Logical Volume Manager (LVM)

This is a quick and dirty cheat sheet on LVM using Linux, I have highlighted many of the common attributes for each command however this is not an extensive list, make sure you look up the command.

With the pvs, vgs and lvs commands, the number of verboses added the more verbose information for example pvs -vvvvv

Directory and Files	
Directories and Files	## Directories /etc/lvm - default lvm directory location /etc/lvm/backup - where the automatic backups go /etc/lvm/cache - persistent filter cache /etc/lvm/archive - where automatic archives go after a volume group change /var/lock/lvm - lock files to prevent metadata corruption # Files /etc/lvm/lvm.conf - main lvm configuration file $HOME/.lvm - lvm history
Tools	
diagnostic	lvmdump lvmdump -d <dir> dmsetup [info|ls|status] Note: by default the lvmdump command creates a tar ball
Physical Volumes	
display	pvdisplay -v pvs -v pvs -a pvs --segments (see the disk segments used) **pvs attributes are:** 1. (a)llocatable 2. e(x)ported
scanning	pvscan -v Note: scans for disks for non-LVM and LVM disks
adding	pvcreate /dev/sdb1 ## Create physical volume with specific UUID, used to recover volume groups (see miscellaneous section) pvcreate --uuid <UUID> /dev/sdb1 **Common Attributes that you may want to use:** -M2 create a LVM2 physical volume
removing	pvremove /dev/sdb1
checking	pvck -v /dev/sdb1 Note: check the consistency of the LVM metadata
change physical attributes	## do not allow allocation of extents on this drive, however the partition must be in a vg otherwise you get an error pvchange -x n /dev/sdb1 **Common Attributes that you may want to use:** --addtag add a tag -x allowed to allocate extents -u change the uuid
moving	pvmove -v /dev/sdb2 /dev/sdb3 Note: moves any used extents from this volume to another volume, in readiness to remove that volume. However you cannot use this on mirrored volumes, you must convert back to non-mirror using "lvconvert -m 0"
Volume Groups	
display	vgdisplay -v vgs -v vgs -a -o +devices **vgs flags:** #PV - number of physical devices #LV - number of configured volumes **vgs attributes are:** 1. permissions (r)|(w) 2. resi(z)eable 3. e(x)ported 4. (p)artial 5. allocation policy - (c)ontiguous, c(l)ing, (n)ormal, (a)nywhere, (i)nherited 6. (c)luster
scanning	vgscan -v
creating	vgcreate VolData00 /dev/sdb1 /dev/sdb2 /dev/sdb3 vgcreate VolData00 /dev/sdb[123]

	## Use 32MB extent size vgcreate VolData00 -s 32 /dev/sdb1 **Common Attributes that you may want to use:** -l maximum logical volumes -p maximum physical volumes -s physical extent size (default is 4MB) -A autobackup
extending	vgextend VolData00 /dev/sdb3
reducing	vgreduce VolData00 /dev/sdb3 vgreduce --removemissing --force VolData00
removing	vgremove VolData00 **Common Attributes that you may want to use:** -f force the removal of any logical volumes
checking	vgck VolData00 Note: check the consistency of the LVM metadata
change volume attributes	vgchange -a n VolData00 **Common Attributes that you may want to use:** -a control availability of volumes within the group -l maximum logical volumes -p maximum physical volumes -s physical extent size (default is 4MB) -x resizable yes or no (see VG status in vxdisplay)
renaming	vgrename VolData00 Data_Vol_01 note: the volume group must not have any active logical volumes
converting metadata type	vgconvert -M2 VolData00 Note: vgconvert allows you to convert from one type of metadata format to another for example from LVM1 to LVM2, LVM2 offers bigger capacity, clustering and mirroring
merging	# the old volumes group will be merged into the new volume group vgmerge New_Vol_Group Old_Vol_Group Note: you must unmount any fielsystems and deactivate the vg that is being merged "vgchange -a n <vg>", then you can activiate it again afterwards "vgchange -a y <vg>", then perform a vgscan, dont forget to backup the configuration
spliting	vgsplit Old_Vol_Group New_Vol_Group [physical volumes] [-n logical volume name]
importing	vgimport VolData00 **Common Attributes that you may want to use:** -a import all exported volume groups
exporting	## to see if a volume has already been export use "vgs" and look at the third attribute should be a x vgexport VolData00 **Common Attributes that you may want to use:** -a export all inactive volume groups
backing up	## Backup to default location (/etc/lvm/backup) vgcfgbackup VolData00 # Backup to specific location vgcfgbackup -f /var/backup/VolData00_bkup VolData00 # Backup to specific location all volume groups (notice the %s) vgcfgbackup -f /var/backup/vg_backups_%s Note: the backup is written in plain text and are by default located in /etc/lvm/backup
restoring	vgcfgrestore -f /var/backup/VolData00_bkup VolData00 **Common Attributes that you may want to use:** -l list backups of file -f backup file -M metadatatype 1 or 2
cloning	vgimportclone /dev/sdb1 Note: used to import and rename duplicated volume group
special files	vgmknodes VolData00 Note: recreates volume group directory and logical volume special files in /dev
Logical Volumes	
display	lvdisplay -v lvdisplay --maps display mirror volumes lvs -v lvs -a -o +devices

	## lvs commands for mirror volumes lvs -a -o +devices lvs -a -o +seg_pe_ranges --segments ## Stripe size lvs -v --segments lvs -a -o +stripes,stripesize ## use complex command lvs -a -o +devices,stripes,stripesize,seg_pe_ranges --segments **lvs attributes are:** 1. volume type: (m)irrored, (M)irrored without initail sync, (o)rigin, (p)vmove, (s)napshot, invalid (S)napshot, (v)irtual, mirror (i)mage mirror (I)mage out-of-sync, under (c)onversion 2. permissions: (w)rite, (r)ead-only 3. allocation policy - (c)ontiguous, c(l)ing, (n)ormal, (a)nywhere, (i)nherited 4. fixed (m)inor 5. state: (a)ctive, (s)uspended, (I)nvalid snapshot, invalid (S)uspended snapshot, mapped (d)evice present with-out tables, mapped device present with (i)nactive table 6. device (o)pen (mounted in other words)
scanning	lvscan -v lvmdiskscan
creating	## plain old volume lvcreate -L 10M VolData00 ## plain old volume but use extents, use 10 4MB extents (if extent size is 4MB) lvcreate -l 10 VolData00 ## plain old volume but with a specific name web01 lvcreate -L 10M -n web01 VolData00 ## plain old volume but on a specific disk lvcreate -L 10M VolData00 /dev/sdb1 ## a striped volume called lvol1 (note the captial i for the stripe size), can use -l (extents) instead of -L lvcreate -i 3 -L 24M -n lvol1 vg01 ## Mirrored volume lvcreate -L 10M -m1 -n data01 vg01 ## Mirrored volume without a mirror log file lvcreate -L 10M -m1 --mirrorlog core -n data01 vg01 **Common Attributes that you may want to use:** -L size of the volume [kKmMgGtT] -l number of extents -C contiguous [y|n] -i stripes -I stripe size -m mirrors --mirrorlog -n volume name
extending	lvextend -L 20M /dev/VolData00/vol01 **Common Attributes that you may want to use:** -L size of the volume [kKmMgGtT] -l number of extents -C contiguous [y|n] -i stripes -I stripe size Note: you can extend a ext2/ext3 filesystem using the "resize2fs" or "fsadm" command fsadm resize /dev/VolData01/data01 resize2fs -p /dev/mapper/VolData01-data01 [size] The -p option displays bars of progress while extendingthe filesystem
reducing/resizing	lvreduce -L 5M /dev/VolData00/vol01 lvresize -L 5M /dev/VolData00/vol01 Note: rounding will occur when extending and reducing volumes to the next extent (4MB by default), you can use resize2fs or fsadm to shrink the filesystem fsadm resize /dev/VolData01/data01 [size] resize2fs -p /dev/mapper/VolData01-data01 [size]
removing	lvremove /dev/VolData00/vol01
adding a mirror to a non-mirrored volume	lvconvert -m1 --mirrorlog core /dev/VolData00/vol01 /dev/sdb2 Note: you can also use the above command to remove a unwanted log
removing a mirror from a mirrored volume	lvconvert -m0 /dev/VolData00/vol01 /dev/sdb2

	Note: the disk in the command is the one you want to remove
Mirror a volume that has stripes	lvconvert --stripes 3 -m1 --mirrorlog core /dev/VolData00/data01 /dev/sdd1 /dev/sde1 /devsdf1
change volume attributes	lvchange -a n /dev/VolData00/vol01 **Common Attributes that you may want to use:** -a availability -C contiguous [y|n]
renaming	lvrename /dev/VolData00/vol_old /dev/VolData00/vol_new
snapshotting	lvcreate --size 100M --snapshot -name snap /dev/vg01/data01
Miscellaneous	
Simulating a disk failure	dd if=/dev/zero of=/dev/sdb2 count=10
reparing a failed mirror no LVM corruption	## check volume, persume /dev/sdb2 has failed lvs -a -o +devices # remove the failed disk from the volume (if not already done so) , this will convert volume into a non-mirrored volume vgreduce --removemissing --force VolData00 ## replace the disk physically, remember to partion it with type 8e fdisk /dev/sdb ..... ## add new disk to LVM pvcreate /dev/sdb2 ## add the disk back into volume group vgextend VolData00 /dev/sdb2 ## mirror up the volume lvconvert -m1 --mirrorlog core /dev/VolData00/vol02 /dev/sdb2
corrupt LVM metadata without replacing drive	# attempt to bring the volume group online vgchange -a y VolData00 # Restore the LVM configation vgcfgrestore VolData00 # attempt to bring the volume grou online vgchange -a y VolData00 # file system check e2fsck /dev/VolData00/data01
corrupt LVM metadata but replacing the faulty disk	# attempt to bring the volume group online but you get UUID conflict errors make note of the UUID number vgchange -a y VolData00 vgchange -a n VolData00 ## sometimes it my only be a logical volume problem lvchange -a y /dev/VolData00/web02 lvchange -a n /dev/Voldata00/web02 ## replace the disk physically, remember to partion it with type 8e fdisk /dev/sdb ..... # after replacing the faulty drive the disk must have the previuos UUID number or you can get it from /etc/lvm directory pvcreate --uuid <**previous UUID number taken from above command**> /dev/sdb2 # Restore the LVM configation vgcfgrestore VolData00 # attempt to bring the volume group online or logical volume vgchange -a y VolData00 lvchange -a y /dev/VolData00/web02 # file system check e2fsck /dev/VolData00/data01 Note: if you have backed the volume group configuration you can obtain the UUID number in the backup file by default located in /etc/lvm/backup or running "pvs -v"

For other LVM's and Array utilities see my LVM central page