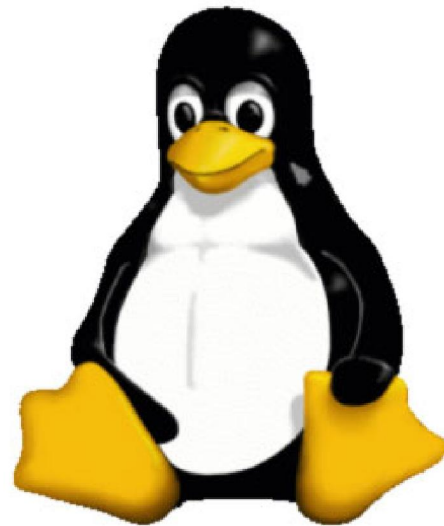


Setup SD card for Linux on PandaBoard



Setup SD Card for Pandaboard

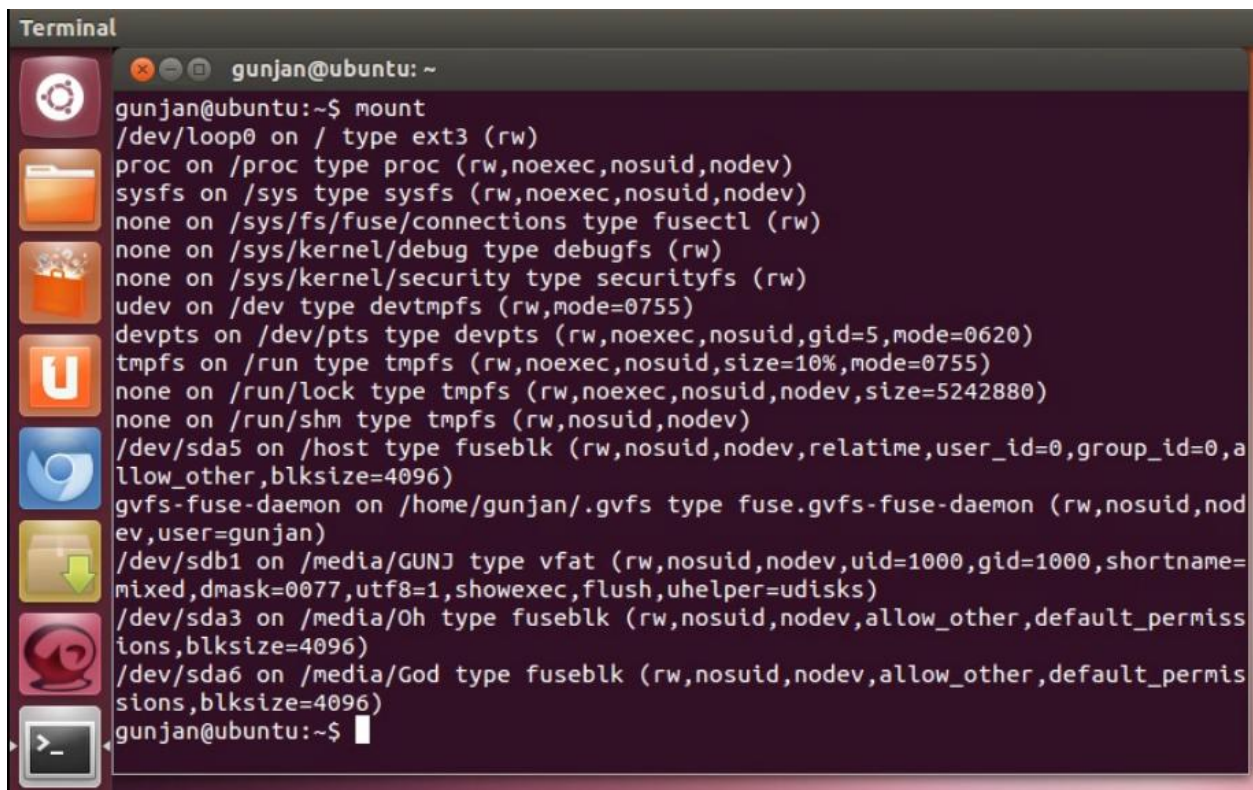
Hardware Necessary:

- Laptop with Linux distro (Ubuntu 12.04)
- SD card (16GB class 10)

I found some issues in Pandaboard community that Ubuntu 12.04 is not booting on Pandaboard ES Rev3. I also faced same problem. But I figured out the solution by manually formatting SD card. I am using my friend Gunjan's laptop for preparing SD card for installation of Linux on Pandaboard. I formatted SD card using Ubuntu. Make sure that, all the installation work must be done on Ubuntu and SD Card is connected to computer and it is not in write protected mode. Pandaboard ES allows booting through SD Card but it do not allow through USB.

First of all start terminal by Ctrl +Alt +T and write in terminal

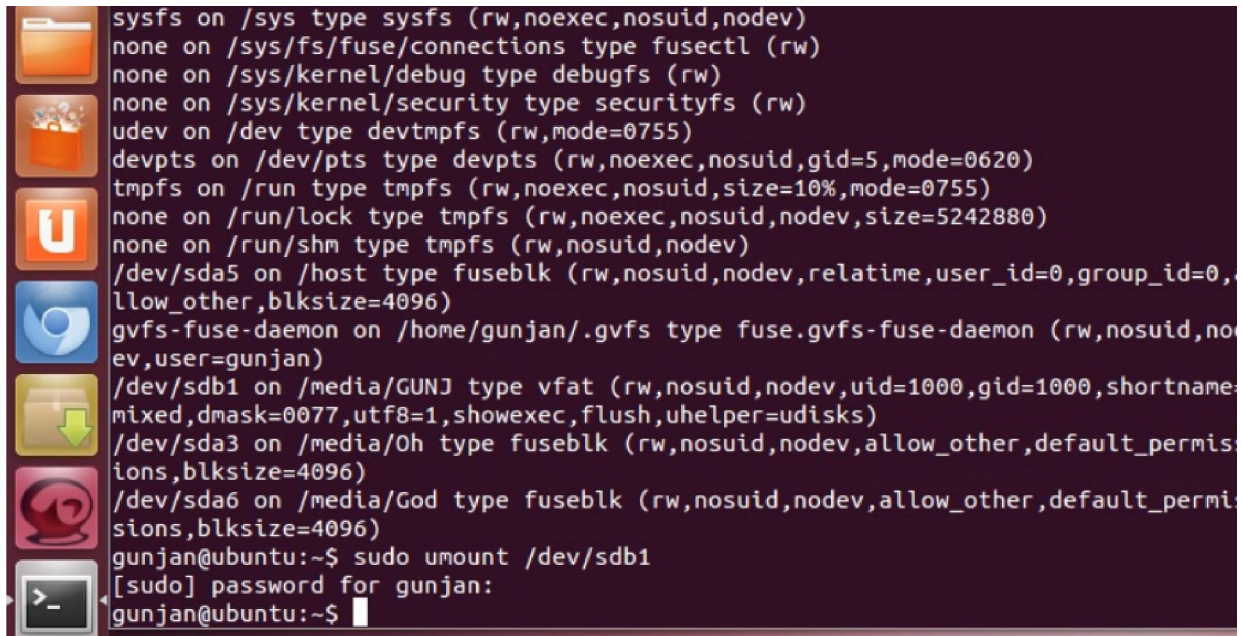
`mount`



```
Terminal
gunjan@ubuntu: ~
gunjan@ubuntu:~$ mount
/dev/loop0 on / type ext3 (rw)
proc on /proc type proc (rw,noexec,nosuid,nodev)
sysfs on /sys type sysfs (rw,noexec,nosuid,nodev)
none on /sys/fs/fuse/connections type fusectl (rw)
none on /sys/kernel/debug type debugfs (rw)
none on /sys/kernel/security type securityfs (rw)
udev on /dev type devtmpfs (rw,mode=0755)
devpts on /dev/pts type devpts (rw,noexec,nosuid,gid=5,mode=0620)
tmpfs on /run type tmpfs (rw,noexec,nosuid,size=10%,mode=0755)
none on /run/lock type tmpfs (rw,noexec,nosuid,nodev,size=5242880)
none on /run/shm type tmpfs (rw,nosuid,nodev)
/dev/sda5 on /host type fuseblk (rw,nosuid,nodev,relatime,user_id=0,group_id=0,allow_other,blksize=4096)
gvfs-fuse-daemon on /home/gunjan/.gvfs type fuse.gvfs-fuse-daemon (rw,nosuid,nodev,user=gunjan)
/dev/sdb1 on /media/GUNJ type vfat (rw,nosuid,nodev,uid=1000,gid=1000,shortname=mixed,dmask=0077,utf8=1,showexec,flush,uhelper=udisks)
/dev/sda3 on /media/Oh type fuseblk (rw,nosuid,nodev,allow_other,default_permissions,blksize=4096)
/dev/sda6 on /media/God type fuseblk (rw,nosuid,nodev,allow_other,default_permissions,blksize=4096)
gunjan@ubuntu:~$
```

It will show us all the memory devices connected to computer. Internal Hard disk will be described as sda and other memory devices can be named sdb, sdc, etc. They are further divided in partitions and hence can have numbering appended to them like sdb1, sdb2, etc. We have to unmount all the partitions of SD Card. Here in my case I have only one partition so I will unmount it which can be done in this way:

```
sudo umount /dev/sdb1
```



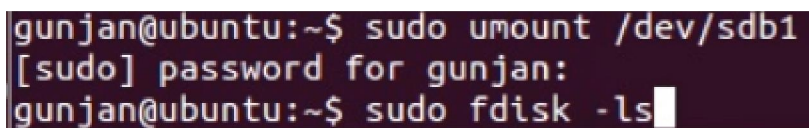
```

sysfs on /sys type sysfs (rw,noexec,nosuid,nodev)
none on /sys/fs/fuse/connections type fusectl (rw)
none on /sys/kernel/debug type debugfs (rw)
none on /sys/kernel/security type securityfs (rw)
udev on /dev type devtmpfs (rw,mode=0755)
devpts on /dev/pts type devpts (rw,noexec,nosuid,gid=5,mode=0620)
tmpfs on /run type tmpfs (rw,noexec,nosuid,size=10%,mode=0755)
none on /run/lock type tmpfs (rw,noexec,nosuid,nodev,size=5242880)
none on /run/shm type tmpfs (rw,nosuid,nodev)
/dev/sda5 on /host type fuseblk (rw,nosuid,nodev,relatime,user_id=0,group_id=0,allow_other,blksize=4096)
gvfs-fuse-daemon on /home/gunjan/.gvfs type fuse.gvfs-fuse-daemon (rw,nosuid,nodev,user=gunjan)
/dev/sdb1 on /media/GUNJ type vfat (rw,nosuid,nodev,uid=1000,gid=1000,shortname=mixed,dmask=0077,utf8=1,showexec,flush,uhelper=udisks)
/dev/sda3 on /media/Oh type fuseblk (rw,nosuid,nodev,allow_other,default_permissions,blksize=4096)
/dev/sda6 on /media/God type fuseblk (rw,nosuid,nodev,allow_other,default_permissions,blksize=4096)
gunjan@ubuntu:~$ sudo umount /dev/sdb1
[sudo] password for gunjan:
gunjan@ubuntu:~$

```

We will list all the connected memory partitions of desktop by writing:

```
sudo fdisk -ls
```



```

gunjan@ubuntu:~$ sudo umount /dev/sdb1
[sudo] password for gunjan:
gunjan@ubuntu:~$ sudo fdisk -ls

```

```

Terminal
gunjan@ubuntu: ~
255 heads, 63 sectors/track, 60801 cylinders, total 976773168 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk identifier: 0xd8000000

Device Boot      Start         End      Blocks   Id  System
/dev/sda1          63         417689     208813+   de  Dell Utility
/dev/sda2 *      417792     26107903     12845056    7  HPFS/NTFS/exFAT
/dev/sda3        26107904     502945791     238418944    7  HPFS/NTFS/exFAT
/dev/sda4        502945792     976771071     236912640    f  W95 Ext'd (LBA)
/dev/sda5        502947840     628776959     62914560    7  HPFS/NTFS/exFAT
/dev/sda6        628779008     976769023     173995008    7  HPFS/NTFS/exFAT

Disk /dev/sdb: 15.9 GB, 15879634944 bytes
136 heads, 12 sectors/track, 19004 cylinders, total 31014912 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk identifier: 0x00000000

Device Boot      Start         End      Blocks   Id  System
/dev/sdb1       131072     31014911     15441920    c  W95 FAT32 (LBA)
gunjan@ubuntu:~$

```

Now we do not have access to SD Card through Desktop but still we can access partitions of SD card through terminal and can manipulate memory of SD Card. For manipulation we need to do memory hacking which can only be done by entering in SD Card through terminal. For 16 GB SD Card and our purpose of installing Ubuntu we have calculated number of heads as 255, sectors/track as 63 and as each sector have 512 bytes so on calculating number of cylinders = Total size / Size of one head is 1930. {Number of Cylinders = $\frac{15879634944}{255*63*512} = 1930$ (Approx.)}

As my SD card is in /dev/sdb segment so I will write

```
sudo fdisk /dev/sdb
```

```

/dev/sda3    26107904  502945791  238418944  7  HPFS/NTFS/exFAT
/dev/sda4    502945792  976771071  236912640  f  W95 Ext'd (LBA)
/dev/sda5    502947840  628776959   62914560  7  HPFS/NTFS/exFAT
/dev/sda6    628779008  976769023  173995008  7  HPFS/NTFS/exFAT

Disk /dev/sdb: 15.9 GB, 15879634944 bytes
136 heads, 12 sectors/track, 19004 cylinders, total 31014912 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk identifier: 0x00000000

   Device Boot      Start         End      Blocks   Id  System
/dev/sdb1            131072    31014911   15441920    c   W95 FAT32 (LBA)
gunjan@ubuntu:~$ sudo fdisk /dev/sdb

Command (m for help):

```

```

Command (m for help): m
Command action
 a  toggle a bootable flag
 b  edit bsd disklabel
 c  toggle the dos compatibility flag
 d  delete a partition
 l  list known partition types
 m  print this menu
 n  add a new partition
 o  create a new empty DOS partition table
 p  print the partition table
 q  quit without saving changes
 s  create a new empty Sun disklabel
 t  change a partition's system id
 u  change display/entry units
 v  verify the partition table
 w  write table to disk and exit
 x  extra functionality (experts only)

Command (m for help):

```

Now as shown we have different commands available to us for memory operation on SD Card. First we have to delete all the partitions. In my case I have only 1 partition so it will be deleted by “d” command. If multiple partitions are present then selecting that partition and repeating “d” again will delete it. After deleting all the partitions we use “p” to check that no partition is existing.

```

Command (m for help): d
Selected partition 1

Command (m for help): d
No partition is defined yet!

Command (m for help): p

Disk /dev/sdb: 15.9 GB, 15879634944 bytes
136 heads, 12 sectors/track, 19004 cylinders, total 31014912 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk identifier: 0x00000000

Device Boot      Start         End      Blocks   Id  System
>- Command (m for help):

```

Now we will go in expert mode by typing “x” and we will have much different functionality available to us for manipulation as shown:

```

Command (m for help): x

Expert command (m for help): m
Command action
  b  move beginning of data in a partition
  c  change number of cylinders
  d  print the raw data in the partition table
  e  list extended partitions
  f  fix partition order
  g  create an IRIX (SGI) partition table
  h  change number of heads
  i  change the disk identifier
  m  print this menu
  p  print the partition table
  q  quit without saving changes
  r  return to main menu
  s  change number of sectors/track
  v  verify the partition table
  w  write table to disk and exit

Expert command (m for help):

```

Here, we will give no of heads by “h” = 255; no of sectors/track by “s” = 63; no of cylinders by “c” = 1930 and then will return to normal mode by “r”.

```

Expert command (m for help): h
Number of heads (1-256, default 136): 255
Expert command (m for help): s
Number of sectors (1-63, default 12): 63
Expert command (m for help): c
Number of cylinders (1-1048576, default 19004): 1930
Expert command (m for help): r
Command (m for help):

```

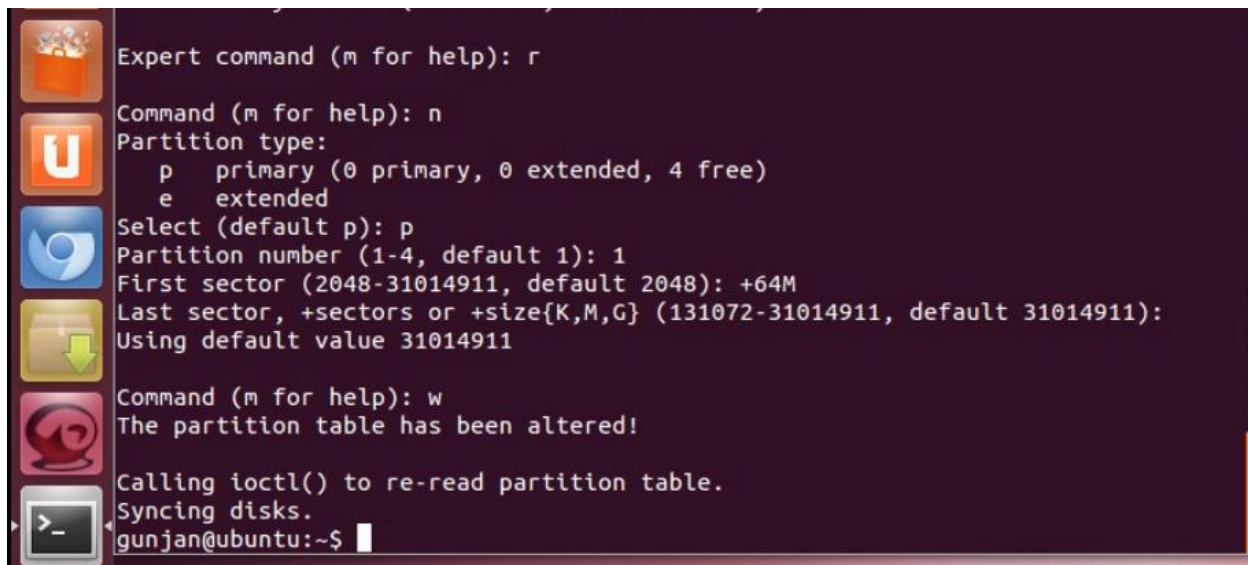
Now we will add a new partition by “n”. It will ask for type of partition, where we will choose primary type by “p” and will give partition number “1” and initial memory allocation size of 64 MB by “+64M” and sector size will be taken default by just entering in command.

```

Terminal
gunjan@ubuntu: ~
w write table to disk and exit
Expert command (m for help): h
Number of heads (1-256, default 136): 255
Expert command (m for help): s
Number of sectors (1-63, default 12): 63
Expert command (m for help): c
Number of cylinders (1-1048576, default 19004): 1930
Expert command (m for help): r
Command (m for help): n
Partition type:
  p primary (0 primary, 0 extended, 4 free)
  e extended
Select (default p): p
Partition number (1-4, default 1): 1
First sector (2048-31014911, default 2048): +64M
Last sector, +sectors or +size{K,M,G} (131072-31014911, default 31014911):
Using default value 31014911
Command (m for help):

```

Now we will write all the changes by “w”. It will save the altered partition table and will make sync disc and make it re-readable. Also it will take us out of SD Card command prompting to normal terminal execution.

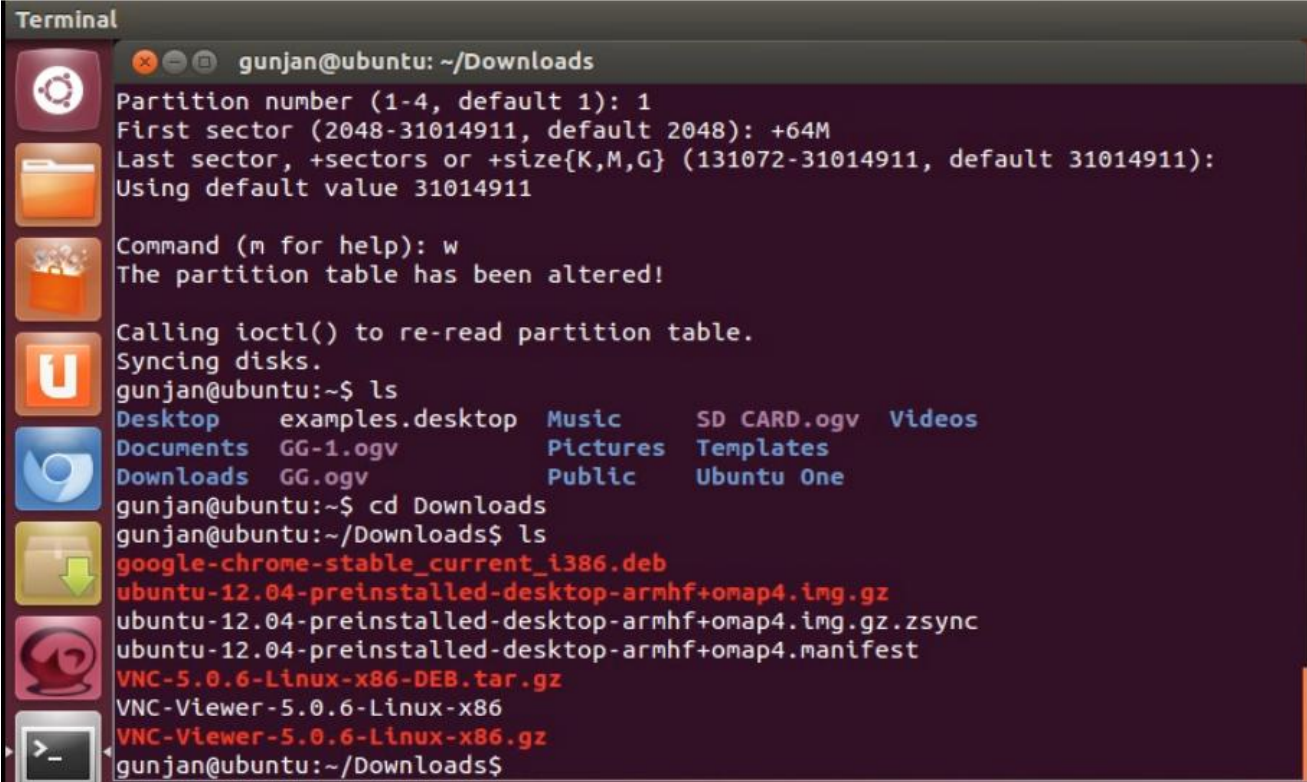
A terminal window with a dark purple background and a vertical sidebar on the left containing icons for various applications. The terminal text shows the execution of the fdisk utility to create a new primary partition. The user enters 'r' for expert mode, 'n' for a new partition, 'p' for primary, '1' for partition number, and '+64M' for the size. The partition is created with the first sector at 2048 and the last sector at 31014911. The user then enters 'w' to write the changes, followed by 'y' to confirm. The terminal shows the partition table being altered and the disk being synced. The prompt returns to the shell.

```
Expert command (m for help): r
Command (m for help): n
Partition type:
   p   primary (0 primary, 0 extended, 4 free)
   e   extended
Select (default p): p
Partition number (1-4, default 1): 1
First sector (2048-31014911, default 2048): +64M
Last sector, +sectors or +size{K,M,G} (131072-31014911, default 31014911):
Using default value 31014911
Command (m for help): w
The partition table has been altered!

Calling ioctl() to re-read partition table.
Syncing disks.
gunjan@ubuntu:~$
```


Installation of Ubuntu 12.04 image on SD card

Now we can prepare our SD Card with help of OMAP image of Ubuntu. This image can be downloaded from <https://wiki.ubuntu.com/ARM/OMAP>. I have Ubuntu 12.04 download in my Downloads folder, so I will enter in that particular folder



```

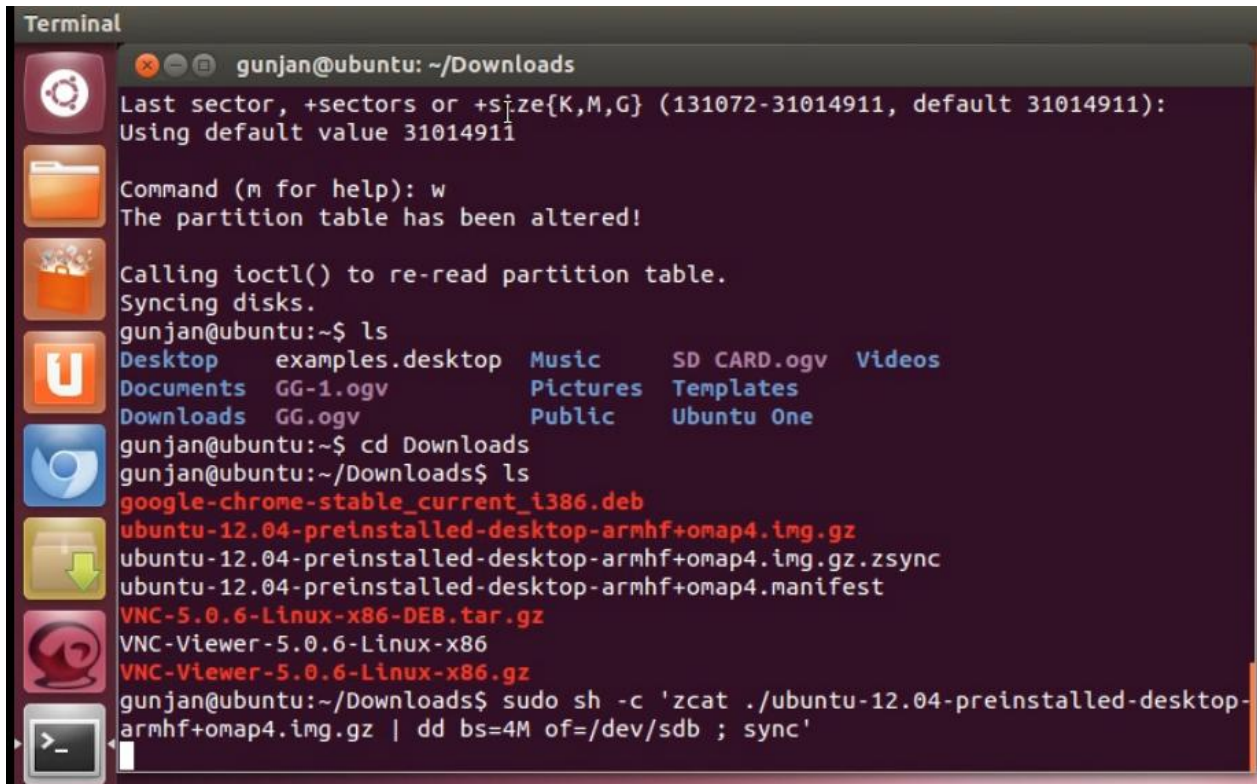
Terminal
gunjan@ubuntu: ~/Downloads
Partition number (1-4, default 1): 1
First sector (2048-31014911, default 2048): +64M
Last sector, +sectors or +size{K,M,G} (131072-31014911, default 31014911):
Using default value 31014911
Command (m for help): w
The partition table has been altered!
Calling ioctl() to re-read partition table.
Syncing disks.
gunjan@ubuntu:~$ ls
Desktop      examples.desktop  Music          SD CARD.ogv  Videos
Documents    GG-1.ogv          Pictures       Templates
Downloads    GG.ogv           Public         Ubuntu One
gunjan@ubuntu:~$ cd Downloads
gunjan@ubuntu:~/Downloads$ ls
google-chrome-stable_current_i386.deb
ubuntu-12.04-preinstalled-desktop-armhf+omap4.img.gz
ubuntu-12.04-preinstalled-desktop-armhf+omap4.img.gz.zsync
ubuntu-12.04-preinstalled-desktop-armhf+omap4.manifest
VNC-5.0.6-Linux-x86-DEB.tar.gz
VNC-Viewer-5.0.6-Linux-x86
VNC-Viewer-5.0.6-Linux-x86.gz
gunjan@ubuntu:~/Downloads$

```

cd Downloads

Now write this script in terminal

```
sudo sh -c 'zcat ./ubuntu-12.04-preinstalled-desktop-armhf+omap4.img.gz |dd bs=4M of=/dev/sdb ; sync'
```



```

Terminal
gunjan@ubuntu: ~/Downloads
Last sector, +sectors or +size[K,M,G] (131072-31014911, default 31014911):
Using default value 31014911
Command (m for help): w
The partition table has been altered!
Calling ioctl() to re-read partition table.
Syncing disks.
gunjan@ubuntu:~$ ls
Desktop      examples.desktop  Music          SD CARD.ogv  Videos
Documents    GG-1.ogv          Pictures       Templates
Downloads    GG.ogv           Public        Ubuntu One
gunjan@ubuntu:~$ cd Downloads
gunjan@ubuntu:~/Downloads$ ls
google-chrome-stable_current_i386.deb
ubuntu-12.04-preinstalled-desktop-armhf+omap4.img.gz
ubuntu-12.04-preinstalled-desktop-armhf+omap4.img.gz.zsync
ubuntu-12.04-preinstalled-desktop-armhf+omap4.manifest
VNC-5.0.6-Linux-x86-DEB.tar.gz
VNC-Viewer-5.0.6-Linux-x86
VNC-Viewer-5.0.6-Linux-x86.gz
gunjan@ubuntu:~/Downloads$ sudo sh -c 'zcat ./ubuntu-12.04-preinstalled-desktop-
armhf+omap4.img.gz | dd bs=4M of=/dev/sdb ; sync'

```

It will start installation of Ubuntu OS in SD Card. This process takes about 5 -10 minutes depending on your processor. After this installation ends successfully we will see number of records which were input and output, total bytes copied, time taken and speed.

```

Terminal
gunjan@ubuntu: ~/Downloads
Command (m for help): w
The partition table has been altered!
Calling ioctl() to re-read partition table.
Syncing disks.
gunjan@ubuntu:~$ ls
Desktop      examples.desktop  Music          SD CARD.ogv   Videos
Documents   GG-1.ogv          Pictures       Templates
Downloads   GG.ogv           Public         Ubuntu One
gunjan@ubuntu:~$ cd Downloads
gunjan@ubuntu:~/Downloads$ ls
google-chrome-stable_current_i386.deb
ubuntu-12.04-preinstalled-desktop-armhf+omap4.img.gz
ubuntu-12.04-preinstalled-desktop-armhf+omap4.img.gz.zsync
ubuntu-12.04-preinstalled-desktop-armhf+omap4.manifest
VNC-5.0.6-Linux-x86-DEB.tar.gz
VNC-Viewer-5.0.6-Linux-x86
VNC-Viewer-5.0.6-Linux-x86.gz
gunjan@ubuntu:~/Downloads$ sudo sh -c 'zcat ./ubuntu-12.04-preinstalled-desktop-
armhf+omap4.img.gz | dd bs=4M of=/dev/sdb ; sync'
0+40802 records in
0+40802 records out
2028994560 bytes (2.0 GB) copied, 267.56 s, 7.6 MB/s
gunjan@ubuntu:~/Downloads$

```

Now, we are ready to insert our SD Card in Pandaboard and boot it for first time. We will follow simple steps of installing Ubuntu just like the steps we follow on installing windows in our computer. After all the steps are completed, we are ready to do our work in Ubuntu on Pandaboard.

Author

I am Sagar Patel, pursuing B.Tech in Electronics and Communication in Nirma University, India. I like to explore new ideas. Embedded systems, digital signal processing and video-sound processing are my favorite fields. I am a blogger at <http://creat-tricks.blogspot.com>. I also own a YouTube channel www.youtube.com/sagarpatel9556. For this documentation, I would like to thank Gunjan Gupta and Romil Shah for helping me.

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☺ THANK YOU ☺