Computer Architecture and Operating Systems - Monsoon 2019

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2018356

Assignment 0 - Part 1(Linux Kernel Complication)

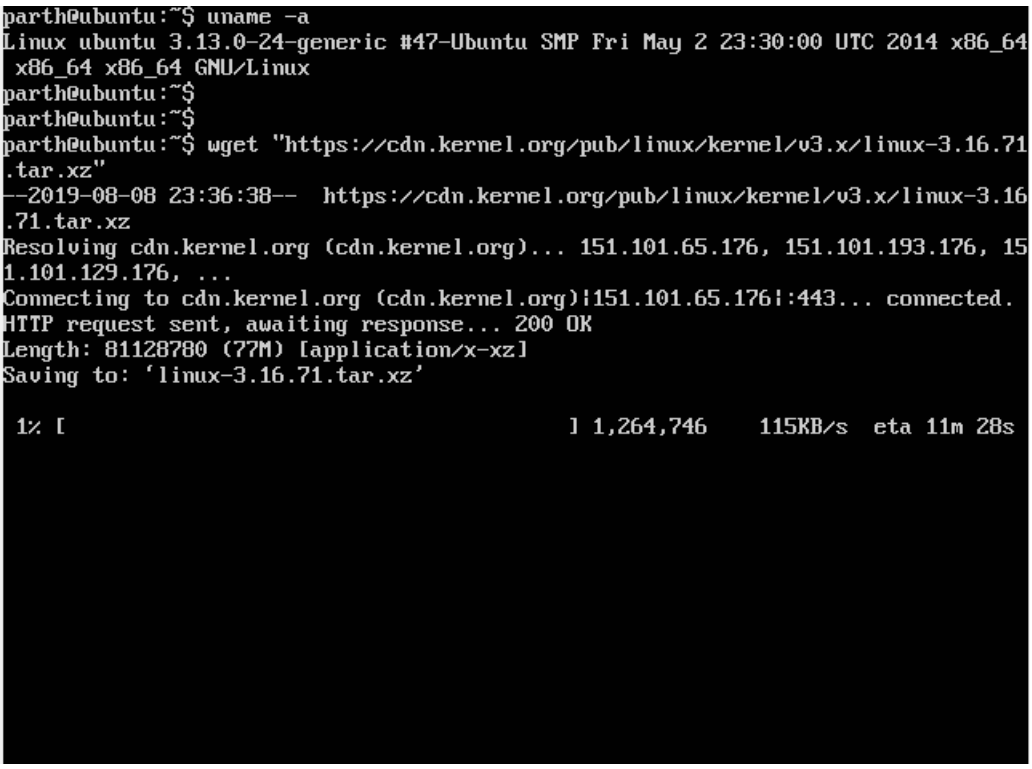
- First step was just to download VirtualBox latest version from https://www.virtualbox.org/. So after downloading this we download Ubuntu 14.10 server iso file from its official site.
- After setting up the virtual machine the we run it. To check the system information, we use uname -a.

```
• uname -a → prints the system information
```

Then we download the kernel from the given link mentioned in code.

```
wget - The non-interactive network downloader
```

- The download starts. Kernel is downloading.



- Just to verify the kernel has been downloaded we just type ls to see kernel source.

```
ls — lists directory contents
```

```
parth@ubuntu:~$ uname -a
Linux ubuntu 3.13.0-24-generic #47-Ubuntu SMP Fri May 2 23:30:00 UTC 2014 x86_64
 x86_64 x86_64 GNU/Linux
parth@ubuntu:~$
parth@ubuntu:~$
parth@ubuntu:~$ wget "https://cdn.kernel.org/pub/linux/kernel/v3.x/linux-3.16.71
.tar.xz"
--2019-08-08 23:36:38--  https://cdn.kernel.org/pub/linux/kernel/v3.x/linux-3.16
.71.tar.xz
Resolving cdn.kernel.org (cdn.kernel.org)... 151.101.65.176, 151.101.193.176, 15
1.101.129.176, ...
Connecting to cdn.kernel.org (cdn.kernel.org)|151.101.65.176|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 81128780 (77M) [application/x-xz]
Saving to: 'linux-3.16.71.tar.xz'

100%[======================================>] 81,128,780   116KB/s   in 11m 32s

2019-08-08 23:48:12 (114 KB/s) - 'linux-3.16.71.tar.xz' saved [81128780/81128780
]

parth@ubuntu:~$  ls
linux-3.16.71.tar.xz
parth@ubuntu:~$ _
```

- Now we need to unzip the source file.

- tar xf -The GNU version of the tar archiving utility
- Here x is for extract from archive and f is for use the archive file.

```
parth@ubuntu:~$ uname -a
Linux ubuntu 3.13.0-24-generic #47-Ubuntu SMP Fri May 2 23:30:00 UTC 2014 x86_64
 x86_64 x86_64 GNU/Linux
parth@ubuntu:~$
parth@ubuntu:~$
parth@ubuntu:~$ wget "https://cdn.kernel.org/pub/linux/kernel/v3.x/linux-3.16.71
.tar.xz"
--2019-08-08 23:36:38--  https://cdn.kernel.org/pub/linux/kernel/v3.x/linux-3.16
.71.tar.xz
Resolving cdn.kernel.org (cdn.kernel.org)... 151.101.65.176, 151.101.193.176, 15
1.101.129.176, ...
Connecting to cdn.kernel.org (cdn.kernel.org)|151.101.65.176|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 81128780 (77M) [application/x-xz]
Saving to: 'linux-3.16.71.tar.xz'

100%[======================================>] 81,128,780   116KB/s   in 11m 32s

2019-08-08 23:48:12 (114 KB/s) - 'linux-3.16.71.tar.xz' saved [81128780/81128780
]

parth@ubuntu:~$  ls
linux-3.16.71.tar.xz
parth@ubuntu:~$ tar xf linux-3.16.71.tar.xz
parth@ubuntu:~$ ls
linux-3.16.71  linux-3.16.71.tar.xz
parth@ubuntu:~$
```

- We are copying the .config file.

- cp – copies file and directories

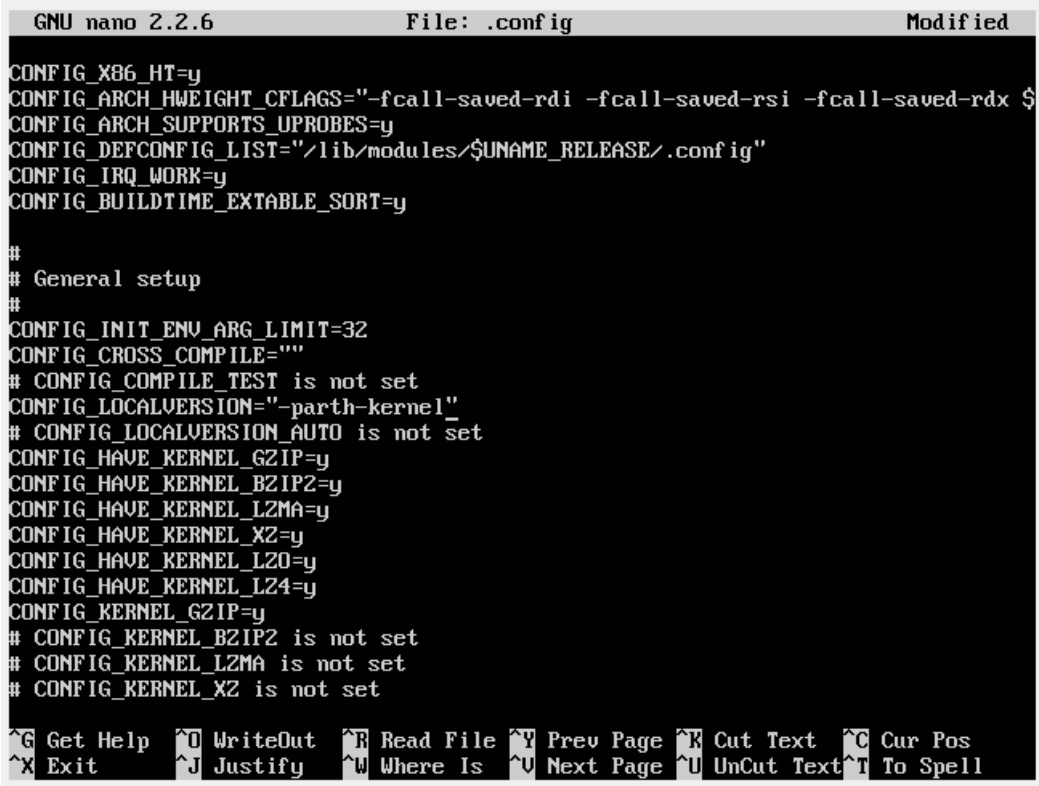
```
parth@ubuntu:~$ uname -r
3.13.0-24-generic
parth@ubuntu:~$ cd /usr/src/linux-headers-3.13.0-24-generic/
parth@ubuntu:/usr/src/linux-headers-3.13.0-24-generic$ ls -a
.             crypto         init      Makefile             scripts        usr
..            Documentation  ipc       .missing-syscalls.d  security       virt
arch          drivers        Kbuild    mm                   sound
block         firmware       Kconfig   Module.symvers       .tmp_versions
.config       fs             kernel    net                  tools
.config.old   include        lib       samples              ubuntu
parth@ubuntu:/usr/src/linux-headers-3.13.0-24-generic$ cp .config ~/linux-3.16.7
1
linux-3.16.71/        linux-3.16.71.tar.xz
parth@ubuntu:/usr/src/linux-headers-3.13.0-24-generic$ cp .config ~/linux-3.16.7
1/
```

- After copying now our task is to name our kernel, I named it Parth-Kernel.

nano .config

nano– an enhanced free Pico clone

After this we need to name our kernel by changing name in CONFIG_LOCALVARIABLE.



- Making oldconfig.

This is made to configure the system within the shell.

```
make– make utility to maintain groups of programs
```

```
parth@ubuntu:~/linux-3.16.71$ make oldconfig
```

Ubuntu 14.04 Server [Running] - Oracle VM VirtualBox

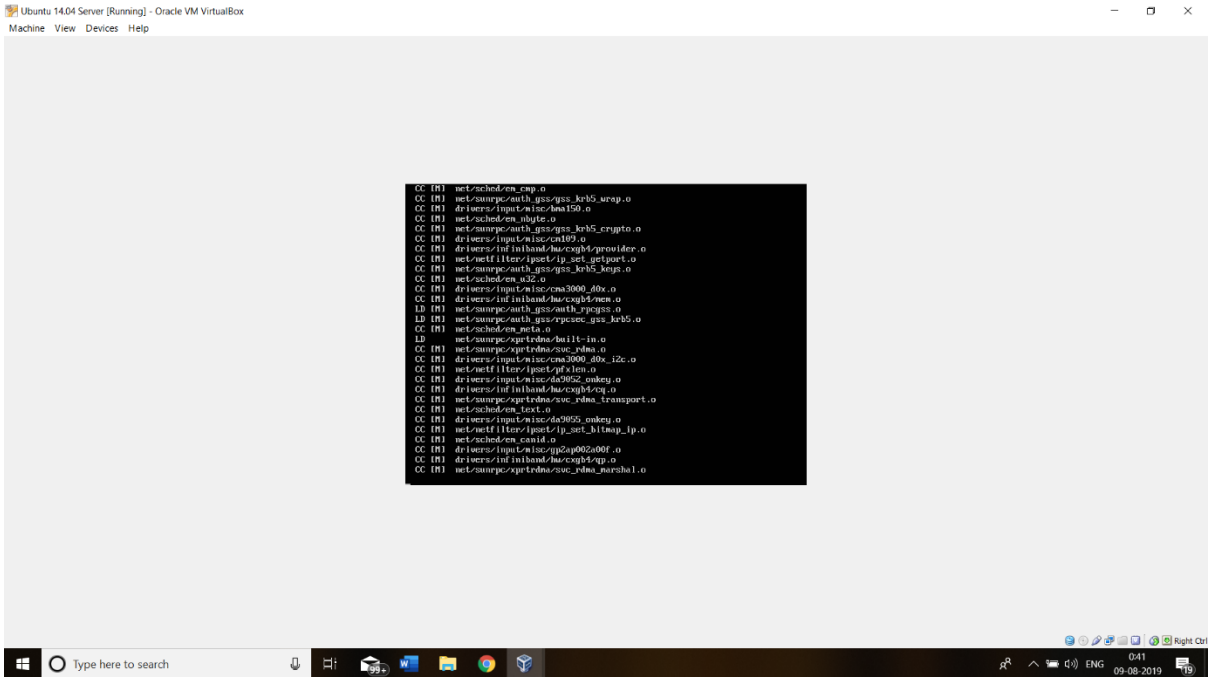
Machine View Devices Help

```
      "SECMARK" target support (NETFILTER_XT_TARGET_SECMARK) [M/n/?] m
      "TCPMSS" target support (NETFILTER_XT_TARGET_TCPMSS) [M/n/?] m
      "TCPOPTSTRIP" target support (NETFILTER_XT_TARGET_TCPOPTSTRIP) [M/n/?] m
      *
      * Xtables matches
      *
      "addrtype" address type match support (NETFILTER_XT_MATCH_ADDRTYPE) [M/n/?
] m
      "bpf" match support (NETFILTER_XT_MATCH_BPF) [M/n/?] m
      "control group" match support (NETFILTER_XT_MATCH_CGROUP) [M/n/?] (NEW)
    "cluster" match support (NETFILTER_XT_MATCH_CLUSTER) [M/n/?] m
      "comment" match support (NETFILTER_XT_MATCH_COMMENT) [M/n/?] m
      "connbytes" per-connection counter match support (NETFILTER_XT_MATCH_CONNB
YTES) [M/n/?] m
      "connlabel" match support (NETFILTER_XT_MATCH_CONNLABEL) [M/n/?] m
      "connlimit" match support (NETFILTER_XT_MATCH_CONNLIMIT) [M/n/?] m
      "connmark" connection mark match support (NETFILTER_XT_MATCH_CONNMARK) [M/
n/?] m
      "conntrack" connection tracking match support (NETFILTER_XT_MATCH_CONNTRAC
K) [M/n/?] m
      "cpu" match support (NETFILTER_XT_MATCH_CPU) [M/n/?] m
      "dccp" protocol match support (NETFILTER_XT_MATCH_DCCP) [M/n/?] m
      "devgroup" match support (NETFILTER_XT_MATCH_DEVGROUP) [M/n/?] m
      "dscp" and "tos" match support (NETFILTER_XT_MATCH_DSCP) [M/n/?] m
      "ecn" match support (NETFILTER_XT_MATCH_ECN) [M/?] m
      "esp" match support (NETFILTER_XT_MATCH_ESP) [M/n/?] m
      "hashlimit" match support (NETFILTER_XT_MATCH_HASHLIMIT) [M/n/?] m
      "helper" match support (NETFILTER_XT_MATCH_HELPER) [M/n/?] m
      "hl" hoplimit/TTL match support (NETFILTER_XT_MATCH_HL) [M/?] m
      "ipcomp" match support (NETFILTER_XT_MATCH_IPCOMP) [M/n/?] (NEW)
```

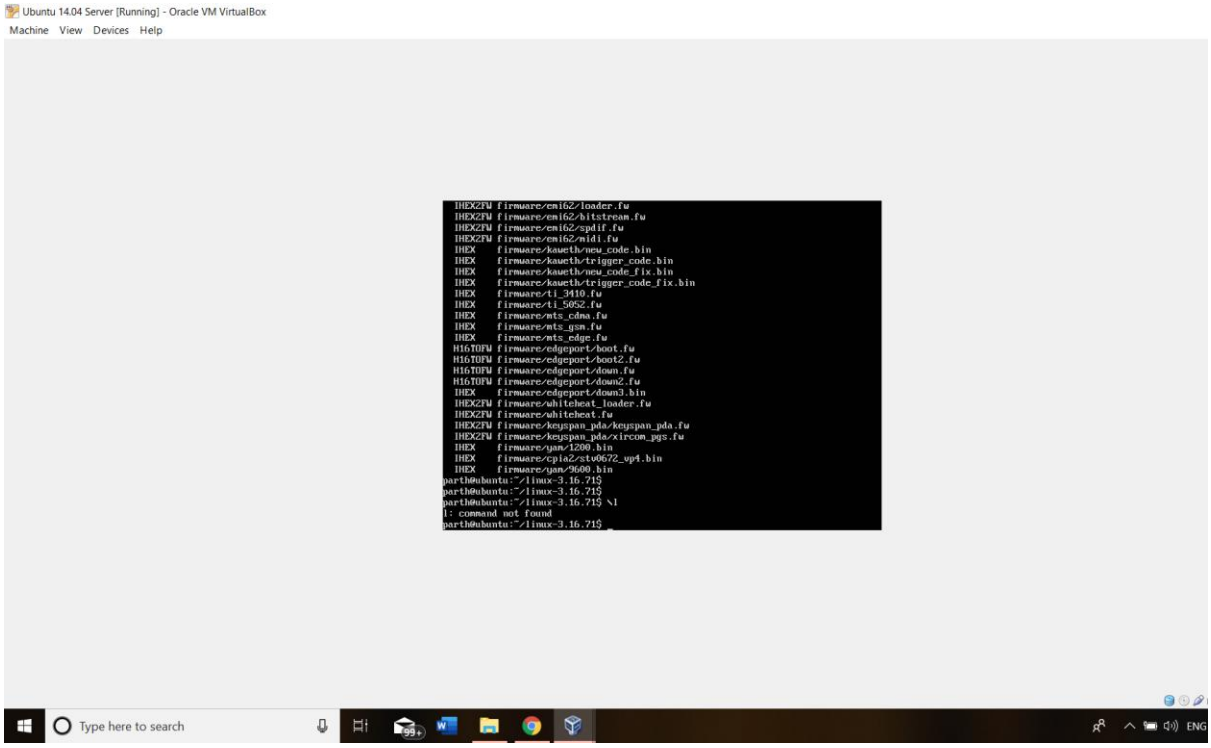
- Compiling the code

-
- make -j 5 → j Specifies the number of jobs (commands) to run simultaneously. If there is more than one **-j** option, the last one is effective.

```
parth@ubuntu:~/linux-3.16.71$ ls
arch      Documentation  init      lib           README           sound
block     drivers        ipc       MAINTAINERS   REPORTING-BUGS   tools
COPYING   firmware       Kbuild    Makefile      samples          usr
CREDITS   fs             Kconfig   mm            scripts          virt
crypto    include        kernel    net           security
parth@ubuntu:~/linux-3.16.71$ make -j 5
```



Done with compiling



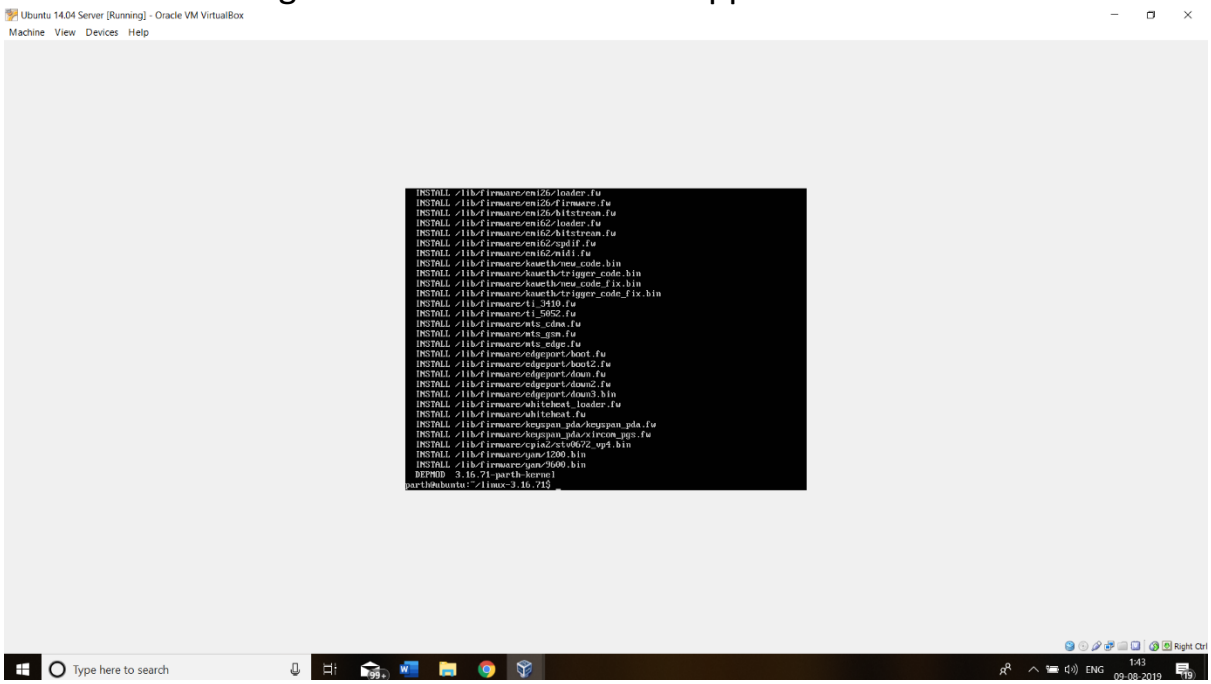
- Installing the modules by using make command and this installs all the modules.

make modules_install

- make– make utility to maintain groups of programs

```
INSTALL crypto/ctr.ko
INSTALL crypto/cts.ko
INSTALL crypto/deflate.ko
INSTALL crypto/des_generic.ko
INSTALL crypto/fcrypt.ko
INSTALL crypto/gcm.ko
INSTALL crypto/gf128mul.ko
INSTALL crypto/ghash-generic.ko
INSTALL crypto/khazad.ko
INSTALL crypto/lrw.ko
INSTALL crypto/lz4.ko
INSTALL crypto/lz4hc.ko
INSTALL crypto/md4.ko
INSTALL crypto/michael_mic.ko
INSTALL crypto/pcbc.ko
INSTALL crypto/pcrypt.ko
INSTALL crypto/rmd128.ko
INSTALL crypto/rmd160.ko
INSTALL crypto/rmd256.ko
INSTALL crypto/rmd320.ko
INSTALL crypto/salsa20_generic.ko
INSTALL crypto/seed.ko
INSTALL crypto/seqiv.ko
INSTALL crypto/serpent_generic.ko
INSTALL crypto/tcrypt.ko
INSTALL crypto/tea.ko
INSTALL crypto/tgr192.ko
INSTALL crypto/twofish_common.ko
INSTALL crypto/twofish_generic.ko
```

After downloading the modules this screen appears.



sudo make install

```
  INSTALL /lib/firmware/kaweth/trigger_code.bin
  INSTALL /lib/firmware/kaweth/new_code_fix.bin
  INSTALL /lib/firmware/kaweth/trigger_code_fix.bin
  INSTALL /lib/firmware/ti_3410.fw
  INSTALL /lib/firmware/ti_5052.fw
  INSTALL /lib/firmware/mts_cdma.fw
  INSTALL /lib/firmware/mts_gsm.fw
  INSTALL /lib/firmware/mts_edge.fw
  INSTALL /lib/firmware/edgeport/boot.fw
  INSTALL /lib/firmware/edgeport/boot2.fw
  INSTALL /lib/firmware/edgeport/down.fw
  INSTALL /lib/firmware/edgeport/down2.fw
  INSTALL /lib/firmware/edgeport/down3.bin
  INSTALL /lib/firmware/whiteheat_loader.fw
  INSTALL /lib/firmware/whiteheat.fw
  INSTALL /lib/firmware/keyspan_pda/keyspan_pda.fw
  INSTALL /lib/firmware/keyspan_pda/xircom_pgs.fw
  INSTALL /lib/firmware/cpia2/stv0672_vp4.bin
  INSTALL /lib/firmware/yam/1200.bin
  INSTALL /lib/firmware/yam/9600.bin
  DEPMOD  3.16.71-parth-kernel
parth@ubuntu:~/linux-3.16.71$ sudo make install
sh ./arch/x86/boot/install.sh 3.16.71-parth-kernel arch/x86/boot/bzImage \
              System.map "/boot"
run-parts: executing /etc/kernel/postinst.d/apt-auto-removal 3.16.71-parth-kerne
l /boot/vmlinuz-3.16.71-parth-kernel
run-parts: executing /etc/kernel/postinst.d/initramfs-tools 3.16.71-parth-kernel
 /boot/vmlinuz-3.16.71-parth-kernel
update-initramfs: Generating /boot/initrd.img-3.16.71-parth-kernel
```

After its installed.

```
  INSTALL /lib/firmware/whiteheat_loader.fw
  INSTALL /lib/firmware/whiteheat.fw
  INSTALL /lib/firmware/keyspan_pda/keyspan_pda.fw
  INSTALL /lib/firmware/keyspan_pda/xircom_pgs.fw
  INSTALL /lib/firmware/cpia2/stv0672_vp4.bin
  INSTALL /lib/firmware/yam/1200.bin
  INSTALL /lib/firmware/yam/9600.bin
  DEPMOD  3.16.71-parth-kernel
parth@ubuntu:~/linux-3.16.71$ sudo make install
sh ./arch/x86/boot/install.sh 3.16.71-parth-kernel arch/x86/boot/bzImage \
              System.map "/boot"
run-parts: executing /etc/kernel/postinst.d/apt-auto-removal 3.16.71-parth-kerne
l /boot/vmlinuz-3.16.71-parth-kernel
run-parts: executing /etc/kernel/postinst.d/initramfs-tools 3.16.71-parth-kernel
 /boot/vmlinuz-3.16.71-parth-kernel
update-initramfs: Generating /boot/initrd.img-3.16.71-parth-kernel
run-parts: executing /etc/kernel/postinst.d/update-notifier 3.16.71-parth-kernel
 /boot/vmlinuz-3.16.71-parth-kernel
run-parts: executing /etc/kernel/postinst.d/zz-update-grub 3.16.71-parth-kernel
/boot/vmlinuz-3.16.71-parth-kernel
Generating grub configuration file ...
Found linux image: /boot/vmlinuz-3.16.71-parth-kernel
Found initrd image: /boot/initrd.img-3.16.71-parth-kernel
Found linux image: /boot/vmlinuz-3.13.0-24-generic
Found initrd image: /boot/initrd.img-3.13.0-24-generic
Found memtest86+ image: /boot/memtest86+.elf
Found memtest86+ image: /boot/memtest86+.bin
done
parth@ubuntu:~/linux-3.16.71$
parth@ubuntu:~/linux-3.16.71$
```

- Now come the grub entry, this opens the grub shell.

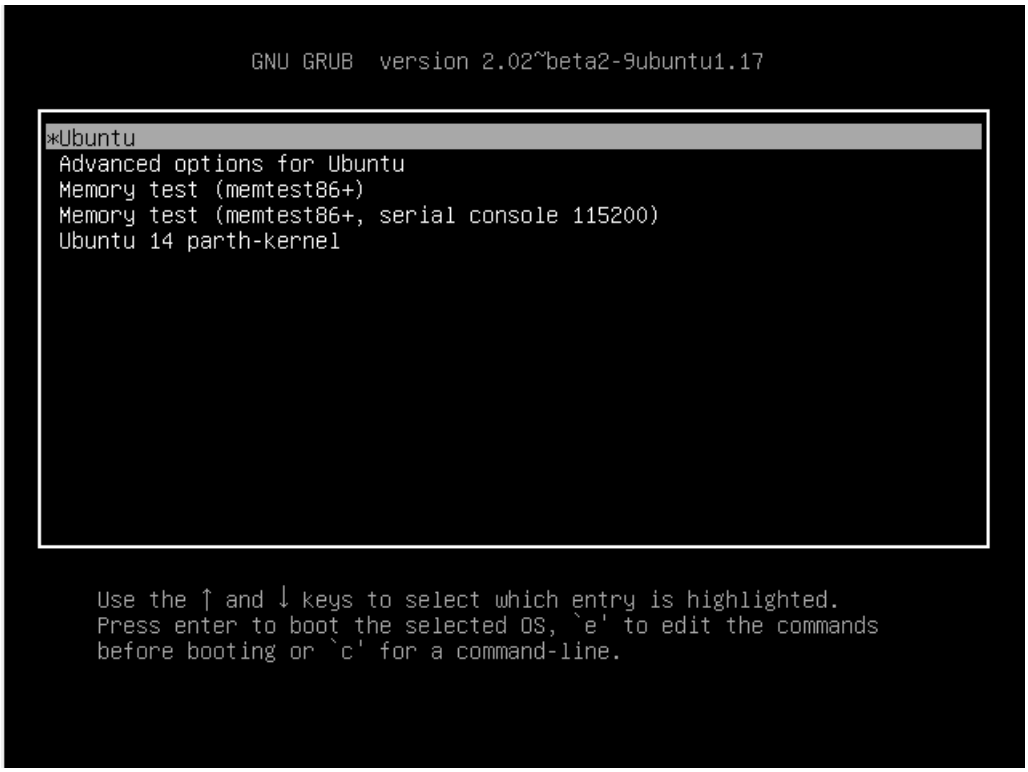
- grub- the grub shell

- Updating the grub entry.

. sudo- execute a command as another user

```
parth@ubuntu:/etc/grub.d$ sudo update-grub
Generating grub configuration file ...
Found linux image: /boot/vmlinuz-3.16.71-parth-kernel
Found initrd image: /boot/initrd.img-3.16.71-parth-kernel
Found linux image: /boot/vmlinuz-3.13.0-24-generic
Found initrd image: /boot/initrd.img-3.13.0-24-generic
Found memtest86+ image: /boot/memtest86+.elf
Found memtest86+ image: /boot/memtest86+.bin
done
parth@ubuntu:/etc/grub.d$ _
```

- Now opening grub menu.



Here at the last we can see UBUNTU 14 PARTH-KERNEL.

- Now reboot and then see the kernel release.

- `Uname -r→ print the kernel release`

//////Done for this part/////
/////Parth Singh/////
//2018356//