LINUX OPERATING SYSTEM
CS-1446
Assignment-1
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Compiling and Installing Linux Kernel 4.20.12 from the source code

Commands used

The commands that were used in compiling and installing the Linux kernel 4.20.12 are as follows:

1. **To download the kernel:** aria2c -x 16 https://cdn.kernel.org/pub/linux/kernel/v4.x/linux-4.20.12.tar.xz
2. **To unzip the tarbal:** tar -xJf linux-4.20.12.tar.xz
3. cd linux-4.20.12
4. cp -v /boot/config-$(uname -r) .config
5. **To remove the "libncurses not found" error(Screenshot provided):** sudo apt install libncurses5-dev libncursesw5-dev (To install ncurses lib)
6. **To tweak the kernel:** make menuconfig
7. **To remove the "libelf not found" error(Screenshot provided):** sudo apt install libelf-dev
8. **To remove the "Could not locate module openssl.h"(Screenshot provided):** sudo apt install libssl-dev
9. **Multithreaded make:** make -j $(nproc)
10. sudo make modules_install
11. sudo make install
12. reboot
13. **Checking if the kernel was installed correctly:** uname -mrs

Output of lspci -vv

```
00:00.0 Host bridge: Intel Corporation 2nd Generation Core Processor Family DRAM
Controller (rev 09)
          Subsystem: Hewlett-Packard Company 2nd Generation Core Processor
Family DRAM Controller
          Control: I/O- Mem+ BusMaster+ SpecCycle- MemWINV- VGASnoop- ParErr-
Stepping- SERR+ FastB2B- DisINTx-
          Status: Cap+ 66MHz- UDF- FastB2B+ ParErr- DEVSEL=fast >TAbort-
<TAbort- <MAbort+ >SERR- <PERR- INTx-
          Latency: 0
          Capabilities: <access denied>
          Kernel driver in use: snb_uncore
```

```
00:02.0 VGA compatible controller: Intel Corporation 2nd Generation Core
Processor Family Integrated Graphics Controller (rev 09) (prog-if 00 [VGA
controller])
            DeviceName:  Onboard IGD
            Subsystem: Hewlett-Packard Company 2nd Generation Core Processor
Family Integrated Graphics Controller
            Control: I/O+ Mem+ BusMaster+ SpecCycle- MemWINV- VGASnoop- ParErr-
Stepping- SERR- FastB2B- DisINTx+
            Status: Cap+ 66MHz- UDF- FastB2B+ ParErr- DEVSEL=fast >TAbort-
<TAbort- <MAbort- >SERR- <PERR- INTx-
            Latency: 0
            Interrupt: pin A routed to IRQ 30
            Region 0: Memory at fe000000 (64-bit, non-prefetchable) [size=4M]
            Region 2: Memory at d0000000 (64-bit, prefetchable) [size=256M]
            Region 4: I/O ports at f000 [size=64]
            [virtual] Expansion ROM at 000c0000 [disabled] [size=128K]
            Capabilities: <access denied>
            Kernel driver in use: i915
            Kernel modules: i915

00:16.0 Communication controller: Intel Corporation 6 Series/C200 Series Chipset
Family MEI Controller #1 (rev 04)
            Subsystem: Hewlett-Packard Company 6 Series/C200 Series Chipset
Family MEI Controller
            Control: I/O- Mem+ BusMaster+ SpecCycle- MemWINV- VGASnoop- ParErr-
Stepping- SERR- FastB2B- DisINTx+
            Status: Cap+ 66MHz- UDF- FastB2B- ParErr- DEVSEL=fast >TAbort-
<TAbort- <MAbort- >SERR- <PERR- INTx-
            Latency: 0
            Interrupt: pin A routed to IRQ 31
            Region 0: Memory at fe42a000 (64-bit, non-prefetchable) [size=16]
            Capabilities: <access denied>
            Kernel driver in use: mei_me
            Kernel modules: mei_me

00:16.3 Serial controller: Intel Corporation 6 Series/C200 Series Chipset Family
KT Controller (rev 04) (prog-if 02 [16550])
            Subsystem: Hewlett-Packard Company 6 Series/C200 Series Chipset
```

```
Family KT Controller
          Control: I/O+ Mem+ BusMaster- SpecCycle- MemWINV- VGASnoop- ParErr-
Stepping- SERR- FastB2B- DisINTx-
          Status: Cap+ 66MHz+ UDF- FastB2B+ ParErr- DEVSEL=fast >TAbort-
<TAbort- <MAbort- >SERR- <PERR- INTx-
          Interrupt: pin B routed to IRQ 17
          Region 0: I/O ports at f0e0 [size=8]
          Region 1: Memory at fe429000 (32-bit, non-prefetchable) [size=4K]
          Capabilities: <access denied>
          Kernel driver in use: serial

00:19.0 Ethernet controller: Intel Corporation 82579LM Gigabit Network
Connection (Lewisville) (rev 04)
          DeviceName:  Onboard LAN
          Subsystem: Hewlett-Packard Company 82579LM Gigabit Network Connection
          Control: I/O+ Mem+ BusMaster+ SpecCycle- MemWINV- VGASnoop- ParErr-
Stepping- SERR+ FastB2B- DisINTx+
          Status: Cap+ 66MHz- UDF- FastB2B- ParErr- DEVSEL=fast >TAbort-
<TAbort- <MAbort- >SERR- <PERR- INTx-
          Latency: 0
          Interrupt: pin A routed to IRQ 29
          Region 0: Memory at fe400000 (32-bit, non-prefetchable) [size=128K]
          Region 1: Memory at fe428000 (32-bit, non-prefetchable) [size=4K]
          Region 2: I/O ports at f080 [size=32]
          Capabilities: <access denied>
          Kernel driver in use: e1000e
          Kernel modules: e1000e

00:1a.0 USB controller: Intel Corporation 6 Series/C200 Series Chipset Family
USB Enhanced Host Controller #2 (rev 04) (prog-if 20 [EHCI])
          Subsystem: Hewlett-Packard Company 6 Series/C200 Series Chipset
Family USB Enhanced Host Controller
          Control: I/O- Mem+ BusMaster+ SpecCycle- MemWINV- VGASnoop- ParErr-
Stepping- SERR+ FastB2B- DisINTx-
          Status: Cap+ 66MHz- UDF- FastB2B+ ParErr- DEVSEL=medium >TAbort-
<TAbort- <MAbort- >SERR- <PERR- INTx-
          Latency: 0
          Interrupt: pin A routed to IRQ 16
          Region 0: Memory at fe427000 (32-bit, non-prefetchable) [size=1K]
```

```
            Capabilities: <access denied>
            Kernel driver in use: ehci-pci

00:1b.0 Audio device: Intel Corporation 6 Series/C200 Series Chipset Family High
Definition Audio Controller (rev 04)
            Subsystem: Hewlett-Packard Company 6 Series/C200 Series Chipset
Family High Definition Audio Controller
            Control: I/O- Mem+ BusMaster+ SpecCycle- MemWINV- VGASnoop- ParErr-
Stepping- SERR+ FastB2B- DisINTx+
            Status: Cap+ 66MHz- UDF- FastB2B- ParErr- DEVSEL=fast >TAbort-
<TAbort- <MAbort- >SERR- <PERR- INTx-
            Latency: 0, Cache Line Size: 64 bytes
            Interrupt: pin A routed to IRQ 32
            Region 0: Memory at fe420000 (64-bit, non-prefetchable) [size=16K]
            Capabilities: <access denied>
            Kernel driver in use: snd_hda_intel
            Kernel modules: snd_hda_intel

00:1c.0 PCI bridge: Intel Corporation 6 Series/C200 Series Chipset Family PCI
Express Root Port 1 (rev b4) (prog-if 00 [Normal decode])
            Control: I/O+ Mem+ BusMaster+ SpecCycle- MemWINV- VGASnoop- ParErr-
Stepping- SERR+ FastB2B- DisINTx+
            Status: Cap+ 66MHz- UDF- FastB2B- ParErr- DEVSEL=fast >TAbort-
<TAbort- <MAbort- >SERR- <PERR- INTx-
            Latency: 0, Cache Line Size: 64 bytes
            Interrupt: pin A routed to IRQ 24
            Bus: primary=00, secondary=01, subordinate=01, sec-latency=0
            Secondary status: 66MHz- FastB2B- ParErr- DEVSEL=fast >TAbort-
<TAbort- <MAbort+ <SERR- <PERR-
            BridgeCtl: Parity- SERR+ NoISA- VGA- MAbort- >Reset- FastB2B-
            PriDiscTmr- SecDiscTmr- DiscTmrStat- DiscTmrSERREn-
            Capabilities: <access denied>
            Kernel driver in use: pcieport

00:1c.4 PCI bridge: Intel Corporation 6 Series/C200 Series Chipset Family PCI
Express Root Port 5 (rev b4) (prog-if 00 [Normal decode])
            Control: I/O+ Mem+ BusMaster+ SpecCycle- MemWINV- VGASnoop- ParErr-
Stepping- SERR+ FastB2B- DisINTx+
            Status: Cap+ 66MHz- UDF- FastB2B- ParErr- DEVSEL=fast >TAbort-
```

```
<TAbort- <MAbort- >SERR- <PERR- INTx-
        Latency: 0, Cache Line Size: 64 bytes
        Interrupt: pin A routed to IRQ 25
        Bus: primary=00, secondary=02, subordinate=02, sec-latency=0
        Secondary status: 66MHz- FastB2B- ParErr- DEVSEL=fast >TAbort-
<TAbort- <MAbort+ <SERR- <PERR-
        BridgeCtl: Parity- SERR+ NoISA- VGA- MAbort- >Reset- FastB2B-
        PriDiscTmr- SecDiscTmr- DiscTmrStat- DiscTmrSERREn-
        Capabilities: <access denied>
        Kernel driver in use: pcieport

00:1c.6 PCI bridge: Intel Corporation 6 Series/C200 Series Chipset Family PCI
Express Root Port 7 (rev b4) (prog-if 00 [Normal decode])
        Control: I/O+ Mem+ BusMaster+ SpecCycle- MemWINV- VGASnoop- ParErr-
Stepping- SERR+ FastB2B- DisINTx+
        Status: Cap+ 66MHz- UDF- FastB2B- ParErr- DEVSEL=fast >TAbort-
<TAbort- <MAbort- >SERR- <PERR- INTx-
        Latency: 0, Cache Line Size: 64 bytes
        Interrupt: pin C routed to IRQ 26
        Bus: primary=00, secondary=03, subordinate=03, sec-latency=0
        Secondary status: 66MHz- FastB2B- ParErr- DEVSEL=fast >TAbort-
<TAbort- <MAbort+ <SERR- <PERR-
        BridgeCtl: Parity- SERR+ NoISA- VGA- MAbort- >Reset- FastB2B-
        PriDiscTmr- SecDiscTmr- DiscTmrStat- DiscTmrSERREn-
        Capabilities: <access denied>
        Kernel driver in use: pcieport

00:1c.7 PCI bridge: Intel Corporation 6 Series/C200 Series Chipset Family PCI
Express Root Port 8 (rev b4) (prog-if 00 [Normal decode])
        Control: I/O+ Mem+ BusMaster+ SpecCycle- MemWINV- VGASnoop- ParErr-
Stepping- SERR+ FastB2B- DisINTx+
        Status: Cap+ 66MHz- UDF- FastB2B- ParErr- DEVSEL=fast >TAbort-
<TAbort- <MAbort- >SERR- <PERR- INTx-
        Latency: 0, Cache Line Size: 64 bytes
        Interrupt: pin D routed to IRQ 27
        Bus: primary=00, secondary=04, subordinate=04, sec-latency=0
        Secondary status: 66MHz- FastB2B- ParErr- DEVSEL=fast >TAbort-
<TAbort- <MAbort+ <SERR- <PERR-
        BridgeCtl: Parity- SERR+ NoISA- VGA- MAbort- >Reset- FastB2B-
```

```
            PriDiscTmr- SecDiscTmr- DiscTmrStat- DiscTmrSERREn-
            Capabilities: <access denied>
            Kernel driver in use: pcieport


00:1d.0 USB controller: Intel Corporation 6 Series/C200 Series Chipset Family
USB Enhanced Host Controller #1 (rev 04) (prog-if 20 [EHCI])
            Subsystem: Hewlett-Packard Company 6 Series/C200 Series Chipset
Family USB Enhanced Host Controller
            Control: I/O- Mem+ BusMaster+ SpecCycle- MemWINV- VGASnoop- ParErr-
Stepping- SERR+ FastB2B- DisINTx-
            Status: Cap+ 66MHz- UDF- FastB2B+ ParErr- DEVSEL=medium >TAbort-
<TAbort- <MAbort- >SERR- <PERR- INTx-
            Latency: 0
            Interrupt: pin A routed to IRQ 23
            Region 0: Memory at fe426000 (32-bit, non-prefetchable) [size=1K]
            Capabilities: <access denied>
            Kernel driver in use: ehci-pci


00:1e.0 PCI bridge: Intel Corporation 82801 PCI Bridge (rev a4) (prog-if 01
[Subtractive decode])
            Control: I/O+ Mem+ BusMaster+ SpecCycle- MemWINV- VGASnoop- ParErr-
Stepping- SERR+ FastB2B- DisINTx-
            Status: Cap+ 66MHz- UDF- FastB2B- ParErr- DEVSEL=fast >TAbort-
<TAbort- <MAbort- >SERR- <PERR- INTx-
            Latency: 0
            Bus: primary=00, secondary=05, subordinate=05, sec-latency=32
            Secondary status: 66MHz- FastB2B+ ParErr- DEVSEL=medium >TAbort-
<TAbort- <MAbort+ <SERR- <PERR-
            BridgeCtl: Parity- SERR+ NoISA- VGA- MAbort- >Reset- FastB2B-
            PriDiscTmr- SecDiscTmr- DiscTmrStat- DiscTmrSERREn-
            Capabilities: <access denied>

00:1f.0 ISA bridge: Intel Corporation Q65 Express Chipset LPC Controller (rev
04)
            Subsystem: Hewlett-Packard Company Q65 Express Chipset Family LPC
Controller
            Control: I/O+ Mem+ BusMaster+ SpecCycle- MemWINV- VGASnoop- ParErr-
Stepping- SERR+ FastB2B- DisINTx-
            Status: Cap+ 66MHz- UDF- FastB2B- ParErr- DEVSEL=medium >TAbort-
```

```
<TAbort- <MAbort- >SERR- <PERR- INTx-
            Latency: 0
            Capabilities: <access denied>
            Kernel driver in use: lpc_ich
            Kernel modules: lpc_ich


00:1f.2 SATA controller: Intel Corporation 6 Series/C200 Series Chipset Family 6
port Desktop SATA AHCI Controller (rev 04) (prog-if 01 [AHCI 1.0])
            Subsystem: Hewlett-Packard Company 6 Series/C200 Series Chipset
Family SATA AHCI Controller
            Control: I/O+ Mem+ BusMaster+ SpecCycle- MemWINV- VGASnoop- ParErr-
Stepping- SERR- FastB2B- DisINTx+
            Status: Cap+ 66MHz+ UDF- FastB2B+ ParErr- DEVSEL=medium >TAbort-
<TAbort- <MAbort- >SERR- <PERR- INTx-
            Latency: 0
            Interrupt: pin B routed to IRQ 28
            Region 0: I/O ports at f0d0 [size=8]
            Region 1: I/O ports at f0c0 [size=4]
            Region 2: I/O ports at f0b0 [size=8]
            Region 3: I/O ports at f0a0 [size=4]
            Region 4: I/O ports at f060 [size=32]
            Region 5: Memory at fe425000 (32-bit, non-prefetchable) [size=2K]
            Capabilities: <access denied>
            Kernel driver in use: ahci
            Kernel modules: ahci


00:1f.3 SMBus: Intel Corporation 6 Series/C200 Series Chipset Family SMBus
Controller (rev 04)
            Subsystem: Hewlett-Packard Company 6 Series/C200 Series Chipset
Family SMBus Controller
            Control: I/O+ Mem- BusMaster- SpecCycle- MemWINV- VGASnoop- ParErr-
Stepping- SERR+ FastB2B- DisINTx-
            Status: Cap- 66MHz- UDF- FastB2B+ ParErr- DEVSEL=medium >TAbort-
<TAbort- <MAbort- >SERR- <PERR- INTx-
            Interrupt: pin C routed to IRQ 10
            Region 0: Memory at fe424000 (64-bit, non-prefetchable) [disabled]
[size=256]
            Region 4: I/O ports at f040 [size=32]
            Kernel modules: i2c_i801
```

Output of lsmod

```
Module                   Size  Used by
intel_rapl              28672  0
x86_pkg_temp_thermal    20480  0
intel_powerclamp        20480  0
coretemp                20480  0
gpio_ich                16384  0
snd_hda_codec_hdmi      61440  1
kvm                    737280  0
snd_hda_codec_realtek  122880  1
snd_hda_codec_generic   90112  1 snd_hda_codec_realtek
snd_hda_intel           49152  3
snd_hda_codec          155648  4
snd_hda_codec_generic,snd_hda_codec_hdmi,snd_hda_intel,snd_hda_codec_realtek
irqbypass               16384  1 kvm
snd_hda_core            98304  5
snd_hda_codec_generic,snd_hda_codec_hdmi,snd_hda_intel,snd_hda_codec,snd_hda_cod
ec_realtek
crct10dif_pclmul        16384  1
crc32_pclmul            16384  0
snd_hwdep               16384  1 snd_hda_codec
ghash_clmulni_intel     16384  0
snd_pcm                118784  4
snd_hda_codec_hdmi,snd_hda_intel,snd_hda_codec,snd_hda_core
input_leds              16384  0
aesni_intel            200704  0
snd_seq_midi            20480  0
snd_seq_midi_event      16384  1 snd_seq_midi
aes_x86_64              20480  1 aesni_intel
snd_rawmidi             45056  1 snd_seq_midi
crypto_simd             16384  1 aesni_intel
snd_seq                 86016  2 snd_seq_midi,snd_seq_midi_event
cryptd                  28672  3 crypto_simd,ghash_clmulni_intel,aesni_intel
cdc_acm                 36864  2
glue_helper             16384  1 aesni_intel
snd_seq_device          16384  3 snd_seq,snd_seq_midi,snd_rawmidi
wmi_bmof                16384  0
hp_wmi                  16384  0
```

```
snd_timer                40960  2 snd_seq,snd_pcm
sparse_keymap            16384  1 hp_wmi
snd                      98304  17
snd_hda_codec_generic,snd_seq,snd_seq_device,snd_hda_codec_hdmi,snd_hwdep,snd_hd
a_intel,snd_hda_codec,snd_hda_codec_realtek,snd_timer,snd_pcm,snd_rawmidi
serio_raw                20480  0
soundcore                16384  1 snd
mei_me                   45056  0
mei                     114688  1 mei_me
tpm_infineon             20480  0
lpc_ich                  28672  0
mac_hid                  16384  0
parport_pc               36864  0
ppdev                    24576  0
lp                       20480  0
parport                  61440  3 parport_pc,lp,ppdev
autofs4                  53248  2
hid_generic              16384  0
usbhid                   61440  0
hid                     143360  2 usbhid,hid_generic
i915                   1757184  5
video                    49152  1 i915
i2c_algo_bit             16384  1 i915
drm_kms_helper          200704  1 i915
syscopyarea              16384  1 drm_kms_helper
sysfillrect              16384  1 drm_kms_helper
sysimgblt                16384  1 drm_kms_helper
fb_sys_fops              16384  1 drm_kms_helper
drm                     487424  6 drm_kms_helper,i915
e1000e                  282624  0
psmouse                 172032  0
ahci                     40960  3
libahci                  40960  1 ahci
wmi                      32768  2 hp_wmi,wmi_bmof
```

Contents of /proc/cpuinfo

```
processor   : 0
vendor_id   : GenuineIntel
```

```
cpu family : 6
model      : 42
model name : Intel(R) Core(TM) i5-2400 CPU @ 3.10GHz
stepping   : 7
microcode  : 0x2e
cpu MHz         : 1606.439
cache size : 6144 KB
physical id     : 0
siblings   : 4
core id         : 0
cpu cores  : 4
apicid          : 0
initial apicid  : 0
fpu         : yes
fpu_exception   : yes
cpuid level     : 13
wp          : yes
flags       : fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat
pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx rdtscp lm
constant_tsc arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid
aperfmperf pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 cx16 xtpr
pdcm pcid sse4_1 sse4_2 x2apic popcnt tsc_deadline_timer aes xsave avx lahf_lm
epb pti ssbd ibrs ibpb stibp tpr_shadow vnmi flexpriority ept vpid xsaveopt
dtherm ida arat pln pts flush_l1d
bugs        : cpu_meltdown spectre_v1 spectre_v2 spec_store_bypass l1tf
bogomips    : 6186.22
clflush size    : 64
cache_alignment : 64
address sizes   : 36 bits physical, 48 bits virtual
power management:

processor  : 1
vendor_id  : GenuineIntel
cpu family : 6
model      : 42
model name : Intel(R) Core(TM) i5-2400 CPU @ 3.10GHz
stepping   : 7
microcode  : 0x2e
cpu MHz         : 1640.772
```

```
cache size : 6144 KB
physical id     : 0
siblings   : 4
core id         : 1
cpu cores  : 4
apicid          : 2
initial apicid  : 2
fpu         : yes
fpu_exception   : yes
cpuid level     : 13
wp          : yes
flags       : fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat
pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx rdtscp lm
constant_tsc arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid
aperfmperf pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 cx16 xtpr
pdcm pcid sse4_1 sse4_2 x2apic popcnt tsc_deadline_timer aes xsave avx lahf_lm
epb pti ssbd ibrs ibpb stibp tpr_shadow vnmi flexpriority ept vpid xsaveopt
dtherm ida arat pln pts flush_l1d
bugs        : cpu_meltdown spectre_v1 spectre_v2 spec_store_bypass l1tf
bogomips   : 6186.22
clflush size    : 64
cache_alignment : 64
address sizes   : 36 bits physical, 48 bits virtual
power management:

processor  : 2
vendor_id  : GenuineIntel
cpu family : 6
model      : 42
model name : Intel(R) Core(TM) i5-2400 CPU @ 3.10GHz
stepping   : 7
microcode  : 0x2e
cpu MHz         : 1612.910
cache size : 6144 KB
physical id     : 0
siblings   : 4
core id         : 2
cpu cores  : 4
apicid          : 4
```

```
initial apicid  : 4
fpu            : yes
fpu_exception   : yes
cpuid level     : 13
wp             : yes
flags         : fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat
pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx rdtscp lm
constant_tsc arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid
aperfmperf pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 cx16 xtpr
pdcm pcid sse4_1 sse4_2 x2apic popcnt tsc_deadline_timer aes xsave avx lahf_lm
epb pti ssbd ibrs ibpb stibp tpr_shadow vnmi flexpriority ept vpid xsaveopt
dtherm ida arat pln pts flush_l1d
bugs          : cpu_meltdown spectre_v1 spectre_v2 spec_store_bypass l1tf
bogomips   : 6186.22
clflush size     : 64
cache_alignment : 64
address sizes    : 36 bits physical, 48 bits virtual
power management:

processor  : 3
vendor_id  : GenuineIntel
cpu family : 6
model      : 42
model name : Intel(R) Core(TM) i5-2400 CPU @ 3.10GHz
stepping   : 7
microcode  : 0x2e
cpu MHz        : 1711.212
cache size : 6144 KB
physical id     : 0
siblings   : 4
core id        : 3
cpu cores  : 4
apicid         : 6
initial apicid  : 6
fpu            : yes
fpu_exception   : yes
cpuid level     : 13
wp             : yes
flags         : fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat
```

```
pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx rdtscp lm
constant_tsc arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid
aperfmperf pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 cx16 xtpr
pdcm pcid sse4_1 sse4_2 x2apic popcnt tsc_deadline_timer aes xsave avx lahf_lm
epb pti ssbd ibrs ibpb stibp tpr_shadow vnmi flexpriority ept vpid xsaveopt
dtherm ida arat pln pts flush_l1d
bugs        : cpu_meltdown spectre_v1 spectre_v2 spec_store_bypass l1tf
bogomips    : 6186.22
clflush size     : 64
cache_alignment : 64
address sizes    : 36 bits physical, 48 bits virtual
power management:
```

Contents of /proc/meminfo

```
MemTotal:        3921868 kB
MemFree:          946536 kB
MemAvailable:    1733856 kB
Buffers:          100704 kB
Cached:          1213436 kB
SwapCached:            0 kB
Active:          1937760 kB
Inactive:         836976 kB
Active(anon):    1463116 kB
Inactive(anon):   349400 kB
Active(file):     474644 kB
Inactive(file):   487576 kB
Unevictable:          96 kB
Mlocked:              96 kB
SwapTotal:       4078588 kB
SwapFree:        4078588 kB
Dirty:              5408 kB
Writeback:             0 kB
AnonPages:       1460756 kB
Mapped:           465352 kB
Shmem:            351924 kB
KReclaimable:      54684 kB
Slab:              92380 kB
```

```
SReclaimable:        54684 kB
SUnreclaim:          37696 kB
KernelStack:         10528 kB
PageTables:          49944 kB
NFS_Unstable:            0 kB
Bounce:                  0 kB
WritebackTmp:            0 kB
CommitLimit:       6039520 kB
Committed_AS:      7984720 kB
VmallocTotal:   34359738367 kB
VmallocUsed:             0 kB
VmallocChunk:            0 kB
Percpu:                912 kB
HardwareCorrupted:       0 kB
AnonHugePages:        2048 kB
ShmemHugePages:          0 kB
ShmemPmdMapped:          0 kB
CmaTotal:                0 kB
CmaFree:                 0 kB
HugePages_Total:         0
HugePages_Free:          0
HugePages_Rsvd:          0
HugePages_Surp:          0
Hugepagesize:         2048 kB
Hugetlb:                 0 kB
DirectMap4k:        176552 kB
DirectMap2M:       3903488 kB
```

Errors encountered

Fig: Could not find ncurses package error

Fig: Libelf error

```
HOSTLD    scripts/genksyms/genksyms
HOSTCC    scripts/mod/sumversion.o
UPD       scripts/mod/devicetable-offsets.h
HOSTCC    scripts/selinux/genheaders/genheaders
HOSTCC    scripts/selinux/mdp/mdp
HOSTCC    scripts/bin2c
HOSTCC    scripts/kallsyms
HOSTCC    scripts/conmakehash
HOSTCC    scripts/mod/file2alias.o
HOSTCC    scripts/recordmcount
HOSTCC    scripts/sortextable
HOSTLD    scripts/mod/modpost
HOSTCC    scripts/asn1_compiler
HOSTCC    scripts/sign-file
scripts/sign-file.c:25:30: fatal error: openssl/opensslv.h: No such file or dire
ctory
compilation terminated.
scripts/Makefile.host:90: recipe for target 'scripts/sign-file' failed
make[1]: *** [scripts/sign-file] Error 1
make[1]: *** Waiting for unfinished jobs....
Makefile:1073: recipe for target 'scripts' failed
make: *** [scripts] Error 2
make: *** Waiting for unfinished jobs....
mrinmay@CS-1443:~/linux-4.20.12$ sudo apt-get install libssl-dev
```

Fig: Could not find openssl/opensslv.h error

```
  DEPMOD  4.20.12
mrinmay@CS-1443:~/linux-4.20.12$ sudo make install
sh ./arch/x86/boot/install.sh 4.20.12 arch/x86/boot/bzImage \
        System.map "/boot"
run-parts: executing /etc/kernel/postinst.d/apt-auto-removal 4.20.12 /boot/vmlin
uz-4.20.12
run-parts: executing /etc/kernel/postinst.d/initramfs-tools 4.20.12 /boot/vmlinu
z-4.20.12
update-initramfs: Generating /boot/initrd.img-4.20.12
W: Possible missing firmware /lib/firmware/i915/skl_dmc_ver1_27.bin for module i
915
W: Possible missing firmware /lib/firmware/i915/kbl_dmc_ver1_04.bin for module i
915
W: Possible missing firmware /lib/firmware/i915/cnl_dmc_ver1_07.bin for module i
915
W: Possible missing firmware /lib/firmware/i915/icl_dmc_ver1_07.bin for module i
915
W: Possible missing firmware /lib/firmware/i915/kbl_guc_ver9_39.bin for module i
915
W: Possible missing firmware /lib/firmware/i915/bxt_guc_ver9_29.bin for module i
915
W: Possible missing firmware /lib/firmware/i915/skl_guc_ver9_33.bin for module i
915
```

Fig: Warnings