RHCEv8 Online Class 16052021 10:00pm
RHCSA-sysadmin
- Accessing Linux File Systems
- Managing Basic Storage
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- Accessing Linux File Systems
**STORAGE MANAGEMENT CONCEPTS**

**what is File System?**
A filesystem is an organized structure of data holding files/directories residing on storage devices.
ex:
aMS-win->NFTS, fat32, fat16
Linux    ->cramfs, ext2, ext3, ext4, fat, minix, msdos, vfat, xfs

**what is Mount on Linux?**
it means attach storage (remove able) to OS
ex:
mount pendrive on Linux

-MS-win and Linux-GUI they are p&p OS. plug and play
-Linux-cli mount is manual

**attach**
# mount <mount device> <mount point>
-<mount device>  ->partition
-<mount point>   ->directory name
**detach**
# umont <mount point>

**List of storage/block-device on Linux**
# cat /proc/partitions
major minor   #blocks     name
  8     0     20,971,520     sda
**-name**
XXXX
first 2XX from left           ->storage technology
vd         ->virtual disk
sd         ->sata, sas, ssd disk
sr         ->sata remove-able
dm         ->disk mapper

3$^{rd}$ X from left              ->its storage number started from **a** to **z**
sda        ->hard disk**1** with sata technology
vdf        ->6$^{th}$ virtual disk

4$^{th}$ X from left              ->number of partition started from 1 to ......
vdb5      ->5$^{th}$ partition from second virtual hard disk
sdc4      ->4$^{th}$ partition from 3$^{rd}$ sata hard disk

**-blokes**                      ->size of storage based-on Kilo Byte
20,971,520          ->20Gb
**-minor**
        **-storage**, stared from **0** with sequence **16     0, 16, 32, 48, …**
        **-partitions**, previous minor + 1
**-major**
kernel detects storage's technology by major number.
8         ->sata, sas, ssd disk
11        ->sata remoe-able CD/DVD
253       ->disk mapper
# lsblk
NAME      MAJ:MIN **RM**  SIZE **RO** TYPE MOUNTPOINT
RM (remove-able)          0/1      0->permanent/disk          1->remove-able
RO (read only)            0/1      0->writable                1->non-writeable

**storage details by use <mark>disk-free</mark> utility**
# df -hT
h->human readable
T->type


**size of file/dir by use <mark>disk-usage</mark> utility**
# du -h anaconda-ks.cfg
4.0K   anaconda-ks.cfg
# du -h /etc
23M    /etc/


**How to manage storage on Linux?**
2methods to manage storage on Linux
1-Master Boot Record-MBR          ->legacy
2-Guid Partition Table-GPT          ->UEFI


**1-Master Boot Record-MBR**
-its first sector from first primary bootable hard disk.
-32bit technology
-size is 512bytes in to:

      446        ->bootloader information
      64          ->partition table information
      2            ->err check

-maximum partitions support by MBR                          ->15partitions in primary, Extend and Logical
-maximum size of supports on one single hard disk in MBR     ->2TB
-command **fdisk**


**2-Guid Partition Table-GPT**
-it works base-on Unified Extensible Firmware Interface-UEFI
-64bit technology
-maximum partitions support by MBR                          ->128 started from 1
-maximum size of supports on one single hard disk in MBR     ->8ZB
-command **gdisk**

| UNIT | ABBREVIATION | STORAGE |
|------|------|------|
| Bit | B | Binary Digit, Single 1 or 0 |
| Nibble | - | 4 bits |
| Byte/Octet | B | 8 bits |
| Kilobyte | KB | 1024 bytes |
| Megabyte | MB | 1024 KB |
| Gigabyte | GB | 1024 MB |
| Terabyte | TB | 1024 GB |
| Petabyte | PB | 1024 TB |
| Exabyte | EB | 1024 PB |
| Zettabyte | ZB | 1024 EB |
| Yottabyte | YB | 1024 ZB |

Storage units (www.byte-notes.com)


<mark>NOTE:</mark> device files on Linux stored on **/dev**
# ls -l /dev/sda1
brw-rw----. 1 root disk 8, 1 May 16 09:52 /dev/sda1


**1-Master Boot Record-MBR**
-create **2gb primary** partition, format it with **xfs** filesystem and mount it on **/mnt/disk1**
# fdisk /dev/sdb
m
      n          new partition
      d          delete partition
      p          print partition table
      t          change partition id
      w          save/write and quit
      q          quit without save


p
Disk /dev/sdb: 5 GiB
Disklabel type: **dos**(mbr)
n
Partition type
  p  primary (0 primary, 0 extended, 4 free)
  e  extended (container for logical partitions)
p
Partition number: **Enter**
First sector: **Enter**
Last sector: **+2G**
p
/dev/sdb1     2048 4196351 4194304   2G 83 Linux
w
# udevadm settle          ->update kernel offline about storage modification

```
# fdisk -l /dev/sdb
# cat /proc/partitions
8    16   5242880 sdb
8    17   2097152 sdb1
# lsblk
sdb        8:16  0   5G  0 disk
└─sdb1     8:17  0   2G  0 part

# mkfs.xfs /dev/sdb1
# blkid
/dev/sdb1: UUID="a5915984-1c50-4604-b2c4-223d048a80ab" TYPE="xfs" PARTUUID="0d7e1514-01"
# mkdir /mnt/disk1
```

**mount**
1-temporary
2-prsistently

**1-temporary**
-Attach
```
# mount /dev/sdb1 /mnt/disk1
# df -hT
/dev/sdb1          xfs    2.0G  47M  2.0G  3%    /mnt/disk1
mount device     filesystem                      mount point
```

**-list of temporary mount**
```
# tail /etc/mtab
```

-Detach
```
# umont /mnt/disk1
```

**2-prsistently**
```
# vim /etc/fstab
```
<mark><mount device> <mount point> <file system> defaults 0 0</mark>
```
/dev/sdb1   /mnt/disk1    xfs    defaults   0  0
:wq!
# mount -a
# df -hT
/dev/sdb1        xfs    2.0G  47M  2.0G  3% /mnt/disk1
```

-create **1.5gb logical** partition, format it with **# mkfs.ext4 /dev/sdb5** filesystem and mount it on **/mnt/disk2**
```
# fdisk /dev/sdb
Disk /dev/sdb: 5 GiB
p
/dev/sdb1     2048 4196351 4194304  2G 83 Linux
n
e
Partition number: Enter
First sector: Enter
Last sector: Enter
p
/dev/sdb1      2048  4196351 4194304     2G 83 Linux
/dev/sdb2    4196352 10485759 6289408   3G  5 Extended
n
Adding logical partition 5
First sector: Enter
Last sector: +1.5G
p
/dev/sdb1      2048  4196351 4194304     2G 83 Linux
/dev/sdb2    4196352 10485759 6289408   3G  5 Extended
/dev/sdb5    4198400  7319551 3121152   1.5G 83 Linux
w
# udevadm settle
# fdisk -l /dev/sdb
# mkfs.ext4 /dev/sdb5
```

```
# blkid
/dev/sdb5: UUID="3bf47fea-adb4-4cca-9da0-70552144acbb" TYPE="ext4" PARTUUID="0d7e1514-05"
# mkdir /mnt/disk2
# echo "/dev/sdb5 /mnt/disk2 ext4 defaults 0 0" >>/etc/fstab
or
# echo "UUID=3bf47fea-adb4-4cca-9da0-70552144acbb /mnt/disk2 ext4 defaults 0 0" >>/etc/fstab
# mount -a
# df -hT
/dev/sdb1       xfs      2.0G  47M  2.0G  3% /mnt/disk1
/dev/sdb5       ext4     1.5G  4.5M 1.4G  1% /mnt/disk2
```

**2-Guid Partition Table-GPT**
```
# cat /proc/partitions
# gdisk /dev/sdc
?
            n       new partition
            d       delete partition
            p       print partition table
            t       change partition id
            w       save/write and quit
            q       quit without save
p
n
Partition number (1-128, default 1): 1
First sector: Enter
Last sector: +1G
Hex code or GUID: Enter
p
1       2048      2099199   1024.0 MiB  8300  Linux filesystem
w
Do you want to proceed? (Y/N): y
# udevadm settle
```

**MANAGING SWAP SPACE**
**INTRODUCING SWAP SPACE CONCEPTS**
-A swap space is an area of a **disk** under the control of the Linux **kernel memory management subsystem**.
-The kernel uses swap space to supplement the system RAM by holding inactive pages of memory.
-The combined system RAM plus swap space is called **virtual memory**.
**Implement SWAP on Linux**
-create **750mb** partition and attach it to Linux swap.
```
# free -m
Swap:        2048
# fdisk /dev/sdb
p
/dev/sdb1      2048  4196351 4194304      2G 83 Linux
/dev/sdb2     4196352 10485759 6289408    3G  5 Extended
/dev/sdb5     4198400  7319551 3121152    1.5G 83 Linux
n
Adding logical partition 6
First sector: Enter
Last sector: +750M
p
/dev/sdb1      2048  4196351 4194304      2G    83 Linux
/dev/sdb2     4196352 10485759 6289408    3G    5 Extended
/dev/sdb5     4198400  7319551 3121152    1.5G  83 Linux
/dev/sdb6     7321600  8857599 1536000    750M 83 Linux
t
Partition number (1,2,5,6, default 6): 6
Hex code (type L to list all codes): 82
p
/dev/sdb1      2048  4196351 4194304      2G    83 Linux
/dev/sdb2     4196352 10485759 6289408    3G    5 Extended
/dev/sdb5     4198400  7319551 3121152    1.5G  83 Linux
/dev/sdb6     7321600  8857599 1536000    750M 82 Linux swap / Solaris
w
# udevadm settle
# fdisk -l /dev/sdb
# mkswap /dev/sdb6
UUID=98529389-4573-4190-8ca8-bbdbf25b3e1f
# echo "UUID=98529389-4573-4190-8ca8-bbdbf25b3e1f swap swap deafults 0 0" >>/etc/fstab
# mount -a
# swapon /dev/sdb6
# free -m
Swap:        2797
# swapon -d
# swapon -s
```

**-delete swap space**
```
# swapoff /dev/sdb6
# free -m
Swap:        2047
# vim /etc/fstab
delete swap record
:wq!
# mount -a
# fdisk /dev/sdb
p
/dev/sdb1      2048  4196351 4194304      2G 83 Linux
/dev/sdb2     4196352 10485759 6289408    3G  5 Extended
/dev/sdb5     4198400  7319551 3121152    1.5G 83 Linux
/dev/sdb6     7321600  8857599 1536000    750M 82 Linux swap / Solaris
d
Partition number (1,2,5,6, default 6): 6
p
/dev/sdb1      2048  4196351 4194304      2G 83 Linux
/dev/sdb2     4196352 10485759 6289408    3G  5 Extended
/dev/sdb5     4198400  7319551 3121152    1.5G 83 Linux
w
# udevadm settle
```

**parted command**
# parted
(parted) select /dev/sdc
Using /dev/sdc
(parted) select /dev/sdd
Using /dev/sdd
(parted) quit
#
or
# parted /dev/sdd
(parted) select /dev/sda
Using /dev/sda
(parted) quit
#
# parted
(parted) **select /dev/sdd**
Using /dev/sdd
(parted) **print**
Partition Table: unknown
(parted) **mktable**
New disk label type?
aix  amiga atari bsd  dvh  **gpt**  loop  mac  **msdos** pc98  sun
New disk label type? **msdos**
(parted) **print**
Partition Table: msdos
(parted) **print free**
Number Start     End       Size
        1024B  5369MB  5369MB
(parted) mkpart
Partition type?  primary/extended? **primary**
File system type?  [ext2]? xfs
Start? 1024B
End? 1024MB
(parted) print
Number Start     End        Size     Type     File system  Flags
 1       1024B 1024MB  1024MB  primary      xfs      lba
(parted) quit
# udevadm settle