Using Linux Live CD

DEPIK is offering a "Damn Small Linux" (DSL) Live CD to learn using Linux and to practice C programming. We strongly recommend you to spend lot of time with Linux by exploring all its applications and commands.

Live CD is the one, using which you can boot Linux operating system without installing it on the hard disk. In this way you can get familiar with operating system and its development tools without having the complexity of installing it. You can also develop programs and run them on Linux. All this you can do without disturbing the PCs hard disk. This is ideal way of using your friend's computer. You may save your files on USB pen drive (flash disk). However if you want, you can install this Linux on hard disk also. This section covers the following topics.

1. How to run DSL operating system
2. Learning Linux Shell commands
3. Using vi editor to create C program file
4. Compiling and running the 'hello.c' program
5. Accessing the hard disk
6. Accessing the USB flash disk (pen drive)
7. Installing DSL on to a hard disk
8. Creating a new partition using fdisk

1. How to run DSL operating system

To run DSL, you need a computer that can boot from CD-ROM drive. Once you have such computer, follow the given steps to run DSL.

- Power-on the computer and continue to press 'Delete' key to go to the BIOS (Note: How to enter into BIOS mode may vary from BIOS to BIOS)
- Change BIOS settings to make CD as first boot device
- Keep DSL CD in the CD drive
- Save BIOS settings and boot
- DSL displays a prompt 'boot:'
- Press 'Enter' key to boot Linux with default options

If you are lucky, the DSL should be up and running in graphical user interface (GUI) mode. GUI mode is also called 'Windows' mode. If you are not very lucky, it will ask you to enter 'mode' number then press 'Enter' key again.

If you are not able to boot Linux in GUI mode, do not worry; nothing is lost. You can boot it in console mode by entering "dsl 2" at the first boot prompt. This console mode (also called CLI mode) is good enough to learn C programming and Linux programming.

2. Learning Linux Shell commands

Unix and Linux are widely used through their Command Line Interface (CLI) also called "shell interface". To practice shell commands, start a shell terminal by clicking the terminal Icon. Shell Terminal window will come up and displays the command prompt as below. This command prompt is showing the name of

the user 'dsl' and name of the computer 'box' and the directory. The character ~ is a symbol for home directory. But now onwards we show only $ as command prompt.

```
dsl@box:~$
```

By trying the following commands, get familiar with using Linux through CLI.

Most of the Linux commands are short with few letters, making it easy to type, but difficult to remember. But remembering is a problem only initially. So Linux people preferred short commands. The 'pwd' (Path to Working Directory) command displays the path name to the current (working) directory. So by using this command you can know the directory name you are presently working in.

```
$ pwd
```

The 'ls' command stands "List". It lists the files and directories present in the current directory. The 'ls -l' command lists the files and directories in the long form.

```
$ ls
$ ls -l
```

The 'cd' command stands for "Change Directory". Using this command we can change to a new directory. For example if you want to change to "/bin" directory you can use the following command.

```
$ cd  /bin
```

Now you can give 'pwd' command to verify that you are in "/bin" directory. You can also give 'ls' command to display the files and directories present in the "/bin" directory. Just giving 'cd' command without specifying any directory name, will change to your home directory.

Change to your home directory. Now you can give the following command to create a new directory with name 'mydir'.

```
$ mkdir mydir
```

Now give 'ls' command and verify that new directory is present in your home directory. Now you can change to the newly created directory by giving the following command.

```
$ cd mydir
```

Give 'pwd' command and verify that you really moved to new directory.

The most important command is 'vi' command, which is used to create a C program file. Using 'vi' is covered in the next section. Assume that you have created "hello.c" file using the 'vi' command. If you want to copy the "hello.c" file to another file with name "hello2.c", then you can use 'cp' command as shown below:

```
$ cp hello.c  hello2.c
```

Verify with 'ls' command that "hello2.c" is present. Now you can change the name of the "hello.c" file to "x.c" by using 'mv' command.

```
$ mv hello.c  x.c
```

Verify with 'ls' command that, instead of "hello.c" file, "x.c" file is present. You can remove a file by using 'rm' command as shown below:

```
$ rm x.c
```

The ‘cat’ command is useful to display the contents of a file. For example you want to print the contents of hello.c file you can use the ‘cat’ command as shown below:

```
$ cat  hello.c
```

The ‘cat’ command is also useful to create small files. Enter the following command to create `abc.txt` file.

```
$ cat > abc.txt
```

Once the above command is given, the cat command is waiting for you to type few lines of text. So type some lines and finally enter Control-d character (Press control key and D simultaneously). Now cat command will create the `abc.txt` file and saves all the lines you typed into that file. Verify this by giving ‘ls’ command. You may display this new file by using same cat command as shown below:

```
$ cat  abc.txt
```

So far in this section, you learned the following commands:

```
ls, cd, mkdir,  pwd,  cp, mv, rm, cat
```

In the next sections you will learn the following commands:

```
vi, gcc, sudo, mount, umount, fdisk
```

3. Using vi editor to create C program file

Enter the following command to create a 'hello.c' file.

```
$ vi  hello.c
```

When you enter the above command, if 'hello.c' file is not already existing, you will see empty window space. If file is already present, you will see its contents.

The vi editor works in two modes. One is ‘command mode’ and another is ‘insert mode’. In command mode whatever you type, the vi editor interprets them as commands. So you can enter commands to delete set of lines, copy the set of lines and paste the lines previously copied or deleted etc.. Whereas In the insert mode, whatever you type it will get inserted into the file.

When you start vi editor it will be in the command mode. Press letter 'i' to go to INSERT mode. Then you will see "-- INSERT --" word in the last line. So you are in INSERT mode of vi editor.

While in INSERT mode, type a C program, by using all alpha numeric characters and punctuation characters. You may also use all ARROW keys, 'Backspace' key and 'Delete' keys.

Once you finish typing the C program, press 'Esc' key to come to the COMMAND mode from INSERT mode. In the COMMAND mode you will not see "-- INSERT --" string at the bottom line.

While in command mode, we can enter two types of commands. These long commands and short commands. Long commands start with a Colon key and end with Enter key. As we enter this long command it will get displayed in the last line. Where as short commands will have one or more letters. While you are entering short commands, they will not get displayed, only their effect will be seen. Following are some short commands you can use:

dd	Deletes the current line on which cursor is present
2dd	Deletes 2 lines
5dd	Deletes 5 lines
100dd	Deletes 100 lines from the current line onwards
yy	Copies the current line into internal buffer
8yy	Copies 8 lines from the current lines
p	pastes the last deleted or copied lines after the current line
P	pastes the last deleted or copies lines before the current line

These are only a few short commands there are many more such commands, which you can type while you are in the command mode of vi editor.

Following are some long commands:

`:x`	Save and exit from the editor
`:q!`	Quit without saving the changes
`:w`	Write to the file without quitting from the vi editor
`:r filename`	Read another file and copy that into the current file

All the above long commands should end with ‘Enter’ key. These are only few of the many long commands available.

So after entering the complete program in insert mode, switch to command mode by pressing ‘Esc’ key and type the following two characters, followed by 'Enter' key save and exit from the editor.

```
:x
```

Then the file 'hello.c' will be saved and you will come out of the vi editor. Now you will see your favorite shell prompt.

Give 'ls' command at command prompt, and verify that 'hello.c' file is present in your directory.

4. Compile and run the above written 'hello.c' program

Enter the following command to compile your first *hello.c* program

```
$ gcc hello.c
```

If you do not see any errors, then compilation is success and executable file will be created with name 'a.out'.

Give 'ls' command at command prompt, and verify that 'a.out' file is present in your directory.

You may run this executable file by entering its name at command prompt as shown below:

```
$ a.out
```

or

```
$ ./a.out
```

5. Accessing the hard disk from DSL

The file 'hello.c' you created and 'a.out' executable file you generated will be stored in the RAM disk. RAM disk is the portion of RAM which is used as disk. So once we shutdown the system the contents of RAM disk will be lost. So it is better to save your files on the hard disk.

The DSL will find the hard disk partitions and it creates one directory for each partition in the /mnt directory. Give the following command to list the contents of /mnt directory

```
$ ls /mnt
```

If you find any directories with names such as hdaX or hdbX or hdcX or hddX (where X is numeric number), it means DSL has detected some hard disk partitions.

To mount the partition, you should become root user. To become root user enter the following command.

```
$ sudo su
```

Once you become root user, the command prompt changes to # instead of $. Now you enter the following command to mount the partition.

```
# mount /dev/hdaX    /mnt/hdaX
```

Again note that the X in the hdaX is the number you found in /mnt directory.

Once mount is successful, you can change to the mounted directory as below:

```
# cd /mnt/hdaX
```

Give 'ls' command to see the files or directories present in the partition.

In the same way you may mount other partitions you found on the hard disk. Typically you may need only one partition to keep your C programs.

You may create your own directory in this partition and change to that directory by using the following commands.

```
# mkdir  depik
# cd depik
```

Now you create a hello.c file in this directory using vi editor.

Compile and run this program.

As these files are created on the hard disk, they will be retained till you delete them.

Note:

If Windows OS is using NTFS file system, then Linux can mount window's partition (i.e. drive) only in read only mode. So from Linux we can read from windows drive but cannot write to it. Linux is capable of mounting only Windows FAT file system partitions in read write mode.

6. Accessing the USB flash disk (pen drive)

You may not have a computer for yourself. But many of your friends have got computers. So buy one USB pen drive (also called flash disk). Use your friend's PC and boot DSL. Insert the USB pen drive into USB port. Enter the following command to mount the USB pen drive:

```
# mkdir /mnt/fdisk
# mount /dev/sda1 /mnt/fdisk
```

You may work from your home directory. Before shutting down, copy all your files to "/mnt/fdisk". Before removing the USB pen drive, you MUST unmount the usb drive by giving following command:

```
# umount /dev/sda1
```

7. Installing DSL on to a hard disk

Running DSL OS every time from CD may not be very convenient. It is possible to install DSL on to a hard disk, provided:

- You have an empty partition on the hard disk.
- You have space to create a new partition

If your hard disk has already got more than one partition (called drives in windows) like C: and D: Then you can empty the D drive by saving whatever you want into C drive. Now D drive (partition) is ready to install DSL. Following are the steps to install the DSL.

- Run DSL from CD
- Identify the partition name of D drive. You can guess(select) the partition name present in the /mnt directory.
- Mount that partition as explained in section 5
- List the files and directories present in that partion, if they are identical to the files in your D drive, then that is your D drive partition.
- If contents of the partition are different, try mounting other partitions.
- Once name of the D partition is identified, right click the mouse on the desktop to get menu. From this menu select the following item.

```
Apps -> Tools -> Install to Hard Drive
```

While installing the Linux to hard disk it will ask the following questions. For each questions a sample answer is shown bold.

```
Enter the target partition name [Example : hda2]    : <your partition>
Do you wish to install the multi-user logins [y/…] : n
Use journal ext3 file system                        : n
Do you wish to continue, last chance                : y
Proceed to install bootloader  [y/…]                : y
Use [G]rub or [L]ilo bootloader    [g/l]            : l
```

You may also use the hdinstall command from the shell window.

If you have only one windows drive (C:) or both C: and D: are full with required data. In such case, you have to check whether you have some space left on the hard disk to create a new partition. To verify this enter the following command:

```
# fdisk -l
```

The above command will display total number of cylinders present on your hard disk. It also display the start cylinder and end cylinder for every partition. For each partition observe the start and end cylinder and verify whether you got any unused cylinders.

Important point to note is that you should ignore the Extended Partition. Extended partition is not a real partition; it is just a placeholder to create other partitions. So start and end cylinders of extended partition should not be counted as used cylinders.

Following is the sample output of `'fdisk -l'` command. It shows that it got total 4865 cylinders. The partition '/dev/hda2' is the extended partition and appears to occupy all the cylinders after the first partition. But observe that all the partitions from '/dev/hda5' to '/dev/hda10' are residing within the range of this extended partition. Also observe that the cylinders 3857 to 4864 are not used by any partition. So you can create a new partition by using fdisk command.

```
Disk /dev/hda: 40.0 GB, 40020664320 bytes
255 heads, 63 sectors/track, 4865 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes

Device     Boot      Start       End      Blocks   Id  System

/dev/hda1   *           1         637     5116671    b  W95 FAT32
/dev/hda2             638        4864    33953377+   f  W95 Ext'd (LBA)
/dev/hda5             638        1274     5116671    b  W95 FAT32
/dev/hda6            1275        2549    10241406   83  Linux
/dev/hda7            2550        3186     5116671   83  Linux
/dev/hda8            3187        3823     5116671   83  Linux
/dev/hda9            3824        3856      265041   82  Linux swap
```

8. Creating a new partition using fdisk

- Enter the fdisk command giving Disk name as shown below:

```
# fdisk  /dev/hda
```

- Now fdisk command will enter into interactive mode. Enter 'm' to display the fdisk sub commands.
- Enter 'p' sub command to print the partition table. The partition table printed will be same as the above one (output of 'fdisk -l')
- Enter 'n' to add a new partition. Then it prompts you to enter 'l' to create logical partition or 'p' to create primary partition. Whatever we create inside an extended partition is called logical partition. Enter 'l' to create logical partition.
- Next it will ask you to enter 'Start' cylinder, but show the default cylinder as first empty cylinder number. So press 'enter' to choose that default.
- Next it will ask you to enter 'End' cylinder. Default End cylinder will be the last cylinder. So it is trying to create a new partition with all the remaining unused cylinders. If this is OK press enter. Otherwise you can specify 'End' cylinder yourself. Instead of typing 'End' cylinder you may enter the size of partition in MB by appending letter 'M' to the number as 4000M. When M is appended to the number fdisk will take it as size in MB instead of 'End' cylinder.
- Once partition is created, you can give 'p' sub command to display the new partition table. This new partition table will display your new partition. Note down its name.
- Finally you have to give 'w' sub command to write this new partition table to the hard disk.
- Now you can install the DSL on this new partition by specifying this new partition name (see section 6).

Please send your queries, comments and feedback to *depik.help@gmail.com*

Enjoy DSL by DEPIK!

- DSL Team at DEPIK