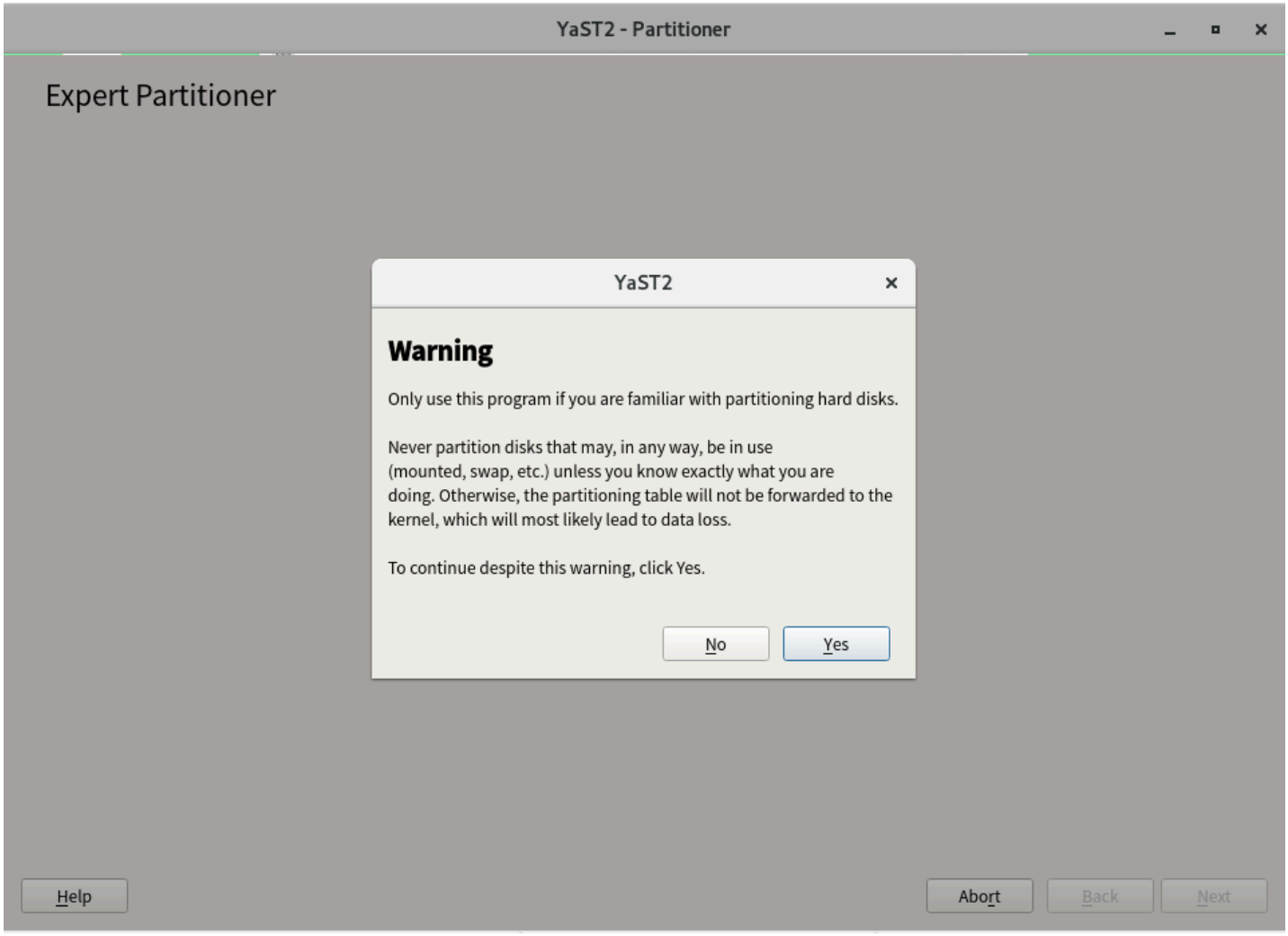
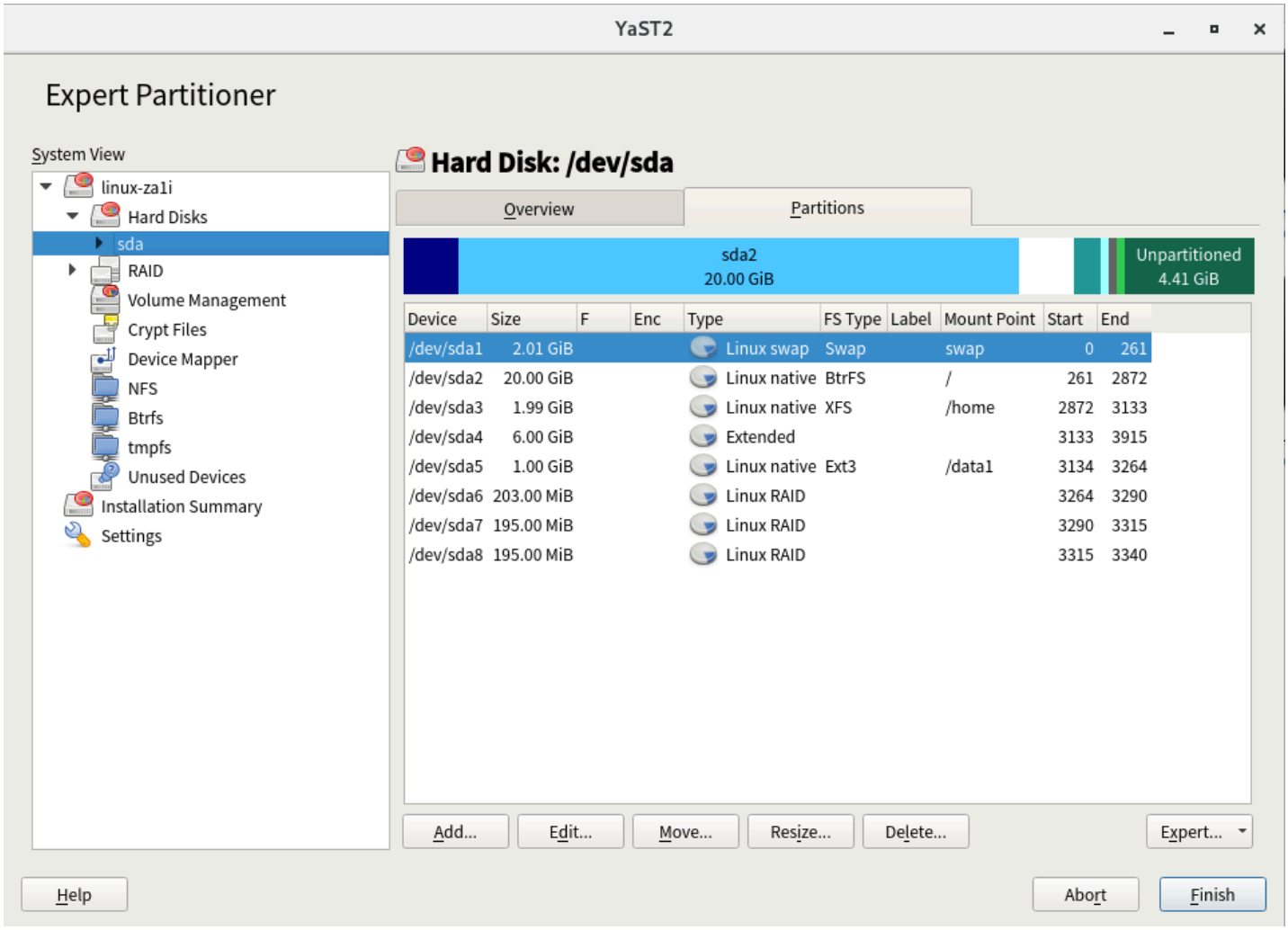
Optional LAB: 用 Command Line 的方式建立 LVM

- 使用**Yast2 Disk 模組**來建立三個大小為 **200 MB**，系統 ID 為 **0x8E Linux LVM** 的分割區

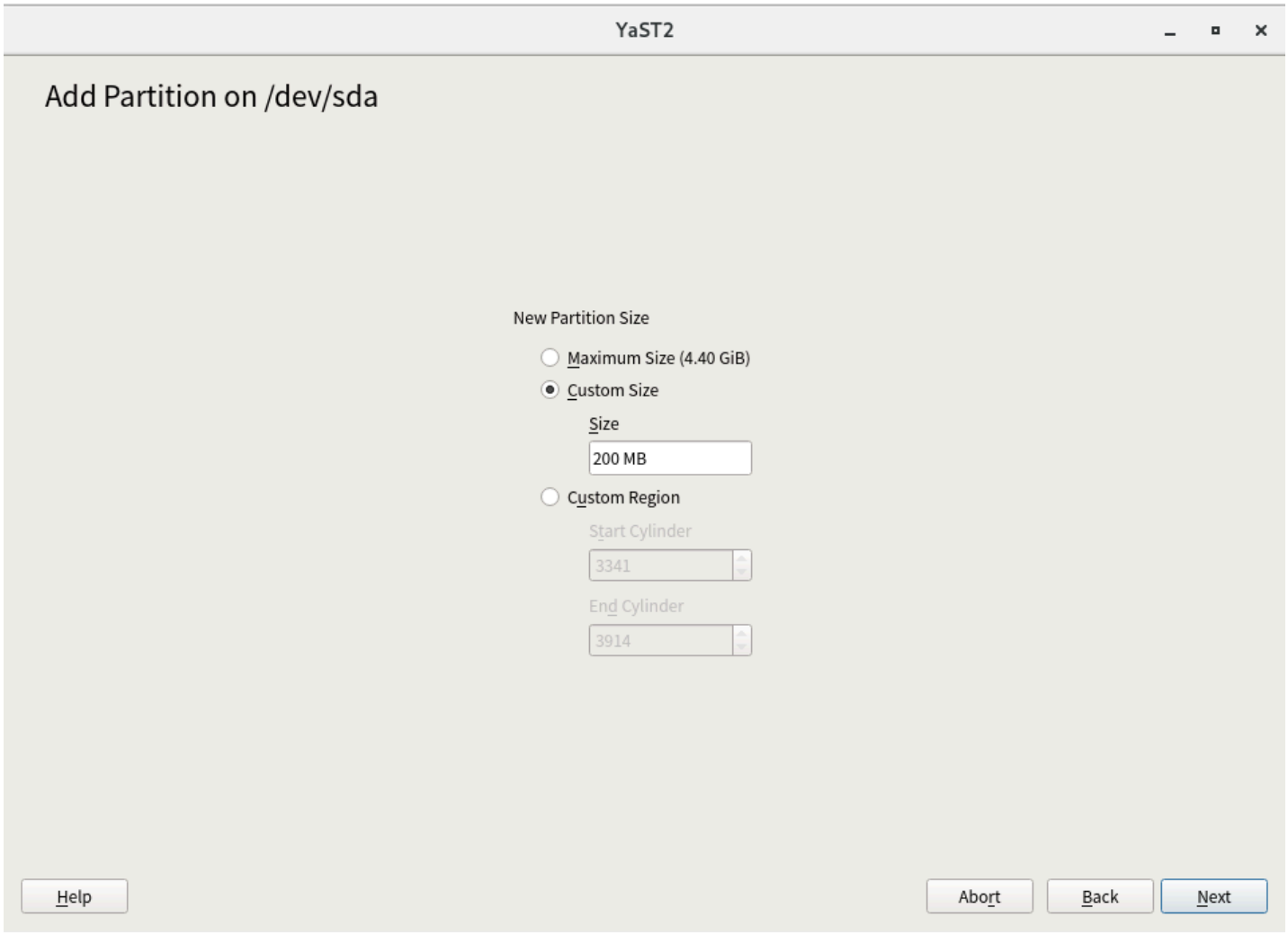
請點選 『 yes 』



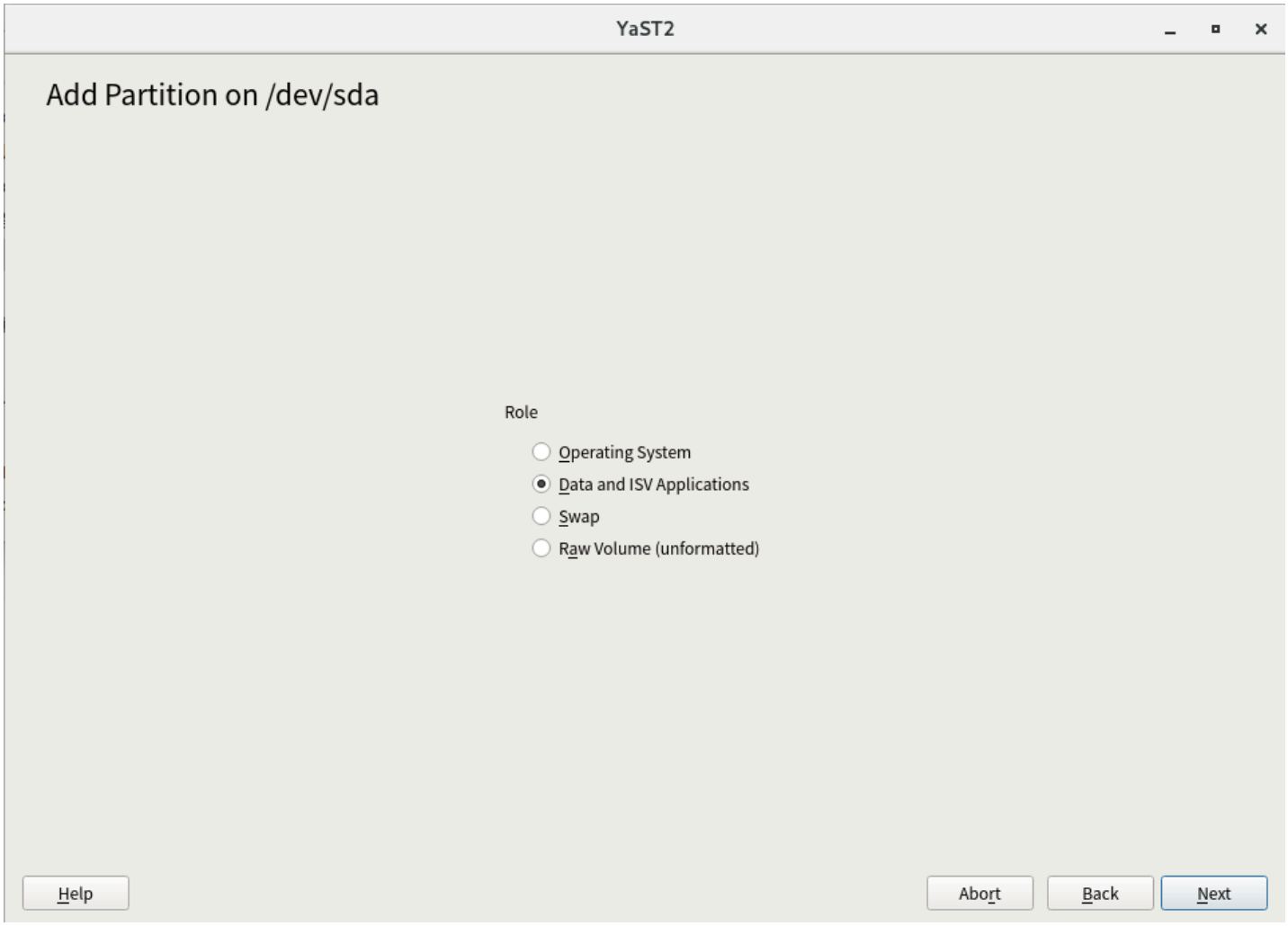
請點選左邊列表中的『 Hard Disks 』，並展開它，再點選左邊列表中的『 sda 』，再點選『 Add 』



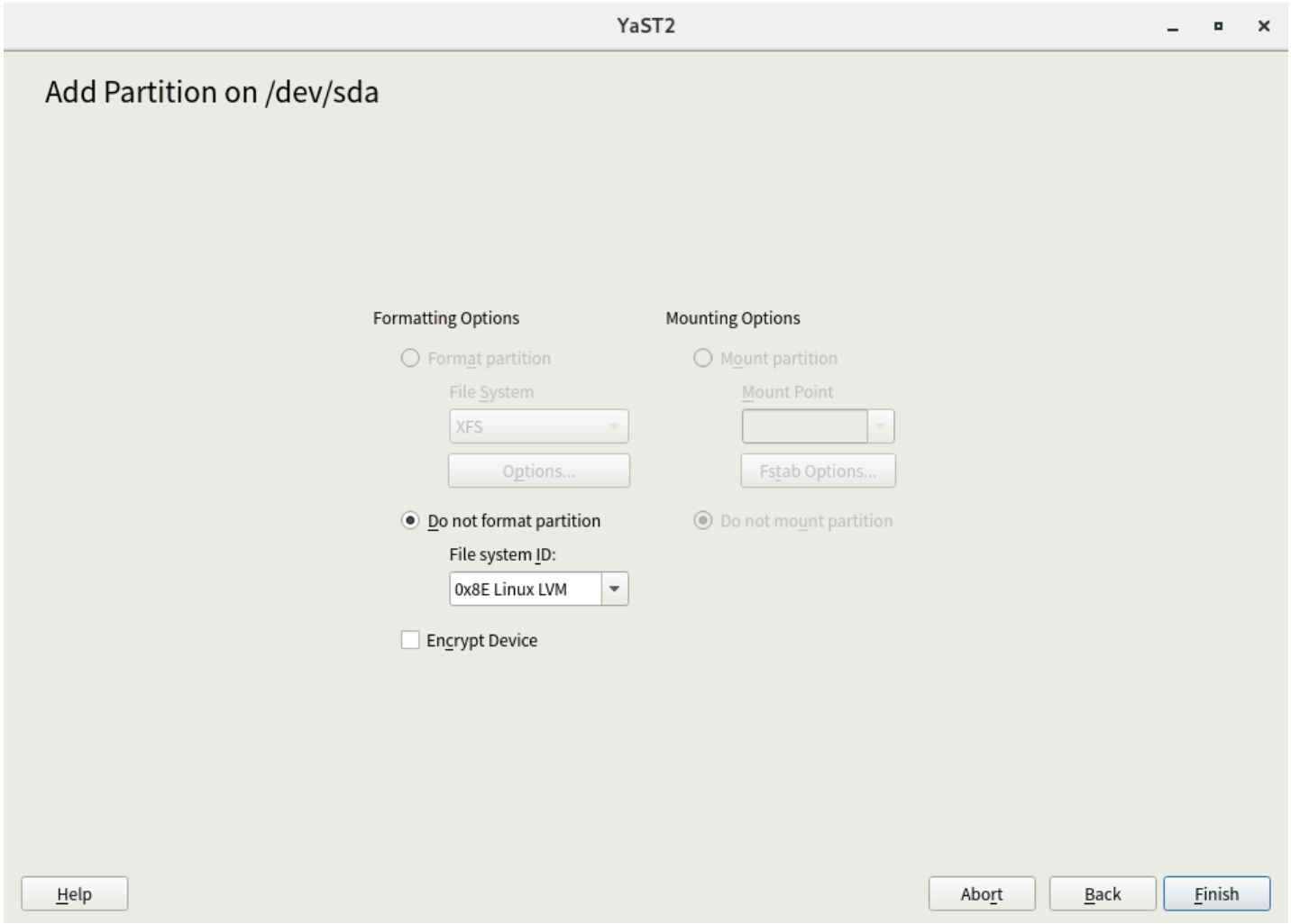
請建立 200 MB，點選『 Next 』



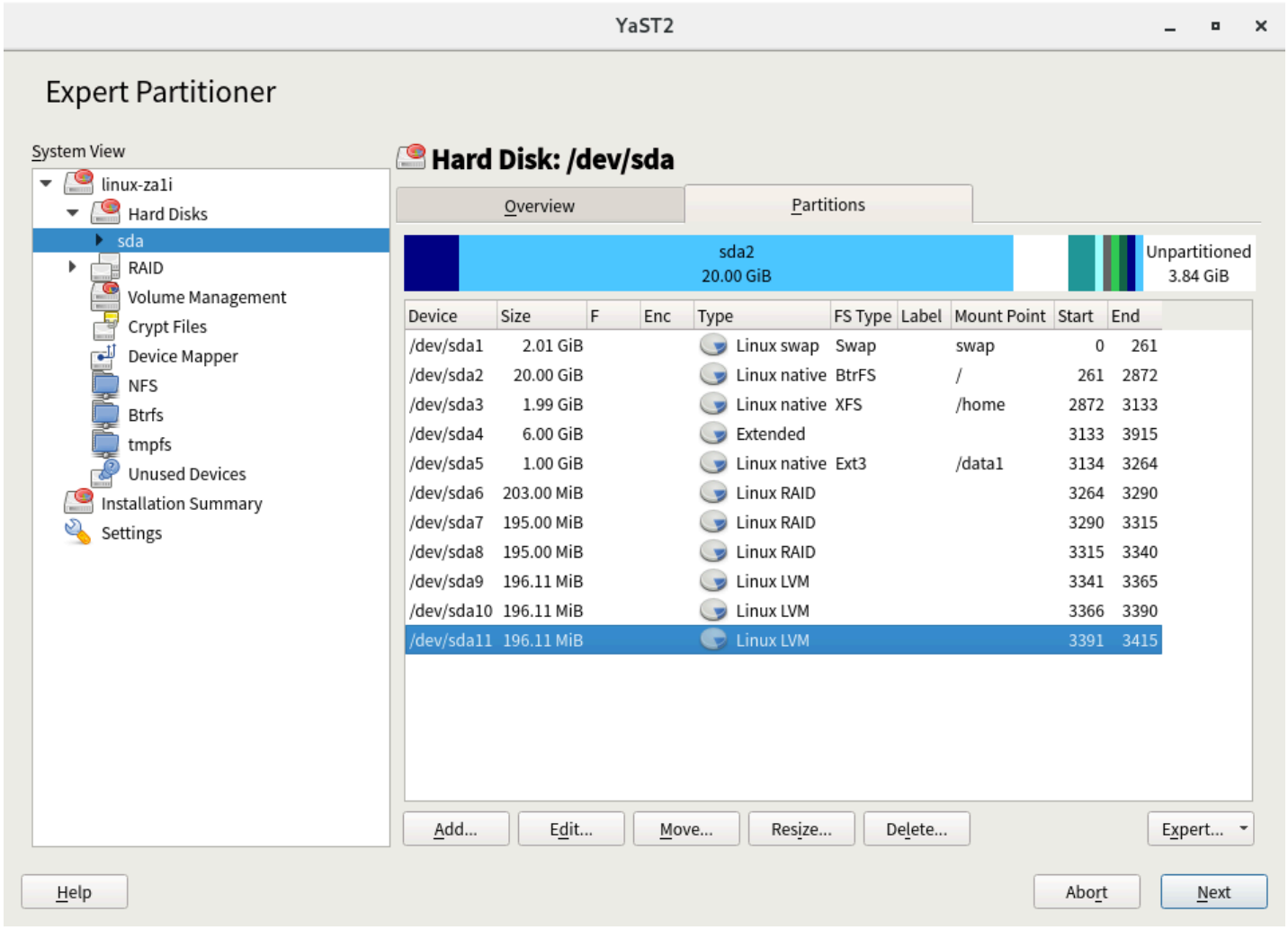
請點選『 Next 』


YaST2
Add Partition on /dev/sda
Role
Operating System
Data and ISV Applications
Swap
Raw Volume (unformatted)
Help
Abort
Back
Next

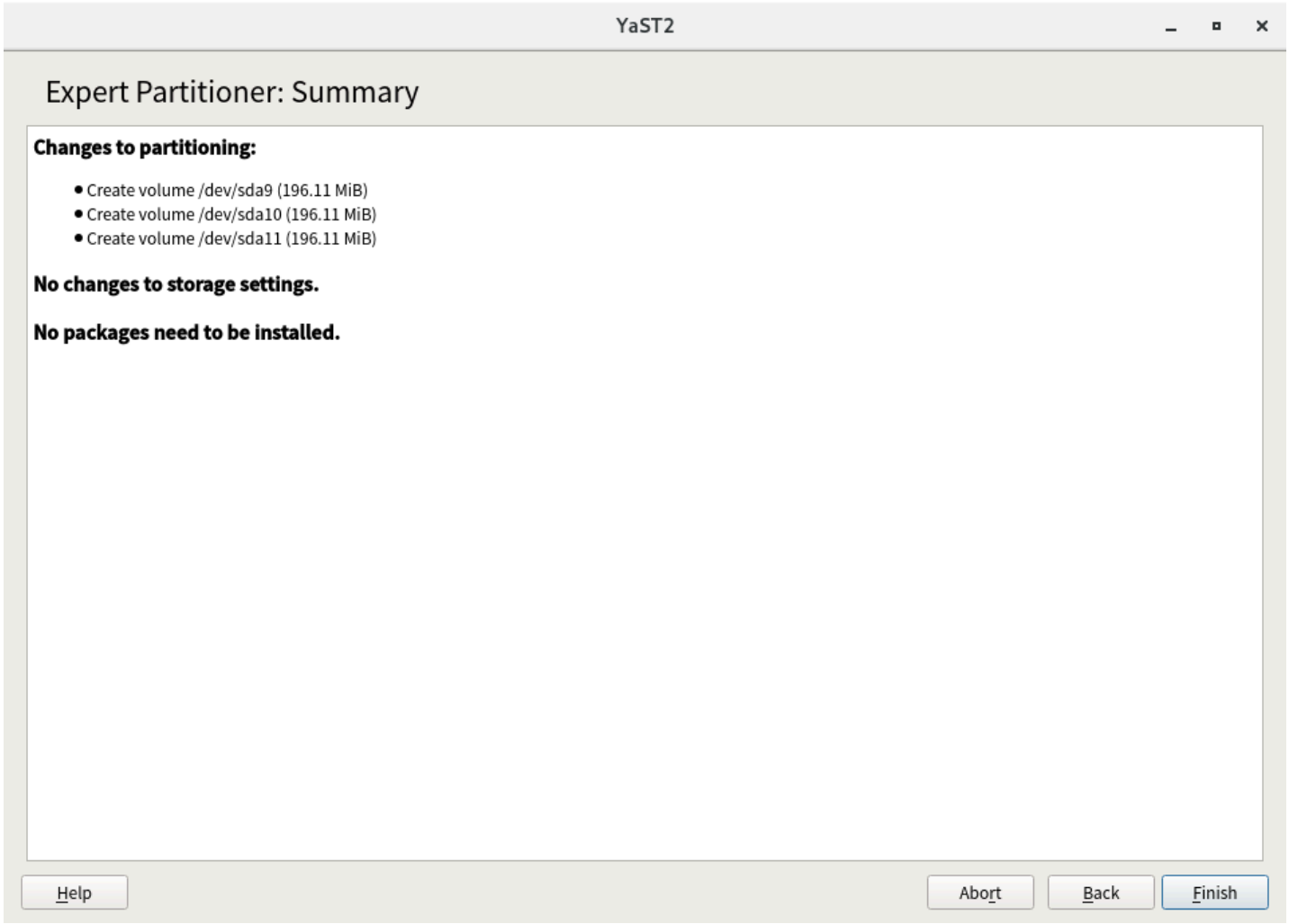
請點選『 Do not format partition 』 → 點選 File System ID 的下拉選單，點選 『 0x8E Linux LVM 』 → 點選『 Next 』



上述建立分割區步驟請再重複二次，確認有看到三個 200 MB 的分割區



請點選『 Finish 』


YaST2
Expert Partitioner: Summary
Changes to partitioning:
Create volume /dev/sda9 (196.11 MiB)
Create volume /dev/sda10 (196.11 MiB)
Create volume /dev/sda11 (196.11 MiB)
No changes to storage settings.
No packages need to be installed.
Help
Abort
Back
Finish

- 請先觀察資訊

```
linux-za1i:~ # fdisk -l
```

- 請查看系統內有沒有其他的 VG Group

```
linux-za1i:~ # vgscan
  Reading all physical volumes.  This may take a while...
```

- 請查看系統內有沒有其他的 PV Group

```
linux-za1i:~ # pvscan
  No matching physical volumes found
```

- 請先建立 PV ，將先前建立三個 200 MB 加入進 PV

Usage: pvcreate PhysicalDevicePath

```
linux-za1i:~ # pvcreate /dev/sda9
  Physical volume "/dev/sda9" successfully created
linux-za1i:~ # pvcreate /dev/sda10
  Physical volume "/dev/sda10" successfully created
linux-za1i:~ # pvcreate /dev/sda11
  Physical volume "/dev/sda11" successfully created
```

- 請建立 VG ，名稱為 `lab` 使用 `/dev/sda9`

Usage: vgcreate VolumeGroupName PhysicalDevicePath

```
linux-za1i:~ # vgcreate lab /dev/sda9
  Volume group "lab" successfully created
```

- 請觀察 VG Group 資訊

```
linux-za1i:~ # vgscan
  Reading all physical volumes.  This may take a while...
  Found volume group "lab" using metadata type lvm2
```

- 請觀察資訊

```
linux-za1i:~ # lvscan
```

- 請建立 LV，名稱為 `pilot` 大小為 `80 MB` ，從 lab 這個 VG 切出來。
    - `-L, --size LogicalVolumeSize`
    - `-n, --name LogicalVolume{Name|Path}`，預設不做任何設定會取名叫 `"lvol#"`

Usage: lvcreate -L Size -n Name VG_GroupName

```
linux-za1i:~ # lvcreate -L 80M -n pilot lab
  Logical volume "pilot" created.
```

- 請列出 LV 資訊

```
linux-za1i:~ # lvdisplay
  --- Logical volume ---
  LV Path                /dev/lab/pilot
  LV Name                pilot
  VG Name                lab
  LV UUID                ZvK6BV-npYr-hbqI-nNtw-0gN8-SLU7-rfm1bP
  LV Write Access        read/write
  LV Creation host, time linux-za1i, 2018-01-10 02:09:48 +0800
  LV Status              available
  # open                 0
  LV Size                80.00 MiB
  Current LE             20
  Segments               1
  Allocation             inherit
  Read ahead sectors     auto
  - currently set to     1024
  Block device           254:0
```

- 請建立 LV，名稱為 `data` 大小為 `50 MB` ，從 lab 這個 VG 切出來。
    - `-L, --size LogicalVolumeSize`
    - `-n, --name LogicalVolume{Name|Path}`，預設不做任何設定會取名叫 `"lvol#"`

Usage: lvcreate -L Size -n LogicalVolumeName VolumeGroupName

```
linux-za1i:~ # lvcreate -L 50M -n data lab
  Rounding up size to full physical extent 52.00 MiB
  Logical volume "data" created.
```

若是要一次把所有的空間都給 LV - data 的話，可以使用

```
# lvcreate -l 100%FREE -n data lab
```

- 請列出 LV - `/dev/lab/data` 資訊

```
linux-za1i:~ # lvdisplay /dev/lab/data
  --- Logical volume ---
  LV Path                /dev/lab/data
  LV Name                data
  VG Name                lab
  LV UUID                P3h7F2-lDOn-rbub-ms1J-vHeE-cRlm-70H4Ft
  LV Write Access        read/write
  LV Creation host, time linux-za1i, 2018-01-10 02:24:42 +0800
  LV Status              available
  # open                 0
  LV Size                52.00 MiB
  Current LE             13
  Segments               1
  Allocation             inherit
  Read ahead sectors     auto
  - currently set to     1024
  Block device           254:1
```

- 請觀察 VG - lab 資訊，請注意容量大小，以及預設 PE 的大小

```
linux-za1i:~ # vgdisplay lab
  --- Volume group ---
  VG Name               lab
  System ID
  Format                lvm2
  Metadata Areas        1
  Metadata Sequence No  3
  VG Access             read/write
  VG Status             resizable
  MAX LV                0
  Cur LV                2
  Open LV               0
  Max PV                0
  Cur PV                1
  Act PV                1
  VG Size               200.00 MiB
  PE Size               4.00 MiB
  Total PE              50
  Alloc PE / Size       33 / 132.00 MiB
  Free  PE / Size       17 / 68.00 MiB
  VG UUID               wdq9aw-DSPk-2YXt-FyZQ-UqLF-Qrp3-cUNqJp
```

- 請觀察資訊

```
linux-za1i:~ # lvscan
  ACTIVE            '/dev/lab/pilot' [80.00 MiB] inherit
  ACTIVE            '/dev/lab/data' [52.00 MiB] inherit
```

- 請觀察 PV Group 資訊

```
linux-za1i:~ # pvscan
  PV /dev/sda9    VG lab   lvm2 [200.00 MiB / 200.00 MiB free]
  PV /dev/sda11            lvm2 [195.00 MiB]
  PV /dev/sda10            lvm2 [195.00 MiB]
  Total: 3 [590.00 MiB] / in use: 1 [200.00 MiB] / in no VG: 2 [390.00 MiB]
```

- 請將剛建立的 LV 格式化為 `ext4`

Usage: mke2fs -t fs-type Device

```
linux-za1i:~ # mke2fs -t ext4 /dev/lab/pilot
mke2fs 1.42.11 (09-Jul-2014)
Creating filesystem with 81920 1k blocks and 20480 inodes
Filesystem UUID: e985f612-8414-4f3a-bdef-ba1348eaa84a
Superblock backups stored on blocks:
    8193, 24577, 40961, 57345, 73729

Allocating group tables: done
Writing inode tables: done
Creating journal (4096 blocks): done
Writing superblocks and filesystem accounting information: done
```

Usage: mkfs.ext4 Device

```
linux-za1i:~ # mkfs.ext4 /dev/lab/data
mke2fs 1.42.11 (09-Jul-2014)
Creating filesystem with 53248 1k blocks and 13328 inodes
Filesystem UUID: abc67d78-0d41-43c2-a46d-5a0ced6576c2
Superblock backups stored on blocks:
    8193, 24577, 40961

Allocating group tables: done
Writing inode tables: done
Creating journal (4096 blocks): done
Writing superblocks and filesystem accounting information: done
```

- 請在 `/mnt` 底下，先建立二個目錄，一個叫 `pilot` ，另一個叫 `data`

```
linux-za1i:~ # mkdir /mnt/pilot
linux-za1i:~ # mkdir /mnt/data
```

- 請將 LV 掛載到剛剛建立的目錄

```
linux-za1i:~ # mount /dev/lab/pilot /mnt/pilot
linux-za1i:~ # mount /dev/lab/data  /mnt/data
```

- 請觀察分割區掛載的情形

```
linux-za1i:~ # df -h /mnt/pilot /mnt/data
檔案系統                容量  已用  可用 已用% 掛載點
/dev/mapper/lab-pilot   74M  1.6M   67M    3% /mnt/pilot
/dev/mapper/lab-data    47M  842K   42M    2% /mnt/data
```

- 請觀察 VG - lab 的資訊

```
linux-za1i:~ # vgdisplay lab
  --- Volume group ---
  VG Name               lab
  System ID
  Format                lvm2
  Metadata Areas        1
  Metadata Sequence No  11
  VG Access             read/write
  VG Status             resizable
  MAX LV                0
  Cur LV                2
  Open LV               2
  Max PV                0
  Cur PV                1
  Act PV                1
  VG Size               200.00 MiB
  PE Size               4.00 MiB
  Total PE              50
  Alloc PE / Size       33 / 132.00 MiB
  Free  PE / Size       17 / 68.00 MiB
  VG UUID               wdq9aw-DSPk-2YXt-FyZQ-UqLF-Qrp3-cUNqJp
```

- 請觀察 PV - `/dev/sda9` 和 `/dev/sda10`

```
linux-za1i:~ # pvdisplay /dev/sda9
  --- Physical volume ---
  PV Name               /dev/sda9
  VG Name               lab
  PV Size               203.00 MiB / not usable 3.00 MiB
  Allocatable           yes
  PE Size               4.00 MiB
  Total PE              50
  Free PE               17
  Allocated PE          33
  PV UUID               QhRDog-j2LC-uw04-l7iL-bRGv-LiA4-z6SOJv

linux-za1i:~ # pvdisplay /dev/sda10
  "/dev/sda10" is a new physical volume of "195.00 MiB"
  --- NEW Physical volume ---
  PV Name               /dev/sda10
  VG Name
  PV Size               195.00 MiB
  Allocatable           NO
  PE Size               0
  Total PE              0
  Free PE               0
  Allocated PE          0
  PV UUID               qEfocG-2bt4-hhRL-GvfS-tsu0-cpcy-mMgSCC
```

- 線上擴充 VG - lab ，將 `/dev/sda10` 加入

```
linux-za1i:~ # vgextend lab /dev/sda10
  Volume group "lab" successfully extended
```

- 請觀察 VG - lab 的資訊

```
linux-za1i:~ # vgdisplay lab
  --- Volume group ---
  VG Name               lab
  System ID
  Format                lvm2
  Metadata Areas        2
  Metadata Sequence No  4
  VG Access             read/write
  VG Status             resizable
  MAX LV                0
  Cur LV                2
  Open LV               0
  Max PV                0
  Cur PV                2
  Act PV                2
  VG Size               392.00 MiB
  PE Size               4.00 MiB
  Total PE              98
  Alloc PE / Size       33 / 132.00 MiB
  Free  PE / Size       65 / 260.00 MiB
  VG UUID               wdq9aw-DSPk-2YXt-FyZQ-UqLF-Qrp3-cUNqJp
```

- 請再次觀察 PV - `/dev/sda9` 和 `/dev/sda10`

```
linux-za1i:~ # pvdisplay /dev/sda9 /dev/sda10
  --- Physical volume ---
  PV Name               /dev/sda9
  VG Name               lab
  PV Size               203.00 MiB / not usable 3.00 MiB
  Allocatable           yes
  PE Size               4.00 MiB
  Total PE              50
  Free PE               17
  Allocated PE          33
  PV UUID               QhRDog-j2LC-uw04-l7iL-bRGv-LiA4-z6SOJv

  --- Physical volume ---
  PV Name               /dev/sda10
  VG Name               lab
  PV Size               195.00 MiB / not usable 3.00 MiB
  Allocatable           yes
  PE Size               4.00 MiB
  Total PE              48
  Free PE               48
  Allocated PE          0
  PV UUID               qEfocG-2bt4-hhRL-GvfS-tsu0-cpcy-mMgSCC
```

- 請使用 `pvs` 來觀察個別 `/dev/sda9`, `/dev/sda10`, `/dev/sda11` 的空間

```
linux-za1i:~ # pvs
  PV         VG   Fmt  Attr PSize   PFree
  /dev/sda10 lab  lvm2 a--  192.00m 192.00m
  /dev/sda11      lvm2 ---  195.00m 195.00m
  /dev/sda9  lab  lvm2 a--  200.00m  68.00m
```

- 請將 `pilot` 從 `/dev/sda9` 移動到 `/dev/sda10`

Usage: pvmove -n LogicalVolume /dev/sda9 /dev/sda10

```
linux-za1i:~ # pvmove -n /dev/lab/pilot /dev/sda9 /dev/sda10
  /dev/sda9: Moved: 0.0%
  /dev/sda9: Moved: 100.0%
```

- 請使用 `pvs` 來觀察個別 `/dev/sda9`, `/dev/sda10`, `/dev/sda11` 的空間

```
linux-za1i:~ # pvs
  PV         VG   Fmt  Attr PSize   PFree
  /dev/sda10 lab  lvm2 a--  192.00m 112.00m
  /dev/sda11      lvm2 ---  195.00m 195.00m
  /dev/sda9  lab  lvm2 a--  200.00m 148.00m
```

- 請觀察 PV - `/dev/sda9` 和 `/dev/sda10`

```
linux-za1i:~ # pvdisplay /dev/sda9
  --- Physical volume ---
  PV Name               /dev/sda9
  VG Name               lab
  PV Size               203.00 MiB / not usable 3.00 MiB
  Allocatable           yes
  PE Size               4.00 MiB
  Total PE              50
  Free PE               37
  Allocated PE          13
  PV UUID               QhRDog-j2LC-uw04-l7iL-bRGv-LiA4-z6SOJv

linux-za1i:~ # pvdisplay /dev/sda10
  --- Physical volume ---
  PV Name               /dev/sda10
  VG Name               lab
  PV Size               195.00 MiB / not usable 3.00 MiB
  Allocatable           yes
  PE Size               4.00 MiB
  Total PE              48
  Free PE               28
  Allocated PE          20
  PV UUID               qEfocG-2bt4-hhRL-GvfS-tsu0-cpcy-mMgSCC
```

- 請將 `data` 從 `/dev/sda9` 移動到 `/dev/sda10`

Usage: pvmove -n LogicalVolume /dev/sda9 /dev/sda10

```
linux-za1i:~ # pvmove -n /dev/lab/data /dev/sda9 /dev/sda10
  /dev/sda9: Moved: 0.0%
  /dev/sda9: Moved: 100.0%
```

- 請使用 `pvs` 來觀察個別 `/dev/sda9`, `/dev/sda10`, `/dev/sda11` 的空間

```
linux-za1i:~ # pvs
  PV         VG   Fmt  Attr PSize   PFree
  /dev/sda10 lab  lvm2 a--  192.00m  60.00m
  /dev/sda11      lvm2 ---  195.00m 195.00m
  /dev/sda9  lab  lvm2 a--  200.00m 200.00m
```

- 請觀察 PV - `/dev/sda9` 和 `/dev/sda10`

```
linux-za1i:~ # pvdisplay /dev/sda9
  --- Physical volume ---
  PV Name               /dev/sda9
  VG Name               lab
  PV Size               203.00 MiB / not usable 3.00 MiB
  Allocatable           yes
  PE Size               4.00 MiB
  Total PE              50
  Free PE               50
  Allocated PE          0
  PV UUID               QhRDog-j2LC-uw04-l7iL-bRGv-LiA4-z6SOJv

linux-za1i:~ # pvdisplay /dev/sda10
  --- Physical volume ---
  PV Name               /dev/sda10
  VG Name               lab
  PV Size               195.00 MiB / not usable 3.00 MiB
  Allocatable           yes
  PE Size               4.00 MiB
  Total PE              48
  Free PE               15
  Allocated PE          33
  PV UUID               qEfocG-2bt4-hhRL-GvfS-tsu0-cpcy-mMgSCC
```

- 請先觀察 VG - lab，等等要做縮小 VG

```
linux-za1i:~ # vgdisplay lab
  --- Volume group ---
  VG Name               lab
  System ID
  Format                lvm2
  Metadata Areas        2
  Metadata Sequence No  18
  VG Access             read/write
  VG Status             resizable
  MAX LV                0
  Cur LV                2
  Open LV               2
  Max PV                0
  Cur PV                2
  Act PV                2
  VG Size               392.00 MiB
  PE Size               4.00 MiB
  Total PE              98
  Alloc PE / Size       33 / 132.00 MiB
  Free  PE / Size       65 / 260.00 MiB
  VG UUID               wdq9aw-DSPk-2YXt-FyZQ-UqLF-Qrp3-cUNqJp
```

- 線上縮小 VG - lab ，將 `/dev/sda9` 移除

Usage: vgreduce VolumeGroupName PhysicalVolumePath

```
linux-za1i:~ # vgreduce lab /dev/sda9
  Removed "/dev/sda9" from volume group "lab"
```

LAB: 使用兩個 PV 來製作等量 LV

- 線上擴充 VG - lab ，將 `/dev/sda9` 加入

```
linux-za1i:~ # vgextend lab /dev/sda9
  Volume group "lab" successfully extended
```

- 請觀察 VG - lab

```
linux-za1i:~ # vgdisplay
  --- Volume group ---
  VG Name               lab
  System ID
  Format                lvm2
  Metadata Areas        2
  Metadata Sequence No  20
  VG Access             read/write
  VG Status             resizable
  MAX LV                0
  Cur LV                2
  Open LV               2
  Max PV                0
  Cur PV                2
  Act PV                2
  VG Size               392.00 MiB
  PE Size               4.00 MiB
  Total PE              98
  Alloc PE / Size       33 / 132.00 MiB
  Free  PE / Size       65 / 260.00 MiB
  VG UUID               wdq9aw-DSPk-2YXt-FyZQ-UqLF-Qrp3-cUNqJp
```

- 使用兩個 PV 來建立等量的 LV

Usage: lvcreate -L LogicalVolumeSize -i Stripes -n LogicalVolumeName VolumeGroupName

```
linux-za1i:~ # lvcreate -L 80M -i 2 -n striplv lab
  Using default stripesize 64.00 KiB.
  Logical volume "striplv" created.
```

- 請使用 `lvscan`

```
linux-za1i:~ # lvscan
  ACTIVE            '/dev/lab/pilot' [80.00 MiB] inherit
  ACTIVE            '/dev/lab/data' [52.00 MiB] inherit
  ACTIVE            '/dev/lab/striplv' [80.00 MiB] inherit
```

- 請觀察 LV - `/dev/lab/striplv`

Usage: lvdisplay -m LogicalVolumePath

```
linux-za1i:~ # lvdisplay -m /dev/lab/striplv
  --- Logical volume ---
  LV Path                /dev/lab/striplv
  LV Name                striplv
  VG Name                lab
  LV UUID                3nFdC5-54Qj-l2qL-71UY-4TeD-cuay-Ys15N4
  LV Write Access        read/write
  LV Creation host, time linux-za1i, 2018-01-29 02:05:59 +0800
  LV Status              available
  # open                 0
  LV Size                80.00 MiB
  Current LE             20
  Segments               1
  Allocation             inherit
  Read ahead sectors     auto
  - currently set to     1024
  Block device           254:2

  --- Segments ---
  Logical extents 0 to 19:
    Type        striped
    Stripes     2
    Stripe size     64.00 KiB
    Stripe 0:
      Physical volume   /dev/sda10
      Physical extents  33 to 42
    Stripe 1:
      Physical volume   /dev/sda9
      Physical extents  0 to 9
```

- 請觀察 PV - `/dev/sda9` 和 `/dev/sda10`

```
linux-za1i:~ # pvdisplay /dev/sda9 /dev/sda10
  --- Physical volume ---
  PV Name               /dev/sda10
  VG Name               lab
  PV Size               195.00 MiB / not usable 3.00 MiB
  Allocatable           yes
  PE Size               4.00 MiB
  Total PE              48
  Free PE               5
  Allocated PE          43
  PV UUID               qEfocG-2bt4-hhRL-GvfS-tsu0-cpcy-mMgSCC

  --- Physical volume ---
  PV Name               /dev/sda9
  VG Name               lab
  PV Size               203.00 MiB / not usable 3.00 MiB
  Allocatable           yes
  PE Size               4.00 MiB
  Total PE              50
  Free PE               40
  Allocated PE          10
  PV UUID               QhRDog-j2LC-uw04-l7iL-bRGv-LiA4-z6SOJv
```

- 請觀察 LV - `/dev/lab/pilot`

```
linux-za1i:~ # lvdisplay /dev/lab/pilot
  --- Logical volume ---
  LV Path                /dev/lab/pilot
  LV Name                pilot
  VG Name                lab
  LV UUID                ZvK6BV-npYr-hbqI-nNtw-0gN8-SLU7-rfm1bP
  LV Write Access        read/write
  LV Creation host, time linux-za1i, 2018-01-10 02:09:48 +0800
  LV Status              available
  # open                 1
  LV Size                80.00 MiB
  Current LE             20
  Segments               1
  Allocation             inherit
  Read ahead sectors     auto
  - currently set to     1024
  Block device           254:0
```

- 線上擴充 LV - `/dev/lab/pilot`

```
linux-za1i:~ # lvextend -L +20M  /dev/lab/pilot
  Size of logical volume lab/pilot changed from 80.00 MiB (20 extents) to 100.00 M
iB (25 extents).
  Logical volume pilot successfully resized
```

- 請觀察 LV - `/dev/lab/pilot`

```
linux-za1i:~ # lvdisplay /dev/lab/pilot
  --- Logical volume ---
  LV Path                /dev/lab/pilot
  LV Name                pilot
  VG Name                lab
  LV UUID                ZvK6BV-npYr-hbqI-nNtw-0gN8-SLU7-rfm1bP
  LV Write Access        read/write
  LV Creation host, time linux-za1i, 2018-01-10 02:09:48 +0800
  LV Status              available
  # open                 1
  LV Size                100.00 MiB
  Current LE             25
  Segments               2
  Allocation             inherit
  Read ahead sectors     auto
  - currently set to     1024
  Block device           254:0
```

- 請觀察分割區掛載情形

```
linux-za1i:~ # df -h /mnt/pilot
檔案系統                容量  已用  可用 已用% 掛載點
/dev/mapper/lab-pilot   74M  6.6M   62M   10% /mnt/pilot
```

- 使用 `resize2fs` 讓檔案系統使其生效

Usage: resize2fs LogicalVolumePath

```
linux-za1i:~ # resize2fs /dev/lab/pilot
resize2fs 1.42.11 (09-Jul-2014)
Filesystem at /dev/lab/pilot is mounted on /mnt/pilot; on-line resizing required
old_desc_blocks = 1, new_desc_blocks = 1
The filesystem on /dev/lab/pilot is now 102400 blocks long.
```

- 請觀察分割區掛載情形

```
linux-za1i:~ # df -h /mnt/pilot
檔案系統                容量  已用  可用 已用% 掛載點
/dev/mapper/lab-pilot   93M  6.6M   80M    8% /mnt/pilot
```

- 請使用 `lvscan`

```
linux-za1i:~ # lvscan
  ACTIVE            '/dev/lab/pilot' [100.00 MiB] inherit
  ACTIVE            '/dev/lab/data' [52.00 MiB] inherit
  ACTIVE            '/dev/lab/striplv' [80.00 MiB] inherit
```

- 請把 `/dev/lab/pilot` 縮小回 80M

Notice: Do you really want to reduce pilot? [y/n]:

```
linux-za1i:~ # lvresize -L 80M /dev/lab/pilot
  WARNING: Reducing active and open logical volume to 80.00 MiB
  THIS MAY DESTROY YOUR DATA (filesystem etc.)
Do you really want to reduce pilot? [y/n]: y
  Size of logical volume lab/pilot changed from 100.00 MiB (25 extents) to 80.00 M
iB (20 extents).
  Logical volume pilot successfully resized
```

- 請使用 `lvscan`

```
linux-za1i:~ # lvscan
  ACTIVE            '/dev/lab/pilot' [80.00 MiB] inherit
  ACTIVE            '/dev/lab/data' [52.00 MiB] inherit
  ACTIVE            '/dev/lab/striplv' [80.00 MiB] inherit
```

- 請觀察分割區掛載情形

```
linux-za1i:~ # df -h /mnt/pilot
檔案系統                容量  已用  可用 已用% 掛載點
/dev/mapper/lab-pilot   93M  6.6M   80M    8% /mnt/pilot
```

- 使用 `resize2fs` 讓檔案系統使其生效

```
linux-za1i:~ # resize2fs /dev/lab/pilot
resize2fs 1.42.11 (09-Jul-2014)
Filesystem at /dev/lab/pilot is mounted on /mnt/pilot; on-line resizing required
resize2fs: On-line shrinking not supported
```

- 請使用 `lvscan`

```
linux-za1i:~ # lvscan
  ACTIVE            '/dev/lab/pilot' [80.00 MiB] inherit
  ACTIVE            '/dev/lab/data' [52.00 MiB] inherit
  ACTIVE            '/dev/lab/striplv' [80.00 MiB] inherit
```

- 線上擴充 LV - `/dev/lab/pilot`
    - `-r, --resizefs 讓檔案系統使其生效`

Usage: lvcreate -L Size -n LogicalVolumeName VolumeGroupName -r

```
linux-za1i:~ # lvextend -L +20M /dev/lab/pilot -r
  Size of logical volume lab/pilot changed from 80.00 MiB (20 extents) to 100.00 M
iB (25 extents).
  Logical volume pilot successfully resized
resize2fs 1.42.11 (09-Jul-2014)
The filesystem is already 102400 blocks long.  Nothing to do!
```

- 請觀察分割區掛載情形

```
linux-za1i:~ # df -h /mnt/pilot
檔案系統                容量  已用  可用 已用% 掛載點
/dev/mapper/lab-pilot   93M  1.6M   85M    2% /mnt/pilot
```

都是縮小

```
linux-za1i:~ # lvresize -L 80M /dev/lab/pilot
linux-za1i:~ # lvreduce -L -20M /dev/lab/pilot
```