516] entry_SYSCALL_64_after_hwframe+0x63/0xcd
[ 554.662520] RIP: 0033:0x7f6decf1ea3d
[ 554.662522] Code: 5b 41 5c c3 66 0f 1f 84 00 00 00 00 f3 0f 1e fa 48 89 f8 48 89 f7 48 89 d6 48 89 ca 4d 89 c2 4d 89 c8 4c 8b 4c 24 08 0f 05
<48> 3d 01 f0 ff ff 73 01 c3 48 8b od c3 a3 0f 00 f7 d8 64 89 01 48
[ 554.662524] RSP: 002b:00007ffc4f4b08218 RFLAGS: 00000246 ORIG RAX: 00000000000000139
[ 554.662526] RAX: ffffffff0fffffd4 RBX: 0000560dac8ac7a0 RCX: 00007f6decf1ea3d
[ 554.662527] RDX: 0000000000000000 RSI: 0000560dabf3bcd2 RDI: 0000000000000003
[ 554.662528] RBP: 0000000000000000 R08: 0000000000000000 R09: 0000000000000000
[ 554.662529] R10: 0000000000000003 R11: 0000000000000246 R12: 0000560dabf3bcd2
[ 554.662530] R13: 0000560dac8ac750 R14: 0000560dabf3a888 R15: 0000560dac8ac8b0
[ 554.662532] </TASK>
[ 554.662533] Tertiary Processor based Controls MSR: 0x0
[ 554.662534] LOADIKEY exiting: Can set=No, Can clear=Yes
[ 554.662534] Enable HLAT: Can set=No, Can clear=Yes
[ 554.662535] EPT paging-write control: Can set=No, Can clear=Yes
```

## Updated the Linux to count the total exits



```
SSH-in-browser
cpuid_original.c vmx_original.c
er_priyagupta123@vt-assignment:~/linux/arch/x86/kvm$ diff ~/CMPE283-VT/A2/vmx_original.c vmx/vmx.c
240a241,248
> /* Begin: VT_Assignment counters */
>
> // Global counter for total exits
> extern atomic_t exit_counter;
>
> /* End : VT_Assignment counters */
>
>
6284a6293,6295
>         // Count total exits regardless the handling
>         arch_atomic_inc(&exit_counter);
>

er_priyagupta123@vt-assignment:~/linux/arch/x86/kvm$ diff ~/CMPE283-VT/A2/cpuid_original.c cpuid.c
1495a1496,1505
> /* Begin: VT_Assignment counters */
>
> // Total count of exits
> atomic_t exit_counter = ATOMIC_INIT(0);
> EXPORT_SYMBOL(exit_counter);
>
> /* Begin: VT_Assignment counters */
>
>
1505c1515,1522
<     kvm_cpuid(vcpu, &eax, &ebx, &ecx, &edx, false);
---
>     // Handle CPUID leaf nodes as per VT assignment
>     if (eax == 0xFFFFFFFFC){
>         eax = arch_atomic_read(&total_exits_counter);
>     } else {
>         kvm_cpuid(vcpu, &eax, &ebx, &ecx, &edx, false);
>     }
>
er_priyagupta123@vt-assignment:~/linux/arch/x86/kvm$
```

## Build and Install modules again

- make -j 4 modules
- sudo make -j 4 INSTALL\_MOD\_STRIP=1 modules\_install && make install
- sudo lsmod | grep kvm
- Sudo rmmod kvm\_intel
- Sudo rmmod kvm
- sudo modprobe kvm
- sudo modprobe kvm\_intel
- Sudo lsmod | grep kvm

## Install modules to install Inner VM

- sudo apt-get install cpu-checker
- sudo apt update
- sudo apt-get install qemu-kvm libvirt-daemon-system libvirt-clients bridge-utils

- sudo kvm-ok
- sudo reboot

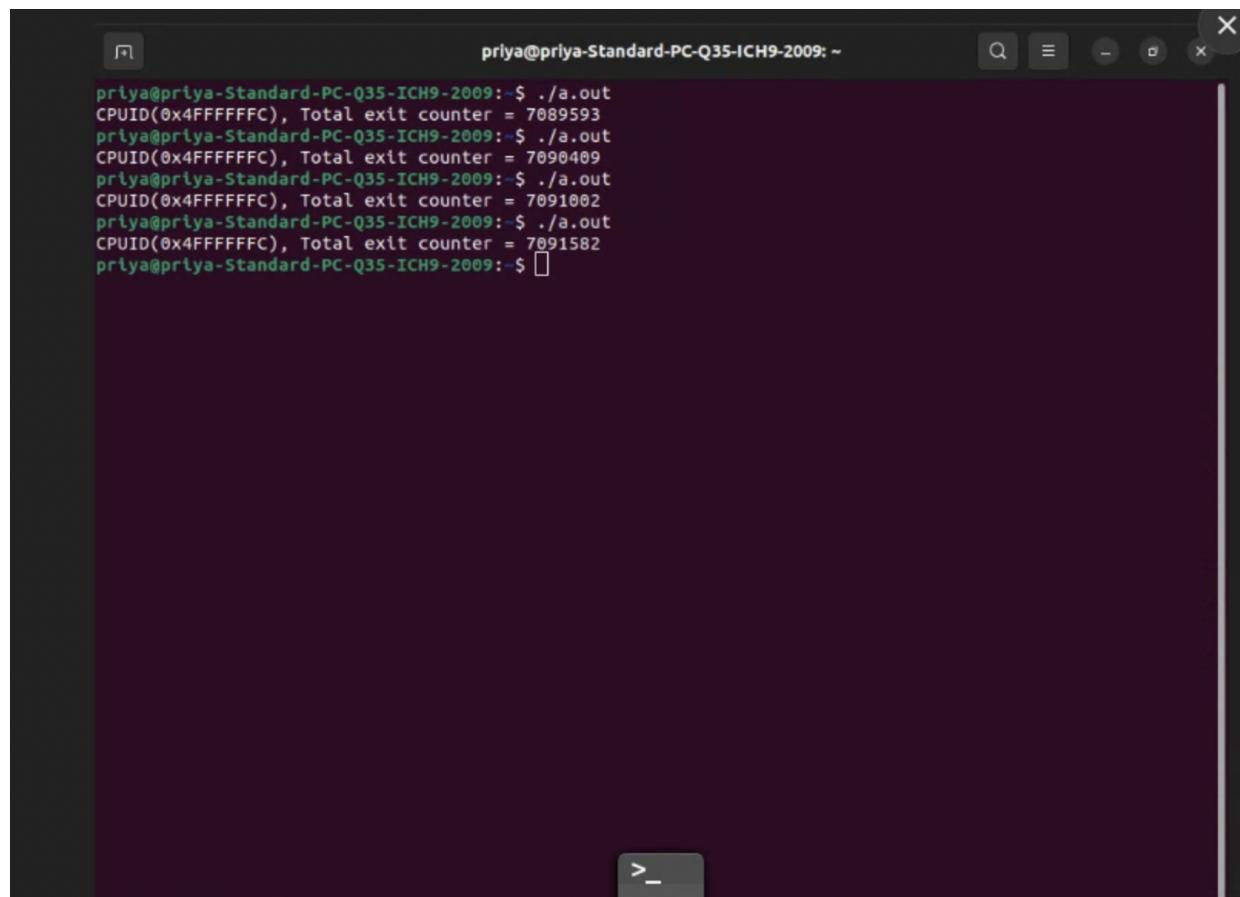
## Authorize an user to access inner VM

- uname -a
- sudo adduser er\_priyagupta123 libvirt
  - sudo getent group | grep libvirt
- sudo adduser er\_priyagupta123 kvm
  - sudo getent group | grep kvm
- sudo virsh list --all
  - Expect an empty list
- sudo systemctl status libvirtd
  - sudo systemctl enable --now libvirtd

## Run test file

- Use remote desktop to connect with the VM:
  - <https://remotedesktop.google.com/headless>
- Find your machine by clicking on "remote access"
- Double click on your machine and open terminal
- Start virt-manager by typing "virt-manager" in terminal
- Start inner vm

Exit counters in Inner VM:



A screenshot of a terminal window titled "priya@priya-Standard-PC-Q35-ICH9-2009: ~". The window contains the following text output from a script named "a.out":

```
priya@priya-Standard-PC-Q35-ICH9-2009: $ ./a.out
CPUID(0x4FFFFFFC), Total exit counter = 7089593
priya@priya-Standard-PC-Q35-ICH9-2009: $ ./a.out
CPUID(0x4FFFFFFC), Total exit counter = 7090409
priya@priya-Standard-PC-Q35-ICH9-2009: $ ./a.out
CPUID(0x4FFFFFFC), Total exit counter = 7091002
priya@priya-Standard-PC-Q35-ICH9-2009: $ ./a.out
CPUID(0x4FFFFFFC), Total exit counter = 7091582
priya@priya-Standard-PC-Q35-ICH9-2009: $ █
```

The terminal window has a dark background and light-colored text. The bottom right corner of the window frame features a small button with a right-pointing arrow and a minus sign.

Activities Terminal Dec 4 21:22

```
priya@priya-Standard-PC-Q35-ICH9-2009:~$ for i in {1..10}; do ./a.out; done  
CPUID(0x4FFFFFFC), Total exits = 1235839  
CPUID(0x4FFFFFFD), Total cycles for procssing exits = 177934168  
  
CPUID(0x4FFFFFFC), Total exits = 1235887  
CPUID(0x4FFFFFFD), Total cycles for procssing exits = 177940752  
  
CPUID(0x4FFFFFFC), Total exits = 1235923  
CPUID(0x4FFFFFFD), Total cycles for procssing exits = 177945526  
  
CPUID(0x4FFFFFFC), Total exits = 1235958  
CPUID(0x4FFFFFFD), Total cycles for procssing exits = 177950050  
  
CPUID(0x4FFFFFFC), Total exits = 1235993  
CPUID(0x4FFFFFFD), Total cycles for procssing exits = 177954910  
  
CPUID(0x4FFFFFFC), Total exits = 1236035  
CPUID(0x4FFFFFFD), Total cycles for procssing exits = 177960670  
  
CPUID(0x4FFFFFFC), Total exits = 1236071  
CPUID(0x4FFFFFFD), Total cycles for procssing exits = 177965190  
  
CPUID(0x4FFFFFFC), Total exits = 1236103  
CPUID(0x4FFFFFFD), Total cycles for procssing exits = 177969672  
  
CPUID(0x4FFFFFFC), Total exits = 1236137  
CPUID(0x4FFFFFFD), Total cycles for procssing exits = 177974318  
  
CPUID(0x4FFFFFFC), Total exits = 1236178  
CPUID(0x4FFFFFFD), Total cycles for procssing exits = 177981766  
priya@priya-Standard-PC-Q35-ICH9-2009:~$ █
```