Comparison and Performance Analysis of Standard and LVM Based Disk Partitioning

Aswin Babu K

College of Engineering Trivandrum

16th September 2018

File Systems

File Systems

- Computers use secondary storage for permanent data storage

File Systems

- Computers use secondary storage for permanent data storage
- File Systems specify the format for read/write tasks

File Systems

- Computers use secondary storage for permanent data storage
- File Systems specify the format for read/write tasks
- Examples: ext4, XFS, FAT32, NTFS

File Systems

- Computers use secondary storage for permanent data storage
- File Systems specify the format for read/write tasks
- Examples: ext4, XFS, FAT32, NTFS
- Partitions are containers on which file systems are created

File Systems

- Computers use secondary storage for permanent data storage
- File Systems specify the format for read/write tasks
- Examples: ext4, XFS, FAT32, NTFS
- Partitions are containers on which file systems are created
- Partitions need not be the entire size of the drive

File Systems

- Computers use secondary storage for permanent data storage
- File Systems specify the format for read/write tasks
- Examples: ext4, XFS, FAT32, NTFS
- Partitions are containers on which file systems are created
- Partitions need not be the entire size of the drive
- Creating multiple partitions is the norm

File Systems

- Computers use secondary storage for permanent data storage
- File Systems specify the format for read/write tasks
- Examples: ext4, XFS, FAT32, NTFS
- Partitions are containers on which file systems are created
- Partitions need not be the entire size of the drive
- Creating multiple partitions is the norm
- Each partition need not have the same file system

Disk Partitioning

Disk Partitioning

- The process of creating partitions

Disk Partitioning

- The process of creating partitions
- Entirely logical process

Disk Partitioning

- The process of creating partitions
- Entirely logical process
- Partition utilities include fdisk, parted and diskutil

Why multiple Partitions?

Why multiple Partitions?

- Separate user data from system files

Why multiple Partitions?

- Separate user data from system files
- Run multiple Operating Systems

Why multiple Partitions?

- Separate user data from system files
- Run multiple Operating Systems
- Organize personal data

Partition Table

Partition Table

- Stores information about the partitions

Partition Table

- Stores information about the partitions
- Several formats exist, eg. APM, MBR, GUID, diskLabel

Partition Table

- Stores information about the partitions
- Several formats exist, eg. APM, MBR, GUID, diskLabel
- Most of the older PCs use Master Boot Record

Partition Table

- Stores information about the partitions
- Several formats exist, eg. APM, MBR, GUID, diskLabel
- Most of the older PCs use Master Boot Record
- Newer PCs use GUID Partition Table

Partition Table

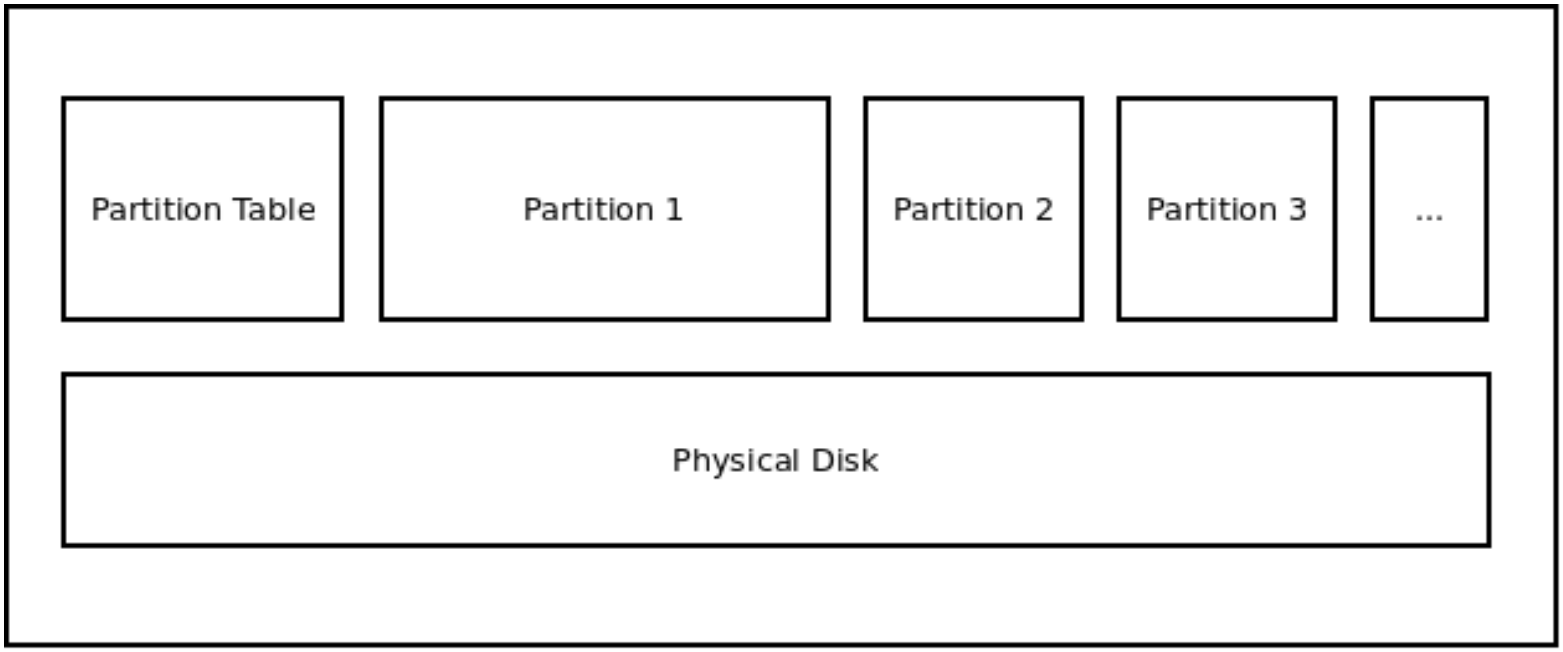

Figure 1: A typical partition table

Disadvantages of Standard Partition Model

Disadvantages of Standard Partition Model

- Mounted partitions cannot be manipulated

Disadvantages of Standard Partition Model

- Mounted partitions cannot be manipulated
- Partitions can use only adjacent free space during resize

Disadvantages of Standard Partition Model

- Mounted partitions cannot be manipulated
- Partitions can use only adjacent free space during resize
- You cannot extend a partition to cover two physical drives

Logical Volume Manager

Logical Volume Manager

- An abstraction on top of an abstraction

Logical Volume Manager

- An abstraction on top of an abstraction
- Creates logical volumes, on top of existing partitions

Logical Volume Manager

- An abstraction on top of an abstraction
- Creates logical volumes, on top of existing partitions
- Existing partitions are called Physical Volumes (PV)

Logical Volume Manager

- An abstraction on top of an abstraction
- Creates logical volumes, on top of existing partitions
- Existing partitions are called Physical Volumes (PV)
- One or more physical volumes form Volume Groups (VG)

Logical Volume Manager

- An abstraction on top of an abstraction
- Creates logical volumes, on top of existing partitions
- Existing partitions are called Physical Volumes (PV)
- One or more physical volumes form Volume Groups (VG)
- Logical Volumes (LV) are created on top of VGs

Logical Volume Manager

- An abstraction on top of an abstraction
- Creates logical volumes, on top of existing partitions
- Existing partitions are called Physical Volumes (PV)
- One or more physical volumes form Volume Groups (VG)
- Logical Volumes (LV) are created on top of VGs
- Device Mapper acts as middle man between LVM and Linux

Logical Volume Manager

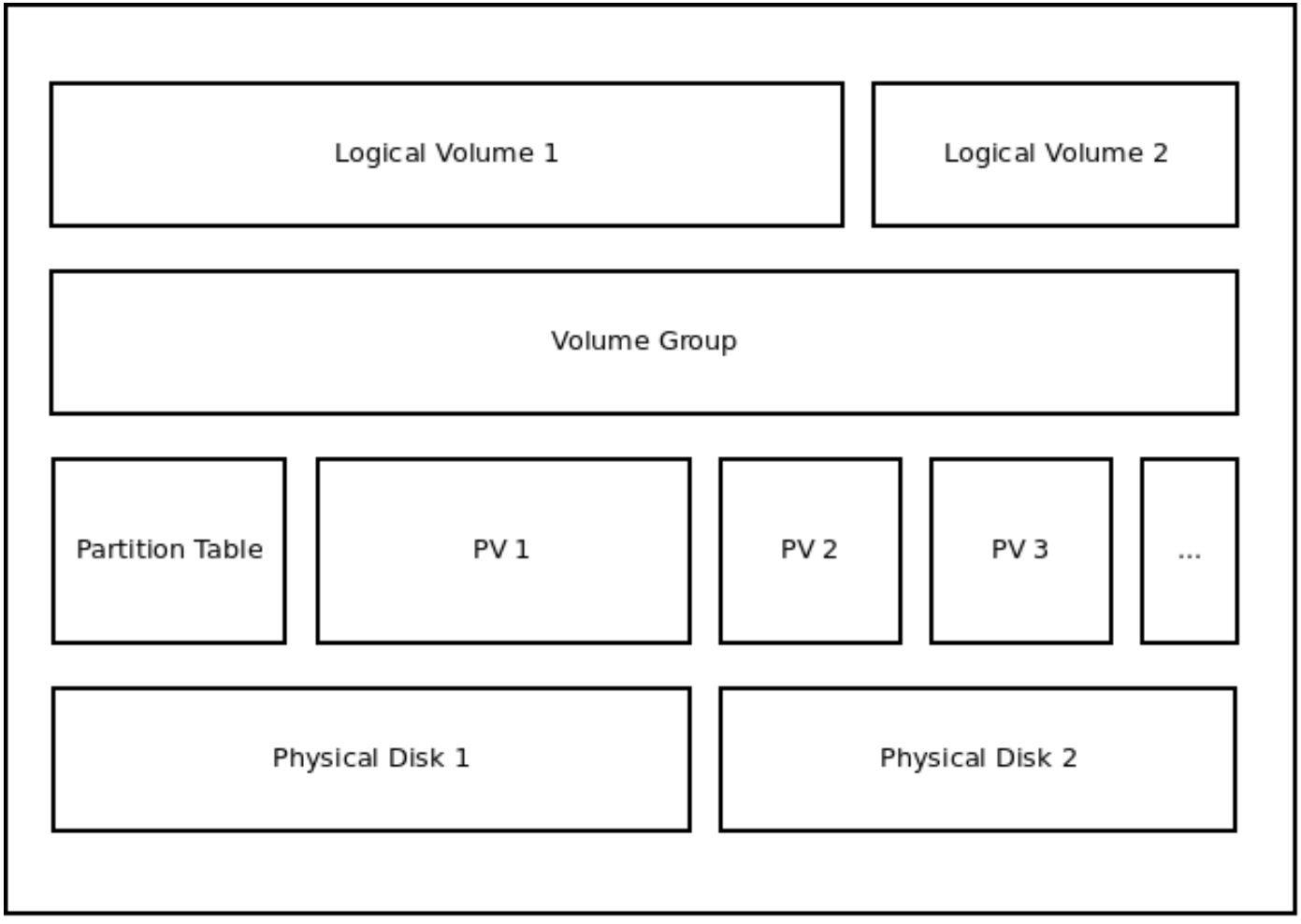

Figure 2: A typical LVM setup

Features of LVM

Features of LVM

- Mounted volumes can be manipulated

Features of LVM

- Mounted volumes can be manipulated
- Partitions can span more than one physical drive

Features of LVM

- Mounted volumes can be manipulated
- Partitions can span more than one physical drive
- Creation of snapshots while system is up

Features of LVM

- Mounted volumes can be manipulated
- Partitions can span more than one physical drive
- Creation of snapshots while system is up
- Allows creating striped volume

LVM vs RAID

- (10-¿Spanned volumes not possbile

LVM vs RAID

- Redundant Array of Independant Disks

- (10-¿Spanned volumes not possbile

LVM vs RAID

- Redundant Array of Independant Disks
- RAID allows combining drives for reliability, performance

- (10-¿Spanned volumes not possbile

LVM vs RAID

- Redundant Array of Independant Disks
- RAID allows combining drives for reliability, performance
- Eight standard modes RAID level 0 to 7

- (10-¿Spanned volumes not possbile

LVM vs RAID

- Redundant Array of Independant Disks
- RAID allows combining drives for reliability, performance
- Eight standard modes RAID level 0 to 7
- RAID Level 5 and up gives Striping + Parity

- (10-¿Spanned volumes not possbile

LVM vs RAID

- Redundant Array of Independant Disks
- RAID allows combining drives for reliability, performance
- Eight standard modes RAID level 0 to 7
- RAID Level 5 and up gives Striping + Parity
- Higher performance than LVM striping

- (10-¿Spanned volumes not possbile

LVM vs RAID

- Redundant Array of Independant Disks
- RAID allows combining drives for reliability, performance
- Eight standard modes RAID level 0 to 7
- RAID Level 5 and up gives Striping + Parity
- Higher performance than LVM striping
- RAID 5 requires at least three drives

- (10-¿Spanned volumes not possbile

LVM vs RAID

- Redundant Array of Independant Disks
- RAID allows combining drives for reliability, performance
- Eight standard modes RAID level 0 to 7
- RAID Level 5 and up gives Striping + Parity
- Higher performance than LVM striping
- RAID 5 requires at least three drives
- All drives must be of same capacity

- (10-¿Spanned volumes not possbile

LVM vs RAID

- Redundant Array of Independant Disks
- RAID allows combining drives for reliability, performance
- Eight standard modes RAID level 0 to 7
- RAID Level 5 and up gives Striping + Parity
- Higher performance than LVM striping
- RAID 5 requires at least three drives
- All drives must be of same capacity
- Does not offer snapshots
- (10-¿Spanned volumes not possbile

LVM vs RAID

- Redundant Array of Independant Disks
- RAID allows combining drives for reliability, performance
- Eight standard modes RAID level 0 to 7
- RAID Level 5 and up gives Striping + Parity
- Higher performance than LVM striping
- RAID 5 requires at least three drives
- All drives must be of same capacity
- Does not offer snapshots
- (10-¿Spanned volumes not possbile

LVM vs RAID

- Redundant Array of Independant Disks
- RAID allows combining drives for reliability, performance
- Eight standard modes RAID level 0 to 7
- RAID Level 5 and up gives Striping + Parity
- Higher performance than LVM striping
- RAID 5 requires at least three drives
- All drives must be of same capacity
- Does not offer snapshots
- (10-¿Spanned volumes not possbile
- Mounted partitions cannot be manipulated

Disadvantages of LVM

Disadvantages of LVM

- Only supported under Linux

Disadvantages of LVM

- Only supported under Linux
- Drive failure while using striped volume cause data loss

Disadvantages of LVM

- Only supported under Linux
- Drive failure while using striped volume cause data loss

Disadvantages of LVM

- Only supported under Linux
- Drive failure while using striped volume cause data loss
- Lower performance than standard partitioning

LVM Performance

LVM Performance

- On average, LVM is 5% slower than standard partitioning

LVM Performance

- On average, LVM is 5% slower than standard partitioning
- LVM based machines takes around 20% more time to boot

Conclusion

Conclusion

- LVM greatly eases the task of system administration

Conclusion

- LVM greatly eases the task of system administration
- Performance penality is mostly negligible

Source Code

https://github.com/karuvally/lvm_seminar.git