CMPE283 - Assignment 1

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Github Repo :

https://github.com/amoolyakoduri/linux

Teamwork :

Individual submission.

Steps followed :

1. Download Ubuntu iso image from
   https://ubuntu.com/download/desktop

2. Download VMWare Fusion Pro from
   https://www.vmware.com/products/fusion/fusion-evaluation.html

3. Install VMware Fusion with license key.

4. Create a vm with ubuntu iso image.

5. Increase disk space of VM from default 20GB to at least 100GB.

6. Install git in ubuntu using
   sudo apt install git

7. Fork linux repo into github account.

8. Clone linux repo from VM.

9. Copy existing kernel config into another .config file to avoid manually configuration.

10. Install modules with
    make modules_install

11. Install various development tools.
    sudo apt-get install build-essential

12. Run command
    make
    Might give errors like missing modules - flex, bison, etc

13. Install flex, bison and other required modules.
    sudo apt-get install flex

14. Run command
    make
    Took 8 hours for completion.

15. Run the command
    sudo update-grub

16. Restart the VM and log into ubuntu.

17. Create a directory with name 283 and copy the starter code files.

18. Edit the cmpe283-1.c file to add code to query MSRs for features using
    gedit cmpe283-1.c

19. Compile the code using the command
    make

20. Find the .ko file using
    ls -al

21. Change into user mode using
    sudo bash

22. Load the module into kernel using

insmod cmpe283-1.ko

23. To see code output, run the command
    dmesg
24. To find the module again, use
    lsmod | grep cmpe

25. To delete the module use
    rmmod cmpe283_1

26. Run the command
    make

27. To see output again, run
    dmesg

28. Git commands to push:
    git add .
    git commit -m "Initial Commit"
    git push

Output :

[25951.090322] CMPE 283 Assignment 1 Module Start

[25951.090330] Pinbased Controls MSR: 0x0
[25951.090331] External-Interrupt Exiting: Can set=No, Can clear=Yes
[25951.090332] NMI Exiting: Can set=No, Can clear=Yes
[25951.090332] Virtual NMIs: Can set=No, Can clear=Yes
[25951.090333] Activate VMX Preemption Timer: Can set=No, Can clear=Yes
[25951.090333] Process Posted Interrupts: Can set=No, Can clear=Yes

[25951.090334] Primary Procbased Controls MSR: 0x0
[25951.090335] Interrupt-window exiting: Can set=No, Can clear=Yes
[25951.090335] Use TSC Offsetting: Can set=No, Can clear=Yes
[25951.090336] HLT Exiting: Can set=No, Can clear=Yes
[25951.090336] INVLPG Exiting: Can set=No, Can clear=Yes
[25951.090336] MWAIT Exiting: Can set=No, Can clear=Yes

[25951.090337] RDPMC Exiting: Can set=No, Can clear=Yes
[25951.090530] RDTSC Exiting: Can set=No, Can clear=Yes
[25951.090532] CR3-Load Exiting: Can set=No, Can clear=Yes
[25951.090533] CR3-Store Exiting: Can set=No, Can clear=Yes
[25951.090533] CR8-Load Exiting: Can set=No, Can clear=Yes
[25951.090534] CR8-Store Exiting: Can set=No, Can clear=Yes
[25951.090534] Use TPR Shadow: Can set=No, Can clear=Yes
[25951.090534] NMI-Window Exiting: Can set=No, Can clear=Yes
[25951.090535] MOV-DR Exiting: Can set=No, Can clear=Yes
[25951.090535] Unconditional I/O Exiting: Can set=No, Can clear=Yes
[25951.090536] Use I/O Bitmaps: Can set=No, Can clear=Yes
[25951.090536] Monitor Trap Flag: Can set=No, Can clear=Yes
[25951.090536] Use MSR Bitmaps: Can set=No, Can clear=Yes
[25951.090537] MONITOR Exiting: Can set=No, Can clear=Yes
[25951.090537] PAUSE Exiting: Can set=No, Can clear=Yes
[25951.090537] Activate Secondary Controls: Can set=No, Can clear=Yes

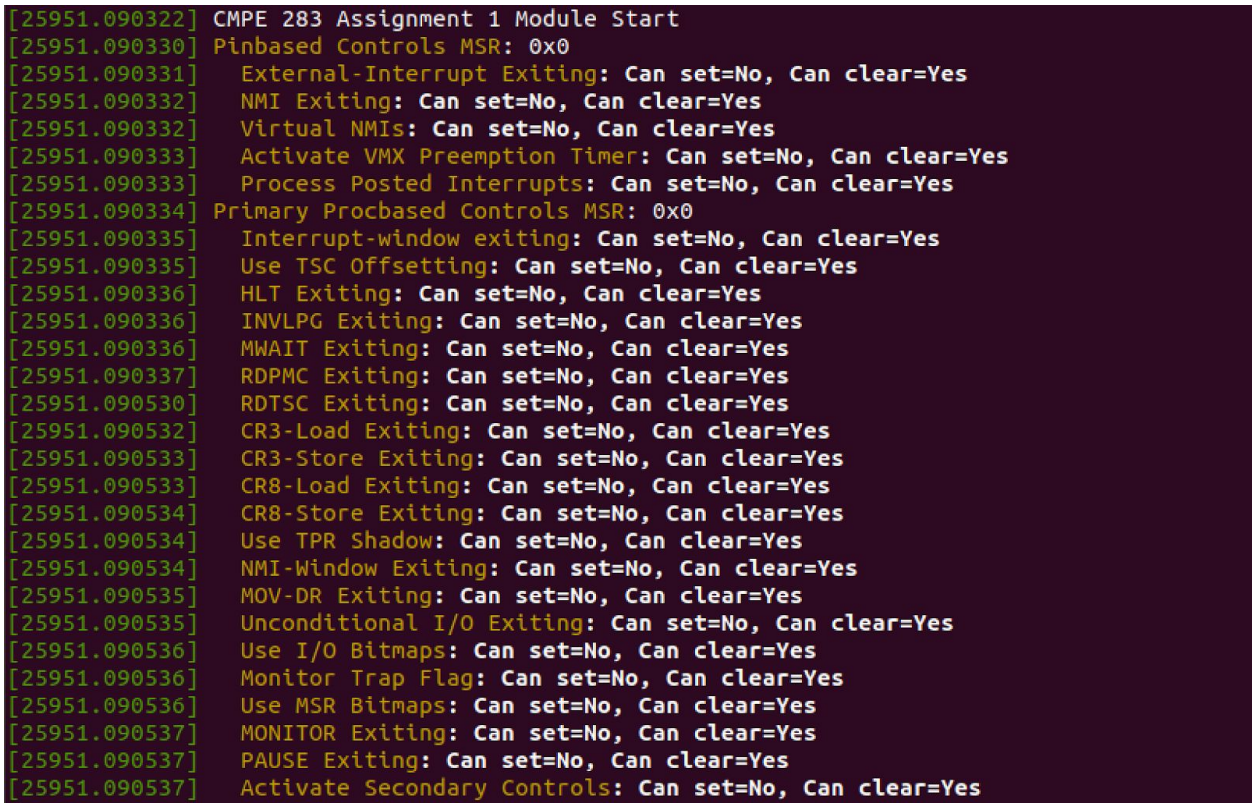
[25951.090539] Secondary Procbased Controls MSR: 0x0
[25951.090540] Virtualize APIC Accesses: Can set=No, Can clear=Yes
[25951.090540] Enable EPT: Can set=No, Can clear=Yes
[25951.090540] Descriptor-table Exiting: Can set=No, Can clear=Yes
[25951.090541] Enable RDTSCP: Can set=No, Can clear=Yes
[25951.090541] Virtualize x2APIC Mode: Can set=No, Can clear=Yes
[25951.090542] Enable VPID: Can set=No, Can clear=Yes
[25951.090542] WBINVD Exiting: Can set=No, Can clear=Yes
[25951.090542] Unrestricted Guest: Can set=No, Can clear=Yes
[25951.090543] APIC-register Virtualization: Can set=No, Can clear=Yes
[25951.090543] Virtual-interrupt Delivery: Can set=No, Can clear=Yes
[25951.090543] PAUSE-loop Exiting: Can set=No, Can clear=Yes
[25951.090544] RDRAND Exiting: Can set=No, Can clear=Yes
[25951.090544] Enable INVPCID: Can set=No, Can clear=Yes
[25951.090544] Enable VM Functions: Can set=No, Can clear=Yes
[25951.090545] VMCS Shadowing: Can set=No, Can clear=Yes
[25951.090545] Enable ENCLS Exiting: Can set=No, Can clear=Yes
[25951.090546] RDSEED Exiting: Can set=No, Can clear=Yes
[25951.090546] Enable PML: Can set=No, Can clear=Yes
[25951.090546] EPT-violation #VE: Can set=No, Can clear=Yes
[25951.090547] Conceal VMX From PT: Can set=No, Can clear=Yes
[25951.090547] Enable XSAVES/XRSTORS: Can set=No, Can clear=Yes

[25951.090547] Mode-based Execution Control for EPT: Can set=No, Can clear=Yes
[25951.090548] Sub-page write permissions for EPT: Can set=No, Can clear=Yes
[25951.090548] Intel PT uses guest physical addresses: Can set=No, Can clear=Yes
[25951.090549] Use TSC Scaling: Can set=No, Can clear=Yes
[25951.090549] Enable user wait and pause: Can set=No, Can clear=Yes
[25951.090549] Enable ENCLV exiting: Can set=No, Can clear=Yes

[25951.090550] Exit Controls MSR: 0x0
[25951.090551] Save Debug Controls: Can set=No, Can clear=Yes
[25951.090551] Host address-space size: Can set=No, Can clear=Yes
[25951.090551] Load IA32_PERF_GLOBAL_CTRL: Can set=No, Can clear=Yes
[25951.090552] Acknowledge interrupt: Can set=No, Can clear=Yes
[25951.090552] Save IA32_PAT: Can set=No, Can clear=Yes
[25951.090552] Load IA32_PAT: Can set=No, Can clear=Yes
[25951.090553] Save IA32_EFER: Can set=No, Can clear=Yes
[25951.090553] Load IA32_EFER: Can set=No, Can clear=Yes
[25951.090553] Save VMX Preemption Timer Value: Can set=No, Can clear=Yes
[25951.090554] Clear IA32_BNDCFGS: Can set=No, Can clear=Yes
[25951.090554] Conceal VMX from PT: Can set=No, Can clear=Yes
[25951.090555] Clear IA32_RTIT_CTL: Can set=No, Can clear=Yes
[25951.090555] Load CET state: Can set=No, Can clear=Yes

[25951.090556] Entry Controls MSR: 0x0
[25951.090556] Load Debug Controls: Can set=No, Can clear=Yes
[25951.090556] IA-32e mode guest: Can set=No, Can clear=Yes
[25951.090557] Entry to SMM: Can set=No, Can clear=Yes
[25951.090557] Deactivate dual-monitor treatment: Can set=No, Can clear=Yes
[25951.090557] Load IA32_PERF_GLOBAL_CTRL: Can set=No, Can clear=Yes
[25951.090607] Load IA32_PAT: Can set=No, Can clear=Yes
[25951.090608] Load IA32_EFER: Can set=No, Can clear=Yes
[25951.090608] Load IA32_BNDCFGS: Can set=No, Can clear=Yes
[25951.090608] Conceal VMX from PT: Can set=No, Can clear=Yes
[25951.090609] Load IA32_RTIT_CTL: Can set=No, Can clear=Yes
[25951.090609] Load CET state: Can set=No, Can clear=Yes

Screenshots :



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[25951.090539] Secondary Procbased Controls MSR: 0x0
[25951.090540]   Virtualize APIC Accesses: Can set=No, Can clear=Yes
[25951.090540]   Enable EPT: Can set=No, Can clear=Yes
[25951.090540]   Descriptor-table Exiting: Can set=No, Can clear=Yes
[25951.090541]   Enable RDTSCP: Can set=No, Can clear=Yes
[25951.090541]   Virtualize x2APIC Mode: Can set=No, Can clear=Yes
[25951.090542]   Enable VPID: Can set=No, Can clear=Yes
[25951.090542]   WBINVD Exiting: Can set=No, Can clear=Yes
[25951.090542]   Unrestricted Guest: Can set=No, Can clear=Yes
[25951.090543]   APIC-register Virtualization: Can set=No, Can clear=Yes
[25951.090543]   Virtual-interrupt Delivery: Can set=No, Can clear=Yes
[25951.090543]   PAUSE-loop Exiting: Can set=No, Can clear=Yes
[25951.090544]   RDRAND Exiting: Can set=No, Can clear=Yes
[25951.090544]   Enable INVPCID: Can set=No, Can clear=Yes
[25951.090544]   Enable VM Functions: Can set=No, Can clear=Yes
[25951.090545]   VMCS Shadowing: Can set=No, Can clear=Yes
[25951.090545]   Enable ENCLS Exiting: Can set=No, Can clear=Yes
[25951.090546]   RDSEED Exiting: Can set=No, Can clear=Yes
[25951.090546]   Enable PML: Can set=No, Can clear=Yes
[25951.090546]   EPT-violation #VE: Can set=No, Can clear=Yes
[25951.090547]   Conceal VMX From PT: Can set=No, Can clear=Yes
[25951.090547]   Enable XSAVES/XRSTORS: Can set=No, Can clear=Yes
[25951.090547]   Mode-based Execution Control for EPT: Can set=No, Can clear=Yes
[25951.090548]   Sub-page write permissions for EPT: Can set=No, Can clear=Yes
[25951.090548]   Intel PT uses guest physical addresses: Can set=No, Can clear=Yes
[25951.090549]   Use TSC Scaling: Can set=No, Can clear=Yes
[25951.090549]   Enable user wait and pause: Can set=No, Can clear=Yes
[25951.090549]   Enable ENCLV exiting: Can set=No, Can clear=Yes
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[25951.090550] Exit Controls MSR: 0x0
[25951.090551]   Save Debug Controls: Can set=No, Can clear=Yes
[25951.090551]   Host address-space size: Can set=No, Can clear=Yes
[25951.090551]   Load IA32_PERF_GLOBAL_CTRL: Can set=No, Can clear=Yes
[25951.090552]   Acknowledge interrupt: Can set=No, Can clear=Yes
[25951.090552]   Save IA32_PAT: Can set=No, Can clear=Yes
[25951.090552]   Load IA32_PAT: Can set=No, Can clear=Yes
[25951.090553]   Save IA32_EFER: Can set=No, Can clear=Yes
[25951.090553]   Load IA32_EFER: Can set=No, Can clear=Yes
[25951.090553]   Save VMX Preemption Timer Value: Can set=No, Can clear=Yes
[25951.090554]   Clear IA32_BNDCFGS: Can set=No, Can clear=Yes
[25951.090554]   Conceal VMX from PT: Can set=No, Can clear=Yes
[25951.090555]   Clear IA32_RTIT_CTL: Can set=No, Can clear=Yes
[25951.090555]   Load CET state: Can set=No, Can clear=Yes
[25951.090556] Entry Controls MSR: 0x0
[25951.090556]   Load Debug Controls: Can set=No, Can clear=Yes
[25951.090556]   IA-32e mode guest: Can set=No, Can clear=Yes
[25951.090557]   Entry to SMM: Can set=No, Can clear=Yes
[25951.090557]   Deactivate dual-monitor treatment: Can set=No, Can clear=Yes
[25951.090557]   Load IA32_PERF_GLOBAL_CTRL: Can set=No, Can clear=Yes
[25951.090607]   Load IA32_PAT: Can set=No, Can clear=Yes
[25951.090608]   Load IA32_EFER: Can set=No, Can clear=Yes
[25951.090608]   Load IA32_BNDCFGS: Can set=No, Can clear=Yes
[25951.090608]   Conceal VMX from PT: Can set=No, Can clear=Yes
[25951.090609]   Load IA32_RTIT_CTL: Can set=No, Can clear=Yes
[25951.090609]   Load CET state: Can set=No, Can clear=Yes
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