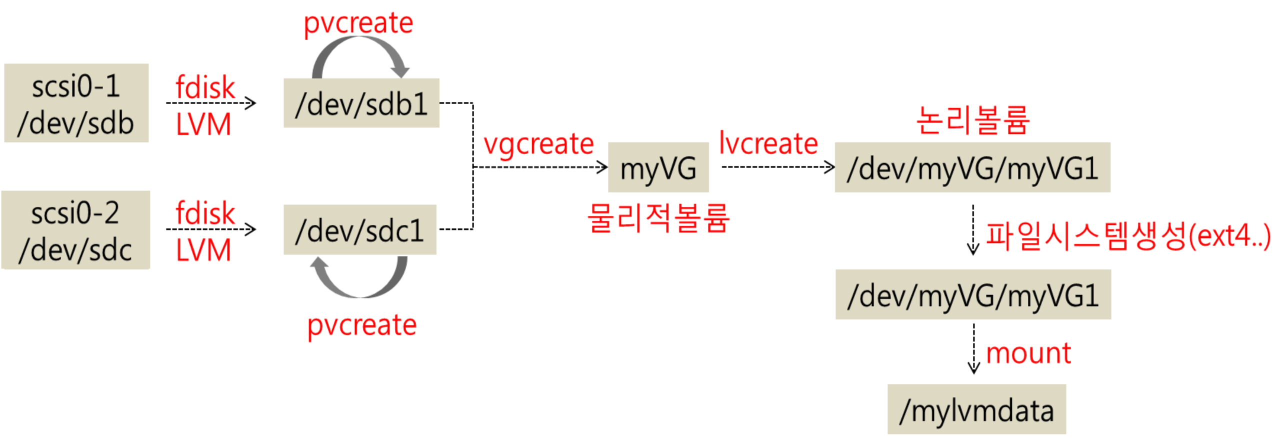
하드디스크관리 3

LVM(Logical Volume Manager)

- 여러 개의 물리적 하드디스크 파티션을 합쳐서 한 개의 파일시스템으로 사용한다.
- 파티션을 추가 또는 제거하고 크기를 조절할 수 있다.
- 디스크 파티션을 효율적으로 관리하고 부족한 디스크 공간을 변경할 수 있다.
- 작은 용량의 하드디스크 여러 개를 큰 용량의 하드디스크 한 개처럼 사용할 수 있다.
- 운용 서버에서 대용량의 별도 저장 공간이 필요할 때 활용할 수 있다.
- 용어
  - Physical Volume(PV, 물리 볼륨) : /dev/sda1, /dev/sdb1, /dev/sdc1
  - Volume Group(VG, 볼륨 그룹) : Physical Volume 을 합쳐서 1 개의 물리적 그룹으로 만드는 것
  - Logical Volume(LV, 논리 볼륨) : Volume Group 을 나눠서 논리적 그룹으로 나눈 것(1 개 이상)
  - Physical Extent : PV 가 갖는 일정한 블록
  - Logical Extent : LV 가 갖는 일정한 블록

/dev/sdb, /dev/sdc 두 개의 디스크로 논리 볼륨만들기



1. /dev/sdb, /dev/sdc 디스크 확인

```
# fdisk -l /dev/sdb /dev/sdc

  Disk /dev/sdb: 106 MB, 106954752 bytes, 208896 sectors
  Units = sectors of 1 * 512 = 512 bytes
  Sector size (logical/physical): 512 bytes / 512 bytes
  I/O size (minimum/optimal): 512 bytes / 512 bytes
  Disk label type: dos
  Disk identifier: 0x0003e5bb

     Device Boot      Start         End      Blocks   Id  System
  WARNING: fdisk GPT support is currently new, and therefore in an experimental phase. Use
  at your own discretion.

  Disk /dev/sdc: 213 MB, 213909504 bytes, 417792 sectors
  Units = sectors of 1 * 512 = 512 bytes
  Sector size (logical/physical): 512 bytes / 512 bytes
  I/O size (minimum/optimal): 512 bytes / 512 bytes
  Disk label type: gpt


  #         Start          End    Size  Type            Name
```

2. fdisk 명령어로 /dev/sdb 를 linux LVM 으로 만듬

```
# fdisk /dev/sdb
  Welcome to fdisk (util-linux 2.23.2).

  Changes will remain in memory only, until you decide to write them.
  Be careful before using the write command.


  Command (m for help): p

  Disk /dev/sdb: 106 MB, 106954752 bytes, 208896 sectors
```

```
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk label type: dos
Disk identifier: 0x0003e5bb

   Device Boot      Start         End      Blocks   Id  System

Command (m for help): n
Partition type:
   p   primary (0 primary, 0 extended, 4 free)
   e   extended
Select (default p): p
Partition number (1-4, default 1): 1
First sector (2048-208895, default 2048): [Enter Key]
Using default value 2048
Last sector, +sectors or +size{K,M,G} (2048-208895, default 208895): [Enter Key]
Using default value 208895
Partition 1 of type Linux and of size 101 MiB is set

Command (m for help): t
Selected partition 1
Hex code (type L to list all codes): L

 0  Empty           24  NEC DOS         81  Minix / old Lin bf  Solaris
 1  FAT12           27  Hidden NTFS Win 82  Linux swap / So c1  DRDOS/sec (FAT-
 2  XENIX root      39  Plan 9          83  Linux           c4  DRDOS/sec (FAT-
 3  XENIX usr       3c  PartitionMagic  84  OS/2 hidden C:  c6  DRDOS/sec (FAT-
 4  FAT16 <32M      40  Venix 80286     85  Linux extended  c7  Syrinx
 5  Extended        41  PPC PReP Boot   86  NTFS volume set da  Non-FS data
 6  FAT16           42  SFS             87  NTFS volume set db  CP/M / CTOS / .
 7  HPFS/NTFS/exFAT 4d  QNX4.x          88  Linux plaintext de  Dell Utility
 8  AIX             4e  QNX4.x 2nd part 8e  Linux LVM       df  BootIt
 9  AIX bootable    4f  QNX4.x 3rd part 93  Amoeba          e1  DOS access
 a  OS/2 Boot Manag 50  OnTrack DM      94  Amoeba BBT      e3  DOS R/O
 b  W95 FAT32       51  OnTrack DM6 Aux 9f  BSD/OS          e4  SpeedStor
 c  W95 FAT32 (LBA) 52  CP/M            a0  IBM Thinkpad hi eb  BeOS fs
 e  W95 FAT16 (LBA) 53  OnTrack DM6 Aux a5  FreeBSD         ee  GPT
 f  W95 Ext'd (LBA) 54  OnTrackDM6      a6  OpenBSD         ef  EFI (FAT-12/16/
10  OPUS            55  EZ-Drive        a7  NeXTSTEP        f0  Linux/PA-RISC b
11  Hidden FAT12    56  Golden Bow      a8  Darwin UFS      f1  SpeedStor
12  Compaq diagnost 5c  Priam Edisk     a9  NetBSD          f4  SpeedStor
14  Hidden FAT16 <3 61  SpeedStor       ab  Darwin boot     f2  DOS secondary
16  Hidden FAT16    63  GNU HURD or Sys af  HFS / HFS+      fb  VMware VMFS
17  Hidden HPFS/NTF 64  Novell Netware  b7  BSDI fs         fc  VMware VMKCORE
18  AST SmartSleep  65  Novell Netware  b8  BSDI swap       fd  Linux raid auto
1b  Hidden W95 FAT3 70  DiskSecure Mult bb  Boot Wizard hid fe  LANstep
1c  Hidden W95 FAT3 75  PC/IX           be  Solaris boot    ff  BBT
1e  Hidden W95 FAT1 80  Old Minix
Hex code (type L to list all codes): 8e
Changed type of partition 'Linux' to 'Linux LVM'


Command (m for help): p


Disk /dev/sdb: 106 MB, 106954752 bytes, 208896 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk label type: dos
Disk identifier: 0x0003e5bb


   Device Boot      Start         End      Blocks   Id  System
/dev/sdb1            2048      208895      103424   8e  Linux LVM


Command (m for help): w
The partition table has been altered!


Calling ioctl() to re-read partition table.
Syncing disks.
```

3. fdisk 명령어로 /dev/sdc 를 linux LVM 으로 만듬

```
# fdisk   /dev/sdc


Welcome to fdisk (util-linux 2.23.2).


Changes will remain in memory only, until you decide to write them.
```

```
Be careful before using the write command.

Command (m for help): p

Disk /dev/sdc: 213 MB, 213909504 bytes, 417792 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk label type: dos
Disk identifier: 0x00036c44

   Device Boot      Start         End      Blocks   Id  System

Command (m for help): n
Partition type:
   p   primary (0 primary, 0 extended, 4 free)
   e   extended
Select (default p): p
Partition number (1-4, default 1): [Enter Key]
First sector (2048-417791, default 2048): [Enter Key]
Using default value 2048
Last sector, +sectors or +size{K,M,G} (2048-417791, default 417791):
Using default value 417791
Partition 1 of type Linux and of size 203 MiB is set

Command (m for help): t
Selected partition 1
Hex code (type L to list all codes): 8e
Changed type of partition 'Linux' to 'Linux LVM'

Command (m for help): p

Disk /dev/sdc: 213 MB, 213909504 bytes, 417792 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
```

```
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk label type: dos
Disk identifier: 0x00036c44

   Device Boot      Start         End      Blocks   Id  System
/dev/sdc1            2048      417791      207872   8e  Linux LVM

Command (m for help): w
The partition table has been altered!

Calling ioctl() to re-read partition table.
Syncing disks.
```

4. 추가한 하드디스크 인식 확인

```
# fdisk  -l  /dev/sdb /dev/sdc

Disk /dev/sdb: 106 MB, 106954752 bytes, 208896 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk label type: dos
Disk identifier: 0x0003e5bb

   Device Boot      Start         End      Blocks   Id  System
/dev/sdb1            2048      208895      103424   8e  Linux LVM

Disk /dev/sdc: 213 MB, 213909504 bytes, 417792 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk label type: dos
Disk identifier: 0x00036c44

   Device Boot      Start         End      Blocks   Id  System
/dev/sdc1            2048      417791      207872   8e  Linux LVM
```

5. pvcreate 명령어로 물리적인 볼륨 생성

```
# pvcreate   /dev/sdb1
   Physical volume "/dev/sdb1" successfully created.

# pvcreate   /dev/sdc1
   Physical volume "/dev/sdc1" successfully created.

# pvscan
   PV /dev/sdc1                          lvm2 [203.00 MiB]
   PV /dev/sdb1                          lvm2 [101.00 MiB]
   Total: 2 [304.00 MiB] / in use: 0 [0     ] / in no VG: 2 [304.00 MiB]
```

6. /dev/sdb1 과 /dev/sdc1 을 하나의 물리적 볼륨으로 묶어줌

```
# vgcreate   myVG   /dev/sdb1   /dev/sdc1
   Volume group "myVG" successfully created
# vgscan
   Reading volume groups from cache.
   Found volume group "myVG" using metadata type lvm2
```

7. vgdisplay 명령어로 생성한 볼륨 그룹 확인

```
# vgdisplay
   --- Volume group ---
   VG Name                 myVG
   System ID
   Format                lvm2
   Metadata Areas        2
   Metadata Sequence No   1
   VG Access             read/write
   VG Status             resizable
   MAX LV                  0
   Cur LV                0
   Open LV                0
   Max PV                 0
   Cur PV                2
```

```
  Act PV                  2
  VG Size                 300.00 MiB
  PE Size                 4.00 MiB
  Total PE                75
  Alloc PE / Size         0 / 0
  Free  PE / Size         75 / 300.00 MiB
  VG UUID                 LqdHVY-2Hv0-D3t2-I4OQ-xtEt-U3bN-CKc17v
```

- myVG 는 단지 볼륨 그룹이지, 논리적인 파티션이 아니다.
- myVG 자체를 마운트 하려고 하면 오류가 발생한다. 위에서 한 작업은 하드 디스크를 추가하여 /dev/sdb 와 같이 물리적인 디스크로 시스템에서 인식할 뿐이다.
- 그러므로 myVG 를 다시 lvcreate 명령어를 이용하여 논리적으로 시스템이 인식하도록 만들어주어야 한다.

8. myVG 를 lvcreate 명령어를 이용하여 myVG1 의 300MB 로 설정

```
# lvcreate -L 300M -n myVG1 myVG
  Logical volume "myVG1" created.
# lvscan
  ACTIVE            '/dev/myVG/myVG1' [300.00 MiB] inherit
```

9.myVG1 파일 시스템 만들기

```
# mkfs.ext4   /dev/myVG/myVG1
  mke2fs 1.42.9 (28-Dec-2013)
  Filesystem label=
  OS type: Linux
  Block size=1024 (log=0)
  Fragment size=1024 (log=0)
  Stride=0 blocks, Stripe width=0 blocks
  76912 inodes, 307200 blocks
  15360 blocks (5.00%) reserved for the super user
  First data block=1
  Maximum filesystem blocks=33947648
  38 block groups
  8192 blocks per group, 8192 fragments per group
  2024 inodes per group
  Superblock backups stored on blocks:
        8193, 24577, 40961, 57345, 73729, 204801, 221185

  Allocating group tables: done
  Writing inode tables: done
  Creating journal (8192 blocks): done
  Writing superblocks and filesystem accounting information: done
```

10. /data 디렉토리에 마운트시키기

```
# mkdi r /mylvmdata
# mount /dev/myVG/myVG1 /mylvmdata
# df   -h   /mylvmdata
  Filesystem                   Size   Used Avail Use% Mounted on
  /dev/mapper/myVG-myVG1   283M   2.1M   262M     1% /mylvmdata
# mount | grep /mylvmdata
  /dev/mapper/myVG-myVG1 on /mylvmdata type ext4 (rw,relatime,seclabel,data=ordered)
```

LVM 삭제

myVG 삭제 (설정한 역순으로 삭제)

```
# umount /mylvmdata
# lvscan
  ACTIVE                  '/dev/myVG/myVG1' [300.00 MiB] inherit
# lvremove /dev/myVG/myVG1
Do you really want to remove active logical volume myVG/myVG1? [y/n]: y
  Logical volume "myVG1" successfully removed
# lvscan
# vgscan
  Reading volume groups from cache.
  Found volume group "myVG" using metadata type lvm2
# vgremove myVG
  Volume group "myVG" successfully removed
# vgscan
  Reading volume groups from cache.
```

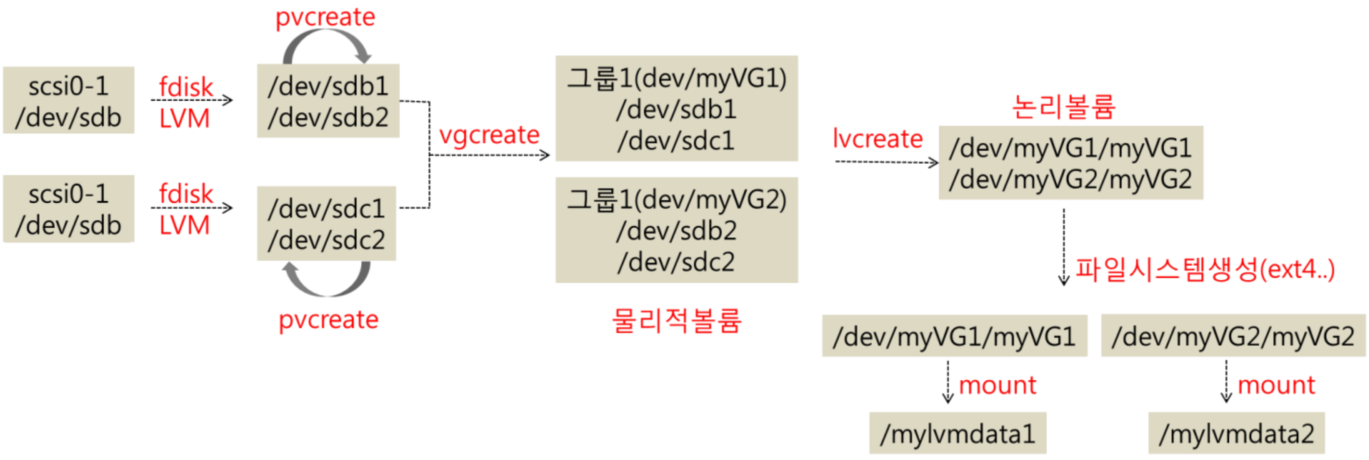
```
# pvscan
  PV /dev/sdc1                      lvm2 [203.00 MiB]
  PV /dev/sdb1                      lvm2 [101.00 MiB]
  Total: 2 [304.00 MiB] / in use: 0 [0    ] / in no VG: 2 [304.00 MiB]
# pvremove /dev/sdb1 /dev/sdc1
  Labels on physical volume "/dev/sdb1" successfully wiped.
  Labels on physical volume "/dev/sdc1" successfully wiped.
# pvscan
  No matching physical volumes found



# fdisk   /dev/sdb
  Welcome to fdisk (util-linux 2.23.2).

  Changes will remain in memory only, until you decide to write them.
  Be careful before using the write command.



  Command (m for help): p

  Disk /dev/sdb: 106 MB, 106954752 bytes, 208896 sectors
  Units = sectors of 1 * 512 = 512 bytes
  Sector size (logical/physical): 512 bytes / 512 bytes
  I/O size (minimum/optimal): 512 bytes / 512 bytes
  Disk label type: dos
  Disk identifier: 0x0003e5bb

     Device Boot       Start         End       Blocks    Id  System
  /dev/sdb1             2048      208895       103424    8e  Linux LVM

  Command (m for help): d
  Selected partition 1
  Partition 1 is deleted

  Command (m for help): p
  Disk /dev/sdb: 106 MB, 106954752 bytes, 208896 sectors
  Units = sectors of 1 * 512 = 512 bytes
  Sector size (logical/physical): 512 bytes / 512 bytes
  I/O size (minimum/optimal): 512 bytes / 512 bytes
  Disk label type: dos
  Disk identifier: 0x0003e5bb

     Device Boot      Start         End      Blocks   Id  System

  Command (m for help): w
  The partition table has been altered!

  Calling ioctl() to re-read partition table.
  Syncing disks.

# fdisk /dev/sdc
  Welcome to fdisk (util-linux 2.23.2).

  Changes will remain in memory only, until you decide to write them.
  Be careful before using the write command.


  Command (m for help): d
  Selected partition 1
  Partition 1 is deleted

  Command (m for help): p

  Disk /dev/sdc: 213 MB, 213909504 bytes, 417792 sectors
  Units = sectors of 1 * 512 = 512 bytes
  Sector size (logical/physical): 512 bytes / 512 bytes
  I/O size (minimum/optimal): 512 bytes / 512 bytes
  Disk label type: dos
  Disk identifier: 0x00036c44
```

```
     Device Boot      Start         End      Blocks   Id  System

Command (m for help): w
The partition table has been altered!

Calling ioctl() to re-read partition table.
Syncing disks.
```

실습 4)

아래 그림대로 구현하시오.

(디스크 파티션 사이즈 및 볼륨 사이즈는 각각 임의대로 할 것!)


pvcreate
scsi0-1
/dev/sdb
fdisk
LVM
/dev/sdb1
/dev/sdb2
vgcreate
그룹1(dev/myVG1)
/dev/sdb1
/dev/sdc1
lvcreate
논리볼륨
/dev/myVG1/myVG1
/dev/myVG2/myVG2
scsi0-1
/dev/sdb
fdisk
LVM
/dev/sdc1
/dev/sdc2
그룹1(dev/myVG2)
/dev/sdb2
/dev/sdc2
파일시스템생성(ext4..)
pvcreate
물리적볼륨
/dev/myVG1/myVG1
/dev/myVG2/myVG2
mount
mount
/mylvmdata1
/mylvmdata2