

# ATOL: Filesystems and Their Management

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Advanced Topics of Linux Administration

# Creating partitions

- ▶ *fdisk*, *cdisk* – view and manage partition tables
- ▶ List partition tables from command line
- ▶ *partprobe* – inform the OS of partition table changes
- ▶ *cat /proc/partitions*

# Making Filesystems

- ▶ *mkfs*
- ▶ *mkfs.ext2*, *mkfs.ext3*, *mkfs.msdos*
- ▶ Specific filesystem utilities can be called directly
  - ▶ *mke2fs [options] device*

# Filesystem Labels

- ▶ Alternate way to refer to devices
- ▶ Device independent
  - ▶ *e2label devfile [fslabel]*
  - ▶ *mount [options] LABEL=fslabel mountpoint*
- ▶ *blkid* – used to see labels and filesystems type of all devices

# Mount Points and `/etc/fstab`

- ▶ Configuration of the filesystem hierarchy
- ▶ Used by *mount*, *fsck* and other programs
- ▶ Maintains the hierarchy between system reboots
- ▶ May use filesystem volume labels in the device field
- ▶ The *mount -a* command can be used to mount all filesystems listed in `/etc/fstab`

# Unmounting Filesystems

- ▶ *umount [options] device—mountpoint*
- ▶ You cannot unmount a filesystem that is in use
  - ▶ Use *fuser* to check and/or kill processes
- ▶ Use the *remount* option to change a mounted filesystem's options atomically
  - ▶ *mount -o remount,ro /data*

# Handling Swap Files and Partitions

- ▶ Swap space is a supplement to system RAM
- ▶ Basic setup involves:
  - ▶ Create a swap partition or file
  - ▶ Write special signature using *mkswap*
  - ▶ Add appropriate entries to */etc/fstab*
  - ▶ Activate swap space with *swapon -a*

# Software RAID Configuration

- ▶ Create and define RAID devices using *mdadm*
  - ▶ *mdadm -C /dev/md0 -a yes -l 1 -n 2 -x 1 elements*
- ▶ Format each RAID device with a filesystem
  - ▶ *mke2fs -k /dev/md0*
- ▶ Test the RAID devices
- ▶ allows to check the status of your RAID devices
  - ▶ *mdadm --detail /dev/md0*

# Software RAID Testing and Recovery

- ▶ Simulating disk failures
  - ▶ `mdadm /dev/md0 -f /dev/sda1`
- ▶ Recovering from a software RAID disk failure
  - ▶ replace the failed hard drive and power on
  - ▶ reconstruct partitions on the replacement drive
  - ▶ `mdadm /dev/md0 -a /dev/sda1`
- ▶ `mdadm`, `/proc/mdstat` and `syslog` messages

# What is Logical Volume Manager?

- ▶ A layer of abstraction that allows easy manipulation of volumes. Including resizing of filesystems.
- ▶ Allow reorganization of filesystems across multiple physical devices
  - ▶ Devices are designated as Physical Volumes (PV)
  - ▶ One or more PV are used to create a Volume Group (VG)
  - ▶ PV are defined with Physical Extents of a fixed size
  - ▶ Logical Volumes (LV) are created on PV and are composed of Physical Extents
  - ▶ Filesystems may be created on Logical Volumes

# Creating Logical Volumes

- ▶ Create physical volumes
  - ▶ `pvccreate /dev/sda3`
- ▶ Assign physical volumes to volume groups
  - ▶ `vgcreate vg0 /dev/sda3`
- ▶ Create logical volumes from volume groups
  - ▶ `lvcreate -L 256M -n data vg0`
  - ▶ `mke2fs -j /dev/vg0/data`

# Resizing Logical Volumes

- ▶ Growing Volumes
  - ▶ *lvextend* can grow logical volumes
  - ▶ *resize2fs* can grow EXT3 filesystems online
  - ▶ *vgextend* adds new physical volumes to an existing volume group
- ▶ Shrinking Volumes
  - ▶ Filesystem have to be reduced first
  - ▶ Requires a filesystem check and cannot be performed online
  - ▶ *lvreduce* can then reduce volume
- ▶ Volume Groups can be reduced with:
  - ▶ *pvmove /dev/sda3*
  - ▶ *vgreduce vg0 /dev/sda3*

# Lab: Installation

- ▶ Goals:
  - ▶ Deploy LVM on the software RAID device
  - ▶ Create a group with two partitions such that new partition could be added, and the filesystem could be extended

## Lab: Prepare a paper

- ▶ Themes:
  - ▶ Compare software and hardware RAID
  - ▶ Compare filesystems in Linux (ext2, ext3, reiser, gfs, ...)
- ▶ Format:
  - ▶ Short presentation (15–20 minutes; 5-7 slides)
  - ▶ Paper containing comparison (500 words)