Ubuntu directory structure

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Linux has a standard directory structure that is very easy to comprehend. No matter what runs Linux and what is the size of the distribution, or whether it is embedded on a device or not, the same directories will appear in the file system, allowing you to make your way on every machine. The list of main directories can be seen by opening a terminal window and issuing the following commands: `cd /` and `ls -l`

The first command changes the current directory to / and the next one will list all the directories in the current directory showing all the details. Let's explain what each contains.

/

This is the parent of all files and folders (devices, partitions, etc.) on a Linux machine. It's called root. Do not confuse it with the user root or with the user's root home folder!

/bin

This directory contains several useful commands that are used by both the system administrator as well as non-privileged users. /bin usually contains the shells like bash, csh etc. as well as the much used commands like `cp` (copy), `mv` (move/rename), `rm` (remove), `cat` (concatenates files and displays them to the standard output), `ls` (list directory contents). There also is */usr/bin*, which contains other user binaries (not essential for the user). The binaries in */bin* however, a user cannot do without.

/boot

This directory contains the *system.map* file as well as the Linux kernel.

GRUB (the boot manager) places the boot sector backups in this directory.

/dev

This is a very interesting directory that highlights one important characteristic of the Linux file system stated earlier – everything is a file or a directory.

/etc

This directory contains all the configuration files for your system, usually in the form of *filename.conf*.

/home

Linux is a multi-user environment, so each user is also assigned a specific directory which is accessible only to them and the system administrator. These are the user home directories, which can be found under */home/username.* This directory also contains the user specific settings for programs.

/lib

This contains all the shared libraries that are required by system programs. Windows equivalent to a shared library would be a DLL file.

/lost+found

Linux should always go through a proper shutdown. Sometimes your system might crash or a power failure might take the machine down. Either way, at the next boot, a lengthy file system check using *e2fsck* will be done. *e2fsck* will go through the system and try to recover any corrupt files that it finds. The result of this recovery opera-
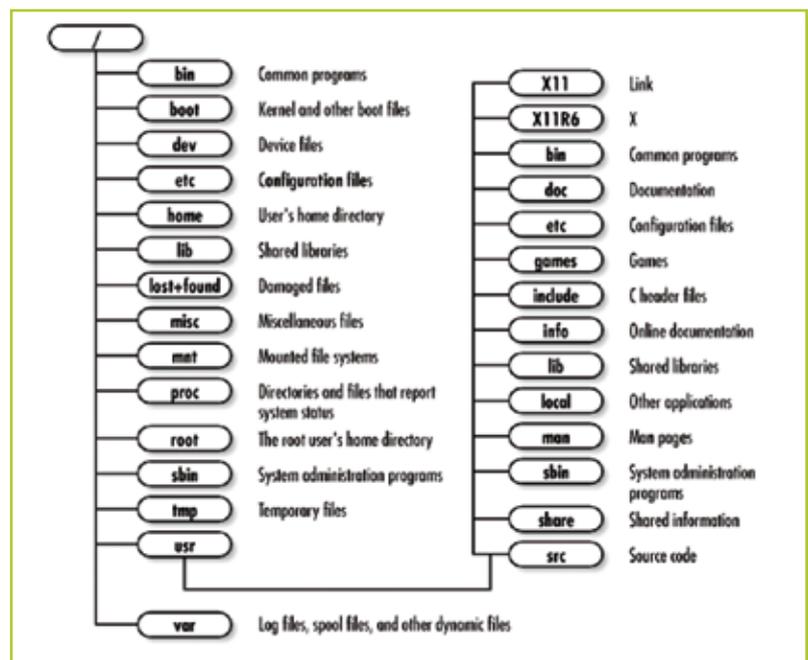

Figure 1. *Debian's directory structure*

tion will be placed in this directory. The files recovered are not likely to be complete or make much sense but there always is a chance that something worthwhile is recovered.

/media

This folder keeps all the removable drives that can be mounted automatically to the file system. Inside you will find at least a folder identifying your optical unit. SD cards and USB devices are mounted here too. This folder isn't a standard one in Linux but is encountered in many distributions.

/mnt

This is a generic mount point under which you mount your file systems or devices. Mounting is the process by which you make a file system available to the system. After mounting your files, they will be accessible under the *mount-point*. This directory usually contains mount points or sub-directories where you mount your floppy and your CD. You can also create additional mount-points here if you want. There is no limitation to creating a mount-point anywhere on your system but convention says that you do not litter your file system with mount-points.

/opt

This directory contains all the software and add-on packages that are not part of the default installation. It is not used very often as it's mostly a standard in Unix installations.

/proc

A special directory that identifies all your processes in real time.

/root

The home directory of the user root. This is not to be confused with the system root, which is directory at the highest level in the file system.

/sbin

/sbin contains binaries just like */bin* does, only that these are available only for the root user, other users not having privileges to work with them.

/selinux

Security-Enhanced Linux (SELinux) is a Linux feature that provides a variety of security policies, including the U.S. Department of Defense style of mandatory access controls, through the use of *Linux Security Modules* (LSM) in the Linux kernel. This folder thus contains all the files necessary for SELinux, but only if SELinux is installed on the system. Ubuntu is one of the few Linux distributions that support the use of this security enhancement.

/tmp

This contains mostly files that are required temporarily. Many programs use this to create lock files and for temporary storage of data. On some systems, this directory is cleared out at boot or at shutdown.

/usr

One of the most important directories in the system as it contains all the user binaries. X and its supporting libraries can be found here. User programs like *telnet*, *ftp* are also placed here. */usr/doc* contains useful system documentation. */usr/src/linux* contains the source code for the Linux kernel.

/var

It contains spooling data like mail and also the output from the printer daemon. The system logs are also kept here in */var/log/messages*.

Depending on the file permissions, a regular user might have the right or not to view, delete or move a file/folder. To check file permissions you must either right click the folder in Nautilus (the file explorer used in Ubuntu) and go to the permissions tab. If you are using the terminal, issue a `ls -l` command for the file or folder that you want to find out the details:

```
drwxr-xr-x 2 radu radu 4096 ↵
   2009-07-23 22:27 Linux ↵
   identity
```

The permissions are the first 10 characters in the output from above. From left to right, they have the following meaning:

- d/l – directory or symbolic link (a symbolic link represents what a Windows user might call a shortcut to another file or folder).
- r/- – r means that the owner (which is indicated in the 3rd string) has the right to read the file/folder. - means that the owner doesn't have the right to read the folder, even if he owns it.
- w/- – same as above, only this one indicates the write right.
- x/- – same as r/-, but this indicates the execution right. For folders the x means that a user can browse to them. Without the x bit marked on a folder, that folder is not browseable.
- The following succession of three represents the rights of the group the owner belongs to (which is indicated in the 4th string).
- The last succession of three represents the rights for every other user.

Linux's directory structure has a nice architecture that is meant to be simple and productive. Once you will start to work a little bit more with the terminal, you will be very familiar with this tree and will start to know better where is what and where should you look for different files.

Note that there are hidden file and folders in Linux too, only that they are marked with a starting dot (.) in their name. For example a file/folder with the name *.radu* will be hidden. To view it, press [*Ctrl*] + [*H*] in Nautilus, or issue the `ls` command adding the *-a* argument to it. ■