Lab Assignment 5	**L5**
Corresponding to Topics 6 & 7, "File Systems"	

Main goals

- To understand basic concepts of filesystems, such as performance tuning and availability improvement.

- Partition management (format, mount, umount, join resize...).

- Extending File System size through logical volumes.

- Error protection (RAID systems) and recovery (Backup tools).

Part 1: Filesystems

1) **Add, in the configuration of your virtual machine in VirtualBOX, a new disk to the SATA controller with 2GB capacity (disk /dev/sdb).**

2) **Create an initial Snapshot for this part (snapShot_mod6).**

3) **Basic (first session):**

   a) Create, on the new disk, 5 partitions of 400MB each and format them. One of them will have an **ext3** filesystem, another one will have **reiserfs**, another one will have **xfs** and the remaining two will have **ext2**.

   b) Mount the partitions permanently in "/disco{x}", where x = 1 ... 5.

   c) What is the difference between `/etc/mtab` and `/etc/fstab`?

   d) Which of the employed filesystems requires more space? Why?

   e) Is it possible to access to an ext3 partition if it has been mounted in ext2 mode? And what about the other way around? Why?

   f) Download the ISO file of Debian Installer (live CD) and boot the virtual machine from it. (rescue mode).

   g) Join the first three partitions in a unique partition of ext3 type (the same way as we formatted before and without creating a new filesystem).

   h) Restore the journaling mechanism once we have resized the filesystem.

   i) Include the content of the /var directory in the new partition that you have just created. Once this has been done, resize it again, so that the size of the partition is the smallest possible. This partition can be equivalent to a snapshot for the real system.

4) **Advanced:**

a) Delete the partitions created in the previous section. (disk /dev/sdb).

b) Add a new auxiliary disk of 2GB to the virtual machine (/dev/sdc).

c) Create two partitions of the same size on each of the auxiliary disks. Create a logical volume with 3 of these 4 partitions and create an ext4 filesystem with 100% of the available space.

d) Mount the created filesystem in a directory and check its state, that is to say, copy any of the files of the root's filesystems on it.

e) Add the 4th partition to the logical volume and extend the filesystem to the total size of the logical volume. Check that the copied content is still available.

f) Delete the previous logical volume (use the proper commands). Create a RAID 5 system with the three available partitions. Create an ext4 filesystem for the RAID 5 system and make it accessible. Copy the content of /var directory on it. Add a simulated failure on the third disk (–f). Recover the content of the lost information using the free available partition.

g) Check the recovery process of the RAID system.

h) Restore the virtual system to the initial Snapshot created at the beginning (snapShot_mod6).

5) Backup:

a) Create 2 partitions of 1GB each on the disks added in the previous section (/dev/sdb) and format both with ext4. The `/var` directory must be mounted under one of the partitions (permanently...), and mount the other partition in a directory called /backups (permanently too...).

b) Perform a backup (at filesystem level) of the /var partition content (store the backup in the /backups directory). This security backup must be designed to make incremental backups in the future. How/Where can you find evidence of the backup process performed by dump tool?

c) Create an empty directory in /var. Reboot the system.

d) Make an incremental backup level 1 and check that it's registered.

e) Verify the content of both backups.

f) Restore all the backup files in the directory `/var/restore`.

6) Restore the virtual system to the initial Snapshot.

Part 2: Shell scripting