

Assignment 2

EBS Volume Creation – Windows Server

Screenshot 1 – Windows New Disk

The screenshot shows a Windows PowerShell window titled "Select Administrator: Windows PowerShell". The user is running the command `get-disk` to list available disks. The output shows two disks: Disk 0 (30 GB, MBR) and Disk 1 (5 GB, RAW). The user then runs `initialize-disk 1` to initialize Disk 1. After running `get-disk` again, the output shows that Disk 1 is now initialized and its partition style has changed to GPT.

```

Windows PowerShell
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PS C:\Users\Administrator> get-disk

Number Friendly Name Serial Number HealthStatus OperationalStatus Total Size Partition Style
-----
0 NVMe Amazo... vol0e5db4c90c76dca9a_00000001. Healthy Online 30 GB MBR
1 NVMe Amazo... vol04c59a95b7c623f03_00000001. Healthy Online 5 GB RAW

PS C:\Users\Administrator> initialize-disk 1
PS C:\Users\Administrator> get-disk

Number Friendly Name Serial Number HealthStatus OperationalStatus Total Size Partition Style
-----
0 NVMe Amazo... vol0e5db4c90c76dca9a_00000001. Healthy Online 30 GB MBR
1 NVMe Amazo... vol04c59a95b7c623f03_00000001. Healthy Online 5 GB GPT

PS C:\Users\Administrator>
  
```

Question 1: The “RAW” type simply means that the disk has not yet been initialized. In about 1-2 paragraphs, describe the difference between the GPT and MBR partition styles. Include differences in size limits, which one is more modern, and why you would use one over the other.

A: The difference between is that gtp newer than mbr but mbr is more compatible with more things since it has been around longer. Another big difference is that mbr max storage is 2tb while gpt max is higher. The result is that if you need anything above 2tb you would not want to use mbr because in the future or present you will run out of storage and after that theres nothing you can do past 2tb because the system simply wont allow it. You would mainly use mbr if youd like to boot from it as well giving the fact that it has to be under a 2tb drive but if you'd like to use it for anything as well and it be over 2tb then gpt

Question 2: Research the concept of Windows Storage Spaces. Write one to two paragraphs describing the functionality and how it would be useful in a large environment with multiple file servers.

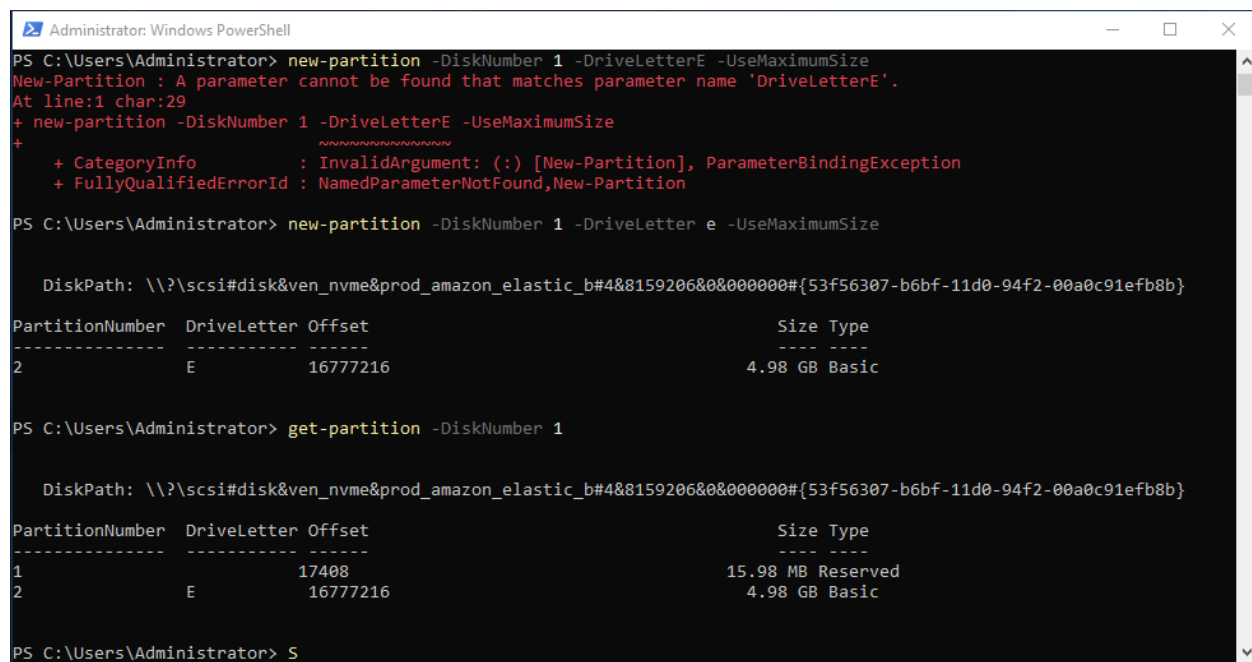
A: Its escentally like a RAID set up on a computer however its a lot easier to to set up. Its only at the operating system level making it versatile in since it can create virtual drives with redundancy features

like mirroring since it basically just makes all the physical drives into a huge storage pool that is a storage space. These virtual drives can also parity that also helps against drive failure making sure our data is available when failures happen and the integrity of the overall storage. It can be expanded dynamically without disrupting the rest of the drives basically can be hot swapped etc making it a flexible option for growing data demands like large environments with multiple file servers.

Question 3: Research the common file system types that Windows uses (FAT32, exFAT, NTFS, and ReFS). In one to two paragraphs, describe the common uses for each, how each is beneficial, and the key drawbacks of each type.

A: FAT32 is the oldest of the 4 systems and is mainly used on things like usb drives and has a huge compatibility with devices due to its age for things like windows linux etc. Its use for removable media or installing operating systems on a system but has a max file size of around 4 gigs and max partition size of 2 tb. exFAT is the newer version of FAT32 and support much larger file sizes past 2tb and partition sizes making it better for larger flash storages. It has compatibility with most like its older parent but shouldn't be used for high value data due to lack of security. NTFS is the default for most modern windows systems just like exFAT it supports large file sizes and partitions but it has file level security or encryption to ensure data integrity. Its good for internal drives since its reliable but its mainly compatible for windows based system making it harder for linux or mac. Lastly reFS it has advanced data integrity like NTFS but its more advance with automatic data corruption repair functionality and is mainly for massive scale storage solutions. Since it can handle massive volumes and files makes it the best for virtual machines and large data sets. But its not as supported as NTFS and does not have encryption.

Screenshot 2 – Windows New Partition



```
Administrator: Windows PowerShell
PS C:\Users\Administrator> new-partition -DiskNumber 1 -DriveLetterE -UseMaximumSize
New-Partition : A parameter cannot be found that matches parameter name 'DriveLetterE'.
At line:1 char:29
+ new-partition -DiskNumber 1 -DriveLetterE -UseMaximumSize
+ ~~~~~
+ CategoryInfo          : InvalidArgument: (:) [New-Partition], ParameterBindingException
+ FullyQualifiedErrorId : NamedParameterNotFound,New-Partition

PS C:\Users\Administrator> new-partition -DiskNumber 1 -DriveLetter e -UseMaximumSize

DiskPath: \\?\scsi#disk&ven_nvme&prod_amazon_elastic_b#4&8159206&0&000000#{53f56307-b6bf-11d0-94f2-00a0c91efb8b}

PartitionNumber  DriveLetter  Offset                Size Type
-----
2                E            16777216             4.98 GB Basic

PS C:\Users\Administrator> get-partition -DiskNumber 1

DiskPath: \\?\scsi#disk&ven_nvme&prod_amazon_elastic_b#4&8159206&0&000000#{53f56307-b6bf-11d0-94f2-00a0c91efb8b}

PartitionNumber  DriveLetter  Offset                Size Type
-----
1                17408       15.98 MB Reserved
2                E            16777216             4.98 GB Basic

PS C:\Users\Administrator> S
```

EBS Volume Creation – Linux Server

Screenshot 3 – Linux New Disk Creation

```
ec2-user@ip-172-31-6-144:~  
[ec2-user@ip-172-31-6-144 ~]$ sudo fdisk -l  
Disk /dev/xvda: 8 GiB, 8589934592 bytes, 16777216 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  
Disklabel type: gpt  
Disk identifier: 560B80C4-7164-45FA-B599-60A610A3D271  
  
Device      Start      End  Sectors  Size Type  
/dev/xvda1  24576 16777182 16752607   8G Linux filesystem  
/dev/xvda127 22528   24575    2048    1M BIOS boot  
/dev/xvda128 2048   22527    20480   10M EFI System  
  
Partition table entries are not in disk order.  
  
Disk /dev/xvdb: 5 GiB, 5368709120 bytes, 10485760 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  
[ec2-user@ip-172-31-6-144 ~]$ sudo pvcreate /dev/xvdb  
Physical volume "/dev/xvdb" successfully created.  
[ec2-user@ip-172-31-6-144 ~]$ sudo vgcreate data-vg /dev/xvdb  
Volume group "data-vg" successfully created  
[ec2-user@ip-172-31-6-144 ~]$ sudo lvcreate -n data_1 --extents 100%FREE data-vg  
Logical volume "data_1" created.  
[ec2-user@ip-172-31-6-144 ~]$
```

Screenshot 4 – Linux New Disk File System/Mount

```
ec2-user@ip-172-31-6-144:~  
[ec2-user@ip-172-31-6-144 ~]$ sudo vgcreate data-vg /dev/xvdb  
Volume group "data-vg" successfully created  
[ec2-user@ip-172-31-6-144 ~]$ sudo lvcreate -n data_1 --extents 100%FREE data-vg  
Logical volume "data_1" created.  
[ec2-user@ip-172-31-6-144 ~]$ sudo mkfs.xfs /dev/data-vg/data_1  
meta-data=/dev/data-vg/data_1 isize=512    agcount=4, agsize=327424 blks  
        =                       sectsz=512   attr=2, projid32bit=1  
        =                       crc=1        finobt=1, sparse=1, rmapbt=0  
        =                       reflink=1    bigtime=1 inobtcount=1  
data      =                       bsize=4096   blocks=1309696, imaxpct=25  
        =                       sunit=0      swidth=0 blks  
naming    =version 2              bsize=4096   ascii-ci=0, ftype=1  
log       =internal log          bsize=4096   blocks=16384, version=2  
        =                       sectsz=512   sunit=0 blks, lazy-count=1  
realtime  =none                  extsz=4096   blocks=0, rtextents=0  
[ec2-user@ip-172-31-6-144 ~]$ sudo mkdir /mnt/data  
[ec2-user@ip-172-31-6-144 ~]$ sudo mount /dev/data-vg/data_1 /mnt/data  
[ec2-user@ip-172-31-6-144 ~]$ df -hT  
Filesystem      Type      Size  Used Avail Use% Mounted on  
devtmpfs        devtmpfs  4.0M   0    4.0M   0% /dev  
tmpfs           tmpfs     475M   0    475M   0% /dev/shm  
tmpfs           tmpfs     190M  456K  190M   1% /run  
/dev/xvda1      xfs       8.0G   1.6G   6.4G  20% /  
tmpfs           tmpfs     475M   0    475M   0% /tmp  
/dev/xvda128    vfat      10M    1.3M   8.7M  13% /boot/efi  
tmpfs           tmpfs     95M    0     95M   0% /run/user/1000  
/dev/mapper/data--vg-data_1 xfs       5.0G   68M   4.9G   2% /mnt/data  
[ec2-user@ip-172-31-6-144 ~]$
```

Screenshot 5 – Linux New Disk - Fstab

```
ec2-user@ip-172-31-6-144:~  
GNU nano 5.8 /etc/fstab  
UUID=7c4e7e0e-ce36-42f9-b456-16f78f3a1eb1 / xfs defaults,noatime 1 1  
UUID=C155-24D2 /boot/efi vfat defaults,noatime,uid=0,gid=0,umask=0077,shortname=wa  
UUID=06a2e13b-f486-48e0-a27f-d9cec82a6b6f /mnt/data xfs defaults,noatime 1 1  
[ Read 5 lines ]  
^G Help ^O Write Out ^W Where Is ^K Cut ^T Execute ^C Location  
^X Exit ^R Read File ^\ Replace ^U Paste ^J Justify ^_ Go To Line
```

Screenshot 6 – Linux New Disk - Permanent

```
ec2-user@ip-172-31-6-144:~  
~~ \_#####\  
~~ \_###|  
~~ \#/ https://aws.amazon.com/linux/amazon-linux-2023  
~~ V~,'->  
~~~  
~~.-.  
~~/_/_____  
~~/_m/,'-/_/_____  
Last login: Thu Oct 10 08:16:02 2024 from 23.241.148.77  
[ec2-user@ip-172-31-6-144 ~]$ df -ht  
df: option requires an argument -- 't'  
Try 'df --help' for more information.  
[ec2-user@ip-172-31-6-144 ~]$ df -hT  
Filesystem Type Size Used Avail Use% Mounted on  
devtmpfs devtmpfs 4.0M 0 4.0M 0% /dev  
tmpfs tmpfs 475M 0 475M 0% /dev/shm  
tmpfs tmpfs 190M 468K 190M 1% /run  
/dev/xvda1 xfs 8.0G 1.6G 6.4G 20% /  
tmpfs tmpfs 475M 0 475M 0% /tmp  
/dev/mapper/data--vg-data_1 xfs 5.0G 68M 4.9G 2% /mnt/data  
/dev/xvda128 vfat 10M 1.3M 8.7M 13% /boot/efi  
tmpfs tmpfs 95M 0 95M 0% /run/user/1000  
[ec2-user@ip-172-31-6-144 ~]$ touch ~/test.txt  
[ec2-user@ip-172-31-6-144 ~]$
```

EBS Volume Expansion - Windows

Screenshot 7 – Expanding E Drive

```
Administrator: Windows PowerShell
Windows PowerShell
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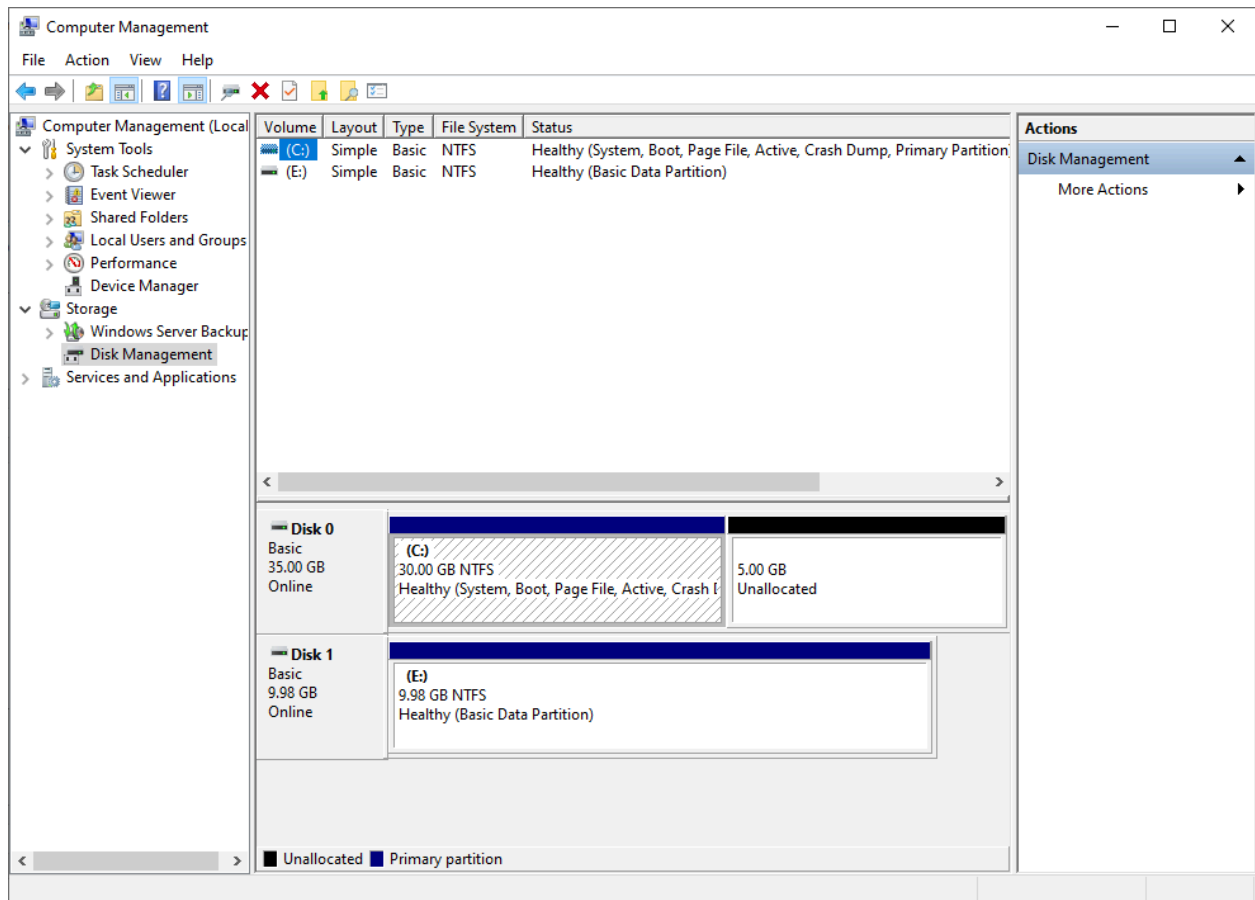
PS C:\Users\Administrator> $MaxSize = (Get-PartitionSupportedSize -DriveLetter e).sizeMax
PS C:\Users\Administrator> Resize-Partition -DriveLetter e -Size $MaxSize
PS C:\Users\Administrator> Get-Partition -DiskNumber 1

    DiskPath: \\?\scsi#disk&ven_nvme&prod_amazon_elastic_b#4&8159206&0&000000#{53f56307-b6bf-11d0-94f2-00a0c91efb8b}

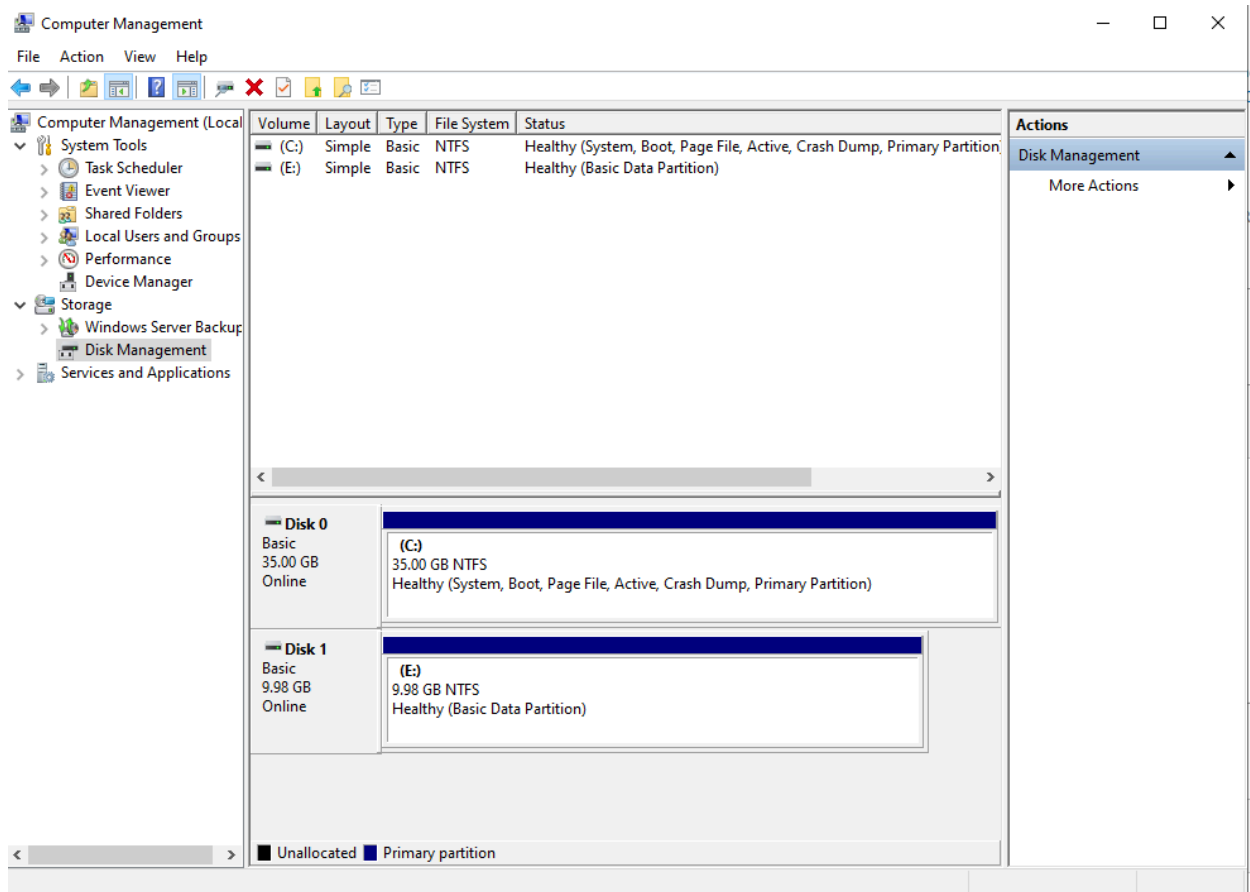
PartitionNumber  DriveLetter  Offset                Size Type
-----
1                17408        15.98 MB Reserved
2                E           16777216          9.98 GB Basic

PS C:\Users\Administrator>
```

Screenshot 8 – Expanding C Drive - Before



Screenshot 9 – Expanding C Drive - After



EBS Volume Expansion - Linux

Screenshot 10 – Expanding Volume - PV

```
ec2-user@ip-172-31-6-144:~  
PV Size          5.00 GiB / not usable 4.00 MiB  
Allocatable      yes (but full)  
PE Size          4.00 MiB  
Total PE         1279  
Free PE          0  
Allocated PE     1279  
PV UUID          uIS4uy-svxq-4q18-oW9I-GSYG-D6Gt-blzfSG  
  
[ec2-user@ip-172-31-6-144 ~]$ sudo pvresize /dev/sdb  
Physical volume "/dev/sdb" changed  
1 physical volume(s) resized or updated / 0 physical volume(s) not resized  
[ec2-user@ip-172-31-6-144 ~]$ sudo pvdisplay  
--- Physical volume ---  
PV Name          /dev/sdb  
VG Name          data-vg  
PV Size          <10.00 GiB / not usable 3.00 MiB  
Allocatable      yes  
PE Size          4.00 MiB  
Total PE         2559  
Free PE          1280  
Allocated PE     1279  
PV UUID          uIS4uy-svxq-4q18-oW9I-GSYG-D6Gt-blzfSG  
  
[ec2-user@ip-172-31-6-144 ~]$
```

Screenshot 11 – Expanding Volume - LV

```
ec2-user@ip-172-31-6-144:~  
[ec2-user@ip-172-31-6-144 ~]$ sudo lvextend -l +100%FREE /dev/data-vg/data_1  
Size of logical volume data-vg/data_1 changed from <5.00 GiB (1279 extents) to  
<10.00 GiB (2559 extents).  
Logical volume data-vg/data_1 successfully resized.  
[ec2-user@ip-172-31-6-144 ~]$ sudo lvdisplay  
--- Logical volume ---  
LV Path          /dev/data-vg/data_1  
LV Name          data_1  
VG Name          data-vg  
LV UUID          qkyuzg-cXYO-X8JB-MUPi-MjFM-OIx9-AwKPFZ  
LV Write Access  read/write  
LV Creation host, time ip-172-31-6-144.ec2.internal, 2024-10-10 08:17:06 +0000  
LV Status        available  
# open           1  
LV Size          <10.00 GiB  
Current LE       2559  
Segments         1  
Allocation       inherit  
Read ahead sectors auto  
- currently set to 256  
Block device     253:0  
  
[ec2-user@ip-172-31-6-144 ~]$
```


Screenshot 12 – Expanding Volume – File System

```
ec2-user@ip-172-31-6-144:~  
tmpfs          tmpfs          95M          0          95M          0% /run/user/1000  
[ec2-user@ip-172-31-6-144 ~]$ sudo xfs_growfs /dev/mapper/data--vg-data_1  
meta-data=/dev/mapper/data--vg-data_1 isize=512    agcount=4, agsize=327424 blks  
         =                               sectsz=512   attr=2, projid32bit=1  
         =                               crc=1        finobt=1, sparse=1, rmapbt=0  
         =                               reflink=1     bigtime=1 inobtcount=1  
data      =                               bsize=4096   blocks=1309696, imaxpct=25  
         =                               sunit=0      swidth=0 blks  
naming    =version 2                       bsize=4096   ascii-ci=0, ftype=1  
log       =internal log                   bsize=4096   blocks=16384, version=2  
         =                               sectsz=512   sunit=0 blks, lazy-count=1  
realtime  =none                           extsz=4096   blocks=0, rtextents=0  
data blocks changed from 1309696 to 2620416  
[ec2-user@ip-172-31-6-144 ~]$ sudo df -hT  
Filesystem      Type      Size      Used Avail Use% Mounted on  
devtmpfs        devtmpfs  4.0M       0    4.0M   0% /dev  
tmpfs           tmpfs     475M       0    475M   0% /dev/shm  
tmpfs           tmpfs     190M    464K  190M   1% /run  
/dev/xvda1      xfs       8.0G    1.6G   6.4G  20% /  
tmpfs           tmpfs     475M       0    475M   0% /tmp  
/dev/mapper/data--vg-data_1 xfs       10G    104M   9.9G   2% /mnt/data  
/dev/xvda128    vfat      10M     1.3M   8.7M  13% /boot/efi  
tmpfs           tmpfs     95M       0     95M   0% /run/user/1000  
[ec2-user@ip-172-31-6-144 ~]$
```

Question 4: Do a little reading on LVM. In one to two paragraphs, describe what LVM is and the various components (PV, LV, VG) and how those components layer on top of each other.

A: LVM is a logical volume manager and its a storage management system used in linux that gives it flexible and dynamic allocation of displace. It lets us turn physical storage devices into logical volumes making it easier to manage and scale disks when needed without having to worry about the physical disks limitations. Its very useful in environments where storage needs to be resized expanded or reorganized without disrupting whatever its on. PV is a physical volume its the actual drive or partitions that LVM uses and depending on the needs it can be a whole disk partitioned off or even set up in a RAID configuration (when all the physical drives are basically seen as 1 by the system). VG is a volume group made by pooling together the PVs and servers as a storage container that the logical volumes can be created by combining PVs into a huge pool thats then sectioned off by admins without having to worry about the limits of the drive itself. Lastly is LV or logical volumes they are whats made in the space of a VG basically they are partition that are treated as normal in the OS but are more flexible as they can actually be resized extended or moved without affecting the data which cant be done really (hence why we cant resize or undo a partition on the windows server in earlier screenshots goodluck to anyone who didn't take that screenshot intime before extending the volume.)

Question 5: Research the common Linux file systems (EXT3, EXT4, XFS, swap). In one to two paragraphs, describe the common uses for each, how each is beneficial, and the key drawbacks of each type.

*A: **EXT3** is the file system widely used in early linux mainly for journaling that helps protect data by keeping track of changes before they are done helping reduce the risk of corruption after sudden crashes. But it has a limit in performance and scalability compared to modern systems that also has a*

max file size of 2 tb and partitions of 16tbs but it cant have a dynamic inode allocation making it less efficient in todays age. ECT4 the successor is the more used one as its like EXT3 but better as it has bigger file sizes of around 8x+ as well as offers faster performance that reduces fragmentation and delayed allocation. Its used mainly on desktops and servers since it has a nice balance. But it lacks specialized filing systems. Speaking of filing systems XFS is a high performance file system designed to be scaled supports massive files and partitions and is mainly optimized for effective systems with heavy workloads or multiple users. However its more complex then those above and lacks the ability to be dynamically reduced storage. Lastly is swap which is apparently not technically a file system for storing files but more of a special purpose space used by the kernel to extend ram. When the system memory is full the kernel moves idel data to the swap space to free up physical ram for more immediate processes basically kicking out anything not being used at that second. but its slower since it reslies on disk access which means if you have a HDD will slow down everything and excessive swapping can severely degrade performance being its biggest drawback. Its crucial however for maintaining system stability under high memory loads but if you rely on it too much might be a sign to just upgrade more ram on the linux system in order to not run into sever degrades in performances over time.

***The deliverable for Assignment 2 will be this document completed with the required screenshots and answers to the questions. You will submit this document in Canvas.