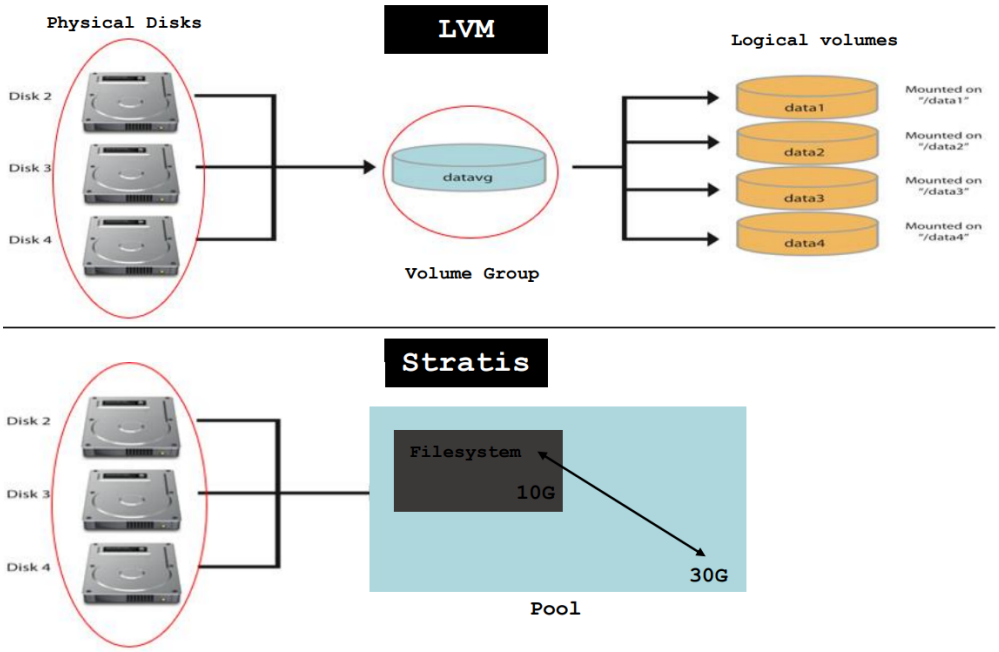
Implement advanced storage features

Linux #redhat #storage #LVM #filesystem

- Red Hat 8 introduces the next generation volume management solution called **Stratis**
- It uses thin provisioning by default
- It combines the process of creating logical volume management (LVM) and creation of filesystems into one management
- In LVM if a filesystem system gets full you will have to extend it manually whereas **stratis** extends the filesystem automatically if it has available space in its pool

In this note:

- How to manage multiple storage layers using **Stratis** local storage management



- With Stratis as we keep adding space to a filesystem and it keeps growing and growing and when it hits 10G at some point, and it needs another one gig or two gig, it will automatically extend that, you do not need to extend a volume manually with `vgextend` and `lvextend` commands.

Stratis

Install Statris package

- `yum/dnf install stratis-cli stratisd`

Enable and start Stratis service

- `systemctl enable|start stratisd`

Add 2 x 5G new disks from virtualization software and verify at the OS level

- Oracle VirtualBox storage setting (More on Manage basic storage)
- `lsblk` for "List block device"

Example using `lsblk` command:

```
[root@localhost ~]# lsblk
```

Output:

```
NAME         MAJ:MIN RM  SIZE RO TYPE MOUNTPOINTS
sda            8:0    0   20G  0 disk
├─sda1         8:1    0    1G  0 part /boot
└─sda2         8:2    0   19G  0 part
  ├─rhel-root
  │          253:0    0   17G  0 lvm  /
  └─rhel-swap
             253:1    0    2G  0 lvm  [SWAP]
sdb            8:16   0    5G  0 disk
sdc            8:32   0    5G  0 disk
sr0           11:0    1  991M  0 rom  /run/media/mmarin/RHEL-9-4-0-BaseOS-x86_64
```

- Note we added two disks to our virtual machine, the `sdb`, and `sdc` disks.

Create a new stratis pool and verify

- `stratis pool create pool1 /dev/sdb`
- `stratis pool list`

Example using `stratis` command:

```
[root@localhost ~]# stratis pool create pool1 /dev/sdb
[root@linuxtest ~]# stratis pool list
Name           Total / Used / Free    Properties                                   UUID   Alerts
pool1   5 GiB / 526 MiB / 4.49 GiB   ~Ca,~Cr, Op   7fce7907-23bd-4351-9078-46771ab92fc9   WS001
```

- Now you can see the pool name, the size, and the physical size of the pool.

Extend the pool

- `stratis pool add-data pool1 /dev/sdc`
- `stratis pool list`

Example using `stratis` command:

```
[root@linuxtest ~]# stratis pool add-data pool1 /dev/sdc
[root@linuxtest ~]# stratis pool list
Name            Total / Used / Free    Properties                                 UUID   Alerts
```

```
pool1   10 GiB / 532 MiB / 9.48 GiB   ~Ca,~Cr, Op   7fce7907-23bd-4351-9078-46771ab92fc9
[root@linuxtest ~]#
```

- Now our pool has been extended to 10G

Create a new filesystem using stratis

- `stratis filesystem create pool1 fs1`
- `stratis filesystem list` (Filesystem will start with 546 MB)

Example using `stratis` command:

```
[root@localhost ~]# stratis filesystem create pool1 fs1
[root@localhost ~]# stratis filesystem list
Pool    Filesystem   Total / Used / Free / Limit            Created             Device
UUID
pool1   fs1          1 TiB / 546 MiB / 1023.47 GiB / None   Jul 04 2024 11:43   /dev/stratis/pool1/fs1
3e434f48-6702-4c34-a05c-c6756298f7c7
```

- Note the name of the new filesystem being created is "`fs1`", you could pick any name for this.
- It will always start with 546 MiB used at first and it will grow as you are adding more data to your filesystem.

Create a directory for mount point and mount filesystem

- `mkdir /bigdata`
- `mount /dev/stratis/pool1/fs1 /bigdata`
- `lsblk`

Example using `mkdir` command:

```
[root@localhost ~]# mkdir /bigdata
```

- Note we are creating a directory in the `/` location\

Example using `mount` command:

```
[root@localhost ~]# mount /dev/stratis/pool1/fs1 /bigdata
```

- Note we need to specify the whole name of the device (`/dev/stratis/pool1/fs1`) which can be found by running `stratis filesystem list`
- We are mounting the pool device into the directory that we just created in `/`

Output from `lsblk`:

```
NAME                                                    MAJ:MIN RM  SIZE RO TYPE
MOUNTPOINTS
sda                                                       8:0    0   20G  0 disk
├─sda1                                                    8:1    0    1G  0 part    /boot
```

```
└─sda2                                                                 8:2    0   19G  0 part
  ├─rhel-root                                                        253:0    0   17G  0 lvm     /
  └─rhel-swap                                                        253:1    0    2G  0 lvm
[SWAP]
sdb                                                                    8:16   0    5G  0 disk
└─stratis-1-private-7fce790723bd4351907846771ab92fc9-physical-originsub
                                                                     253:2    0   10G  0 stratis
  ├─stratis-1-private-7fce790723bd4351907846771ab92fc9-flex-thinmeta 253:3    0    6M  0 stratis
  │ └─stratis-1-private-7fce790723bd4351907846771ab92fc9-thinpool-pool
  │                                                                  253:6    0  9.5G  0 stratis
  │   └─stratis-1-7fce790723bd4351907846771ab92fc9-thin-fs-3e434f4867024c34a05cc6756298f7c7
  │                                                                  253:7    0    1T  0 stratis
/bigdata
  ├─stratis-1-private-7fce790723bd4351907846771ab92fc9-flex-thindata 253:4    0  9.5G  0 stratis
  │ └─stratis-1-private-7fce790723bd4351907846771ab92fc9-thinpool-pool
  │                                                                  253:6    0  9.5G  0 stratis
  │   └─stratis-1-7fce790723bd4351907846771ab92fc9-thin-fs-3e434f4867024c34a05cc6756298f7c7
  │                                                                  253:7    0    1T  0 stratis
/bigdata
  └─stratis-1-private-7fce790723bd4351907846771ab92fc9-flex-mdv      253:5    0  512M  0 stratis
sdc                                                                    8:32   0    5G  0 disk
└─stratis-1-private-7fce790723bd4351907846771ab92fc9-physical-originsub
                                                                     253:2    0   10G  0 stratis
  ├─stratis-1-private-7fce790723bd4351907846771ab92fc9-flex-thinmeta 253:3    0    6M  0 stratis
  │ └─stratis-1-private-7fce790723bd4351907846771ab92fc9-thinpool-pool
  │                                                                  253:6    0  9.5G  0 stratis
  │   └─stratis-1-7fce790723bd4351907846771ab92fc9-thin-fs-3e434f4867024c34a05cc6756298f7c7
  │                                                                  253:7    0    1T  0 stratis
/bigdata
  ├─stratis-1-private-7fce790723bd4351907846771ab92fc9-flex-thindata 253:4    0  9.5G  0 stratis
  │ └─stratis-1-private-7fce790723bd4351907846771ab92fc9-thinpool-pool
  │                                                                  253:6    0  9.5G  0 stratis
  │   └─stratis-1-7fce790723bd4351907846771ab92fc9-thin-fs-3e434f4867024c34a05cc6756298f7c7
  │                                                                  253:7    0    1T  0 stratis
/bigdata
  └─stratis-1-private-7fce790723bd4351907846771ab92fc9-flex-mdv      253:5    0  512M  0 stratis
sr0                                                                   11:0    1  991M  0 rom
/run/media/mmarin/RHEL-9-4-0-BaseOS-x86_64
```

- Note it says `/bigdata` on the MOUNTPOINTS section of the `sdb` and `sdc` disks
- You can additionally run `df -h` to confirm that your pool device is mounted on the correct directory

Output from `df -h`:

```
Filesystem                                                                      Size
Used Avail Use% Mounted on
devtmpfs                                                                        4.0M
0  4.0M   0% /dev
tmpfs                                                                           5.1G
0  5.1G   0% /dev/shm
tmpfs                                                                           2.1G
9.3M  2.1G   1% /run
/dev/mapper/rhel-root                                                            17G
7.2G  9.8G  43% /
/dev/sda1                                                                       960M
411M  550M  43% /boot
tmpfs                                                                           1.0M
0  1.0M   0% /run/stratisd/ns_mounts
tmpfs                                                                           1.1G
96K  1.1G   1% /run/user/1000
```

```
/dev/sr0                                                                                    991M
991M     0 100% /run/media/mmarin/RHEL-9-4-0-BaseOS-x86_64
/dev/mapper/stratis-1-7fce790723bd4351907846771ab92fc9-thin-fs-3e434f4867024c34a05cc6756298f7c7  1.0T
7.2G 1017G   1% /bigdata
```

- Note it says 1.0T as the size of the device. But shouldn't it be 10G, why is it one terabyte?
  - By default, it's in the code of Stratis, that's how its built, it will always show you as a one terabyte pool
  - If you wanted to know the actual size that is being used and taken from the pool you can always run `stratis filesystem list` and look at the `/ Used /` section.

Create a snapshot of your filesystem

- `stratis filesystem snapshot pool1 fs1 fs1-snap`
- `stratis filesystem list`

Example using `stratis` command:

```
[root@localhost ~]# stratis filesystem snapshot pool1 fs1 fs1-snap
```

- Note that in order to create a snapshot with the `snapshot` option we need to specify the name of the pool, in this case it is "`pool1`" followed by the name of the filesystem, which in this case is "`fs1`", as well as the name that we will give to the snapshot, in this case we picked "`fs1-snap`"
- It could take some time, but it depends on the size of your filesystem, A 10G pool shouldn't take a lot.

Example using `stratis` command:

```
[root@localhost ~]# stratis filesystem list
```

- Verify that we created a snapshot of our filesystem

Output:

```
Pool    Filesystem   Total / Used / Free / Limit            Created             Device
UUID
pool1   fs1          1 TiB / 546 MiB / 1023.47 GiB / None   Jul 04 2024 11:43   /dev/stratis/pool1/fs1
3e434f48-6702-4c34-a05c-c6756298f7c7
pool1   fs1-snap     1 TiB / 546 MiB / 1023.47 GiB / None   Jul 04 2024 12:04
/dev/stratis/pool1/fs1-snap   b4fa5a00-1b1b-4486-8ada-248a7af1bd01
```

- Now you'll see two filesystems listed, one is `fs1` and the other is `fs1-snap`
- It becomes so easier in case you ar doing date management and you want to create an entire copy of your filesystem.

Add entry to `/etc/fstab` to mount at boot

- Remember that you will need to edit the `/etc/fstab` file if you want to enable this device to mount on boot. (More on Manage basic storage)
- Add the following line to the `/etc/fstab` file:
  - `UUID="asf-0887afgdja-" /bigdata xfs defaults, x-systemd.requires-stratisd.service 0 0`

- These parameters are telling `fstab` to do not mount this filesystem unless the system starts the `stratisd` daemon.