How to install Real Time Kernel patch on Linux(Ubuntu 16.04)

1. Install Ubuntu on Virtual box or Real hardware.
2. Download a kernel

```
https://www.kernel.org/
```

   - What means Number/version 4.13.15
     - 4: Kernel version
     - 13: Major revision
     - 15: Minor revision
   - ! Kernel version and major revision number must be the same.
   - Create Kernel directory and download kernel source into the directory.

```
mkdir Kernel && cd Kernel
wget https://cdn.kernel.org/pub/linux/kernel/v4.x/linux-4.13.15.tar.xz
```

3. Download RT-Patch into the Kernel directory.

```
https://wiki.linuxfoundation.org/realtime/preempt_rt_versions
https://cdn.kernel.org/pub/linux/kernel/projects/rt/4.13/
```

   Download it

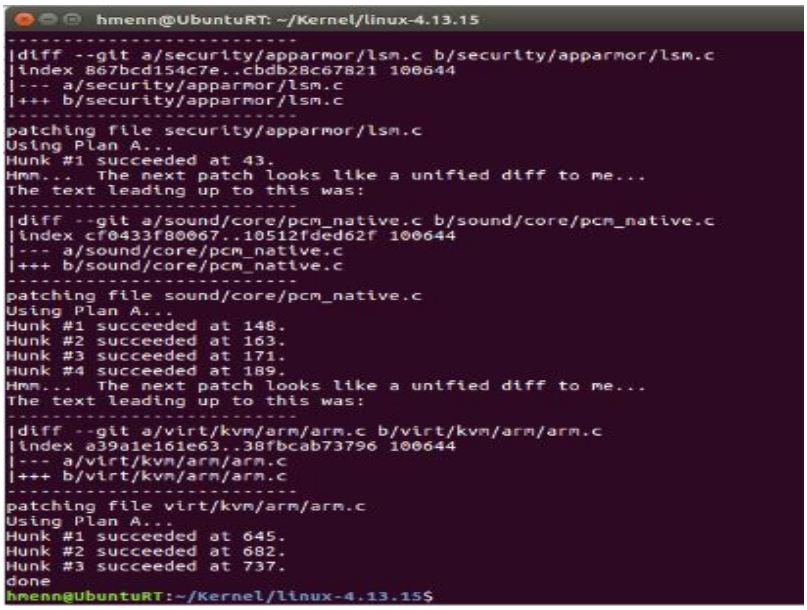
```
wget https://cdn.kernel.org/pub/linux/kernel/projects/rt/4.13/patch-
4.13.13-rt5.patch.gz
```

4. Extract Kernel source and patch it.

```
tar xvf linux-4.13.15.tar.xz
cd linux-4.13.15
```

   Patch it

```
gzip -cd ../patch-4.13.13-rt5.patch.gz | patch -p1 --verbose
```



5. Install libncurses5-dev and libssl-dev to enable real time processing and compiling packages.

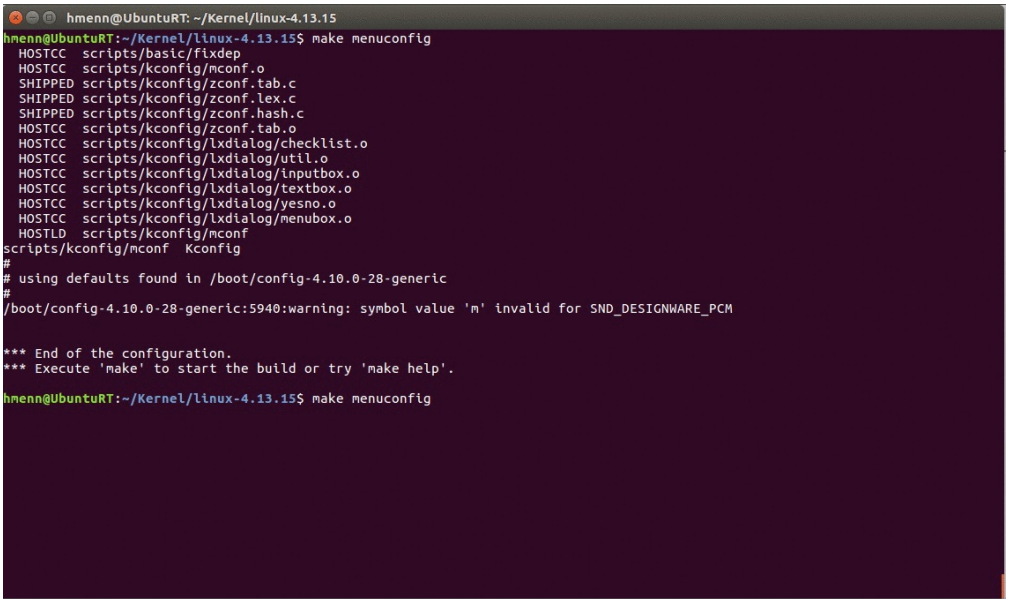
```
sudo apt-get install libncurses5-dev
sudo apt-get install libssl-dev
```

6. Configure Makefile before compiling kernel. This configure will open Real time preemt options.

```
make menuconfig
```

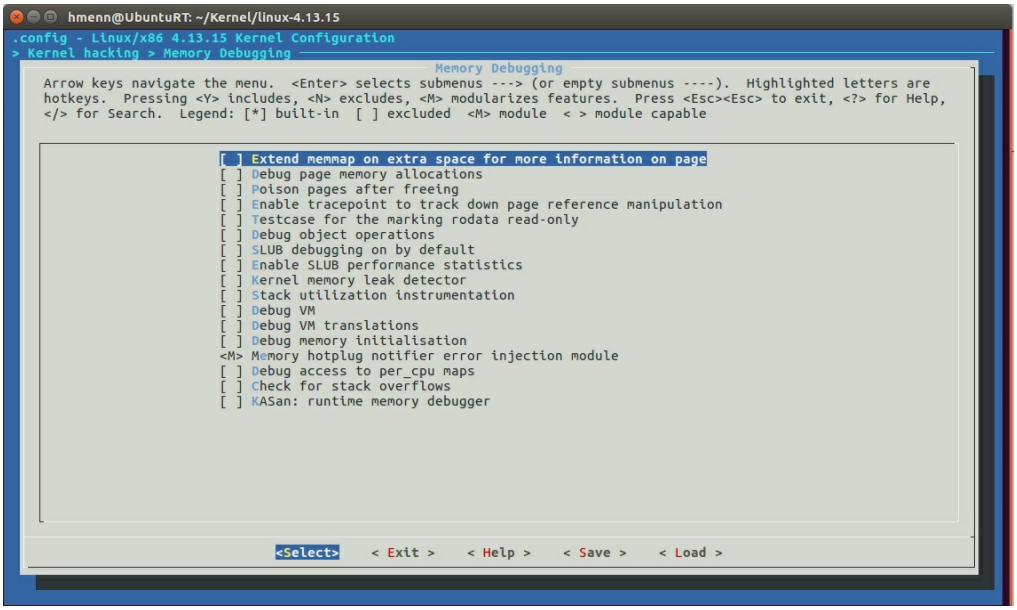
Select Fully Preemtible Kernel option from

1. Processor type and features
2. Preemption Model (Voluntary Kernel Preemption (Desktop))
3. Fully Preemptible Kernel (RT)



Go upper menu with ESC-ESC key. Deselect stack overflows if selected.

1. Kernel hacking --> [Enter]
2. Memory Debugging [Enter]
3. Check for stack overflows



Go upper menu and save(RIGHT_ARROW) .config file.

7. Compile Kernel source file

```
make
```

NOTE: You can use "make -jX" option if you have thread support. X is number of core + 1. It will compile faster. For VirtualBox use this.

```
make -j2
```

Wait until compilation done. It can take 3-4 hour on VirtualBox.

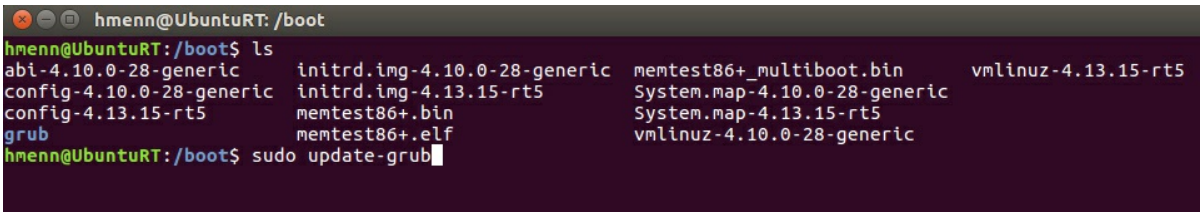
8. Make modules and install

```
sudo make modules_install -j2
sudo make install -j2
```

9. Check new kernel file and update grub boot loader to start Linux with new RT-Kernel.

```
cd /boot
ls
```

   - You will see new kernel.



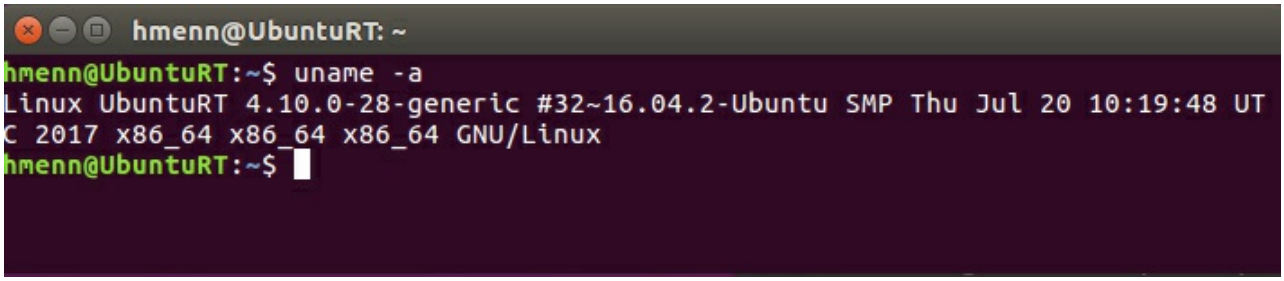
   - Now update grub and reboot machine.

```
sudo update-grub
sudo reboot
```

10. Check kernel version to be sure.

```
uname -a
```

- Old Kernel(Ubuntu SMP 4.10.0)



- New Kernel(PREEMPT RT 4.13.15)