TEJ4M
File Formats and Volumes and Partitions

What is a Partition?

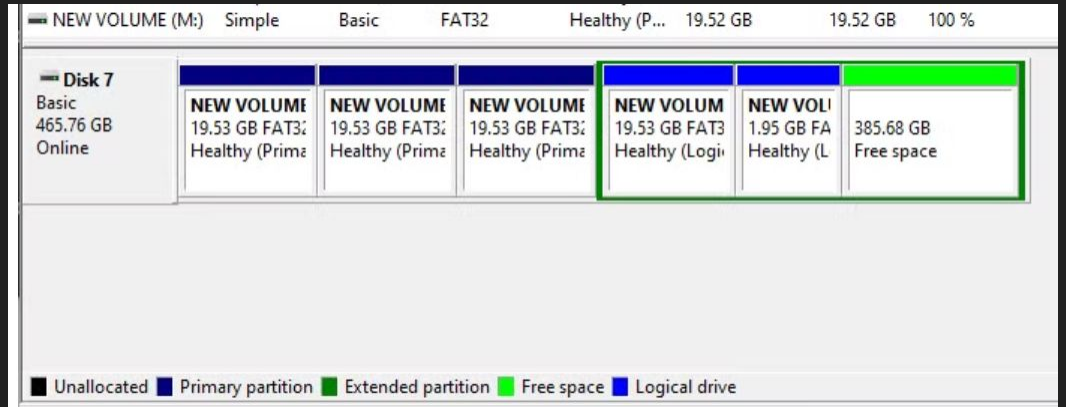
A partition is a portion of a drive in which can reside several different volumes.

A HDD can be divided into multiple partition, each with multiple volumes.

There are 3 main partition types: 1. Primary 2. Extended 3. Logical

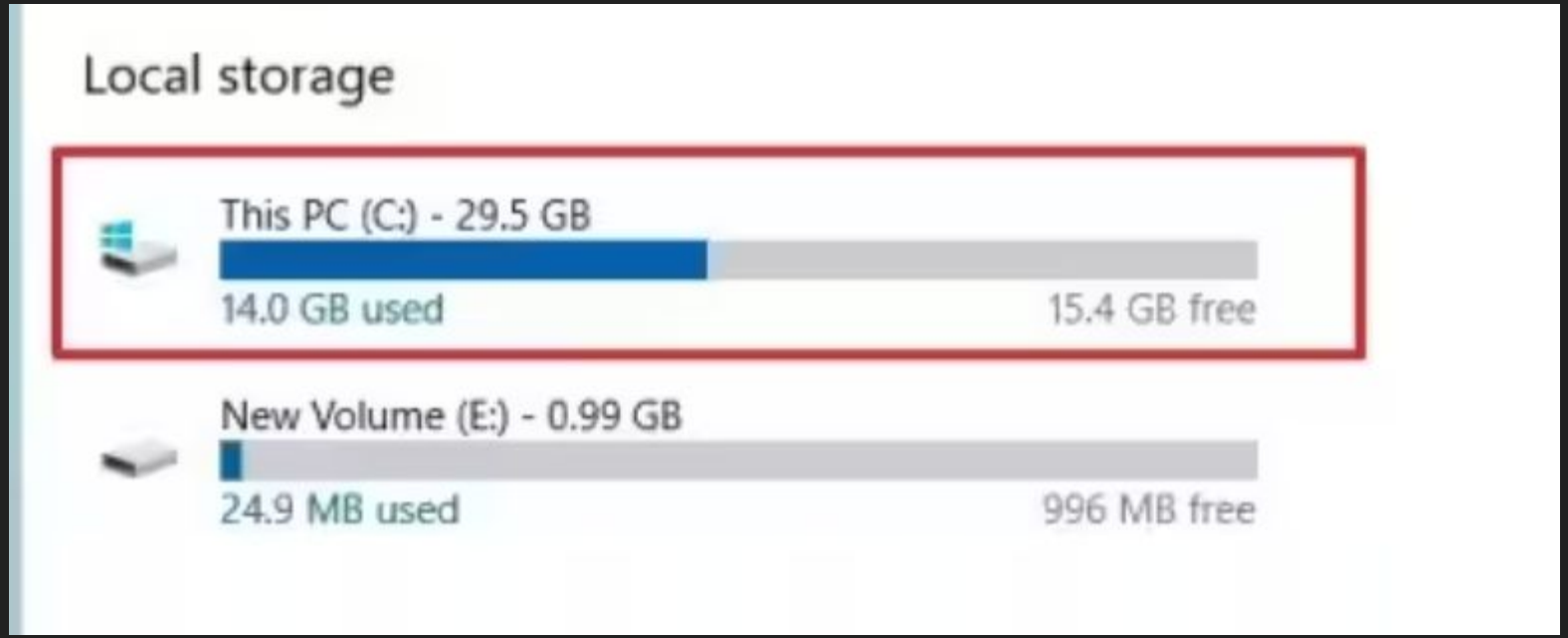
A HDD can contain a maximum of 4 primary partitions. The fourth can be modified to be an extended partition.

The extended partition can then be divided into multiple logical drives.



What is a Volume?

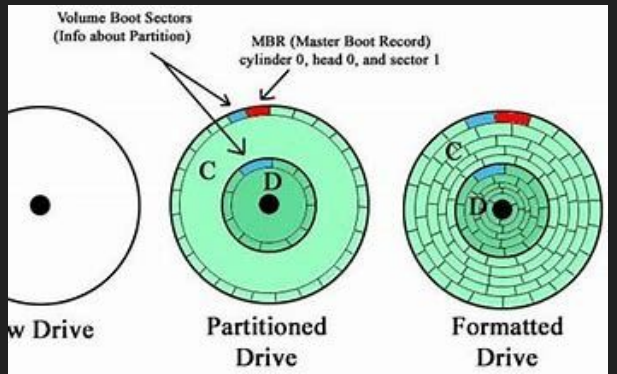
A disk volume is a collection of partitions or portions of partitions that is accessible using a file system ex. FAT32, exFAT, NTFS and a drive letter



What is an Active and Extended Partition?

There can only be a single active partition. This is the partition that contains all the necessary files for booting an OS.

Information about the partitions is stored in the Partition Table which is located in the MBR(master boot record-older Windows 7 and earlier) or GPT(GUID Partition Table-newer).



Primary, Extended, and Logical Partitions

- When partitioning, you'll need to be aware of the difference between primary, extended, and logical drives
- A disk with a traditional partition table can only have up to four partitions
- Extended and logical partitions are a way to get around this limitation
- Each disk can have up to four primary partitions or three primary partitions and an extended partition
- If you need four partitions or less, you can just create them as primary partitions
- let's say you want six partitions on a single drive then you would need an extended partition into which other partition containers could be made (3 primary and 1 extended)
- The partitions created in an extended partition are called logical drives
- For example if you wanted 6 partitions then you could create 3 primary partitions, 1 extended and in the extended create 3 logical drives
- Or you could create 1 primary partitions, 1 extended with 5 logical drives in it
- You just can't have more than four primary partitions at a time.

Advantages of GPT over MBR

GPT can handle much larger disks (18 exabytes) and more partitions 128 vs only 4 primary ones in MBR

Less corruptible.

Works well with UEFI to boot faster

Types of Partition Status

Active/System-the partition that contains information about where to find the files needed to boot the computer using the OS

Boot-the partition that contains the boot files

Page File-reserved portion of a partition that contains information from RAM to help alleviate overloads in RAM

Crash Dump-partition is used to dump all system crash information

What’s the difference between the file formats?

- **FAT32 is an older file system that’s not as efficient as NTFS and doesn’t support as big a feature set, but does offer greater compatibility with other operating systems.**
- **exFAT is a modern replacement for FAT32—and more devices and operating systems support it than NTFS—but it’s not nearly as widespread as FAT32.**
- **NTFS is the modern file system Windows likes to use by default.**
- **Windows gives you the choice of using three different file systems: NTFS, FAT32, and exFAT**

What is a file format?

- **is a type of file system on the hard drive**
- **A file system provides a way of organizing a drive. It specifies how data is stored on the drive and what types of information can be attached to files—filenames, permissions, and other attributes.**
- **three of the most common formats, or file systems, are FAT, FAT32 and NTFS**
- **‘Formatting a HDD’ means to set up a file format while removing access to the current files on the hard drive**
- **A basic format removes pointers to files but they still exist**
- **‘Zero filling’ is a type of format that completely removes all traces of old files during a format**

NTFS

- **NTFS is packed with modern features not available to FAT32 and exFAT**
- **NTFS supports file permissions for security, a change journal that can help quickly recover errors if your computer crashes, shadow copies for backups, encryption, disk quota limits, hard links, and various other features.**
- **Your Windows system partition must be NTFS**
- **Despite its advantages, where NTFS lacks is compatibility**
- **It’ll work with all recent versions of Windows—all the way back to Windows XP—but it has limited compatibility with other operating systems**
- **By default, Macs can only read NTFS drives, not write to them**

FAT32

- **big advantage is that because it’s so old, FAT32 is the de-facto standard**
- **Most bought USB drives come preformatted with FAT32**
- **Individual files on a FAT32 drive can’t be over 4GB in size**
- **A FAT32 partition must also be less than 8TB**
- **you won’t want to FAT32 for an internal drive. It lacks the permissions and other security features built into the more modern NTFS file system**

Extended File Allocation Table (exFAT)

- exFAT is optimized for flash drives—designed to be a lightweight file system like FAT32, but without the extra features and overhead of NTFS and without the limitations of FAT32
- Like NTFS, exFAT has very large limits on file and partition sizes., allowing you to store files much larger than the 4 GB allowed by FAT32
- Macs offer full read-write support for exFAT
- exFAT drives can be accessed on Linux by installing the appropriate software

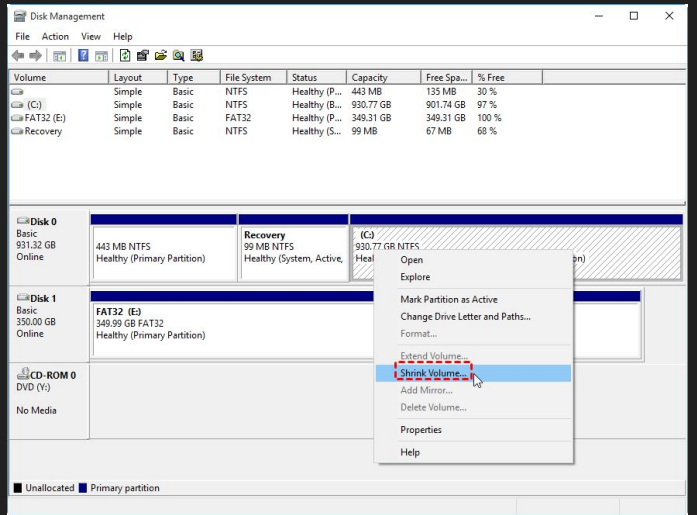
How to Partition

- While installing an operating system — Windows or Linux — your operating system installer will offer a partitioning screen where you can create, delete, format, and resize partitions
- In windows you can use the Disk Management Tool
- In linux you can use the Gparted tool
- You can’t always modify a partition while it’s in-use — for example, you can’t delete a Windows system partition while you’re running Windows from it! — so you may need to boot from a Linux live CD or use an operating system installer disk to make many changes

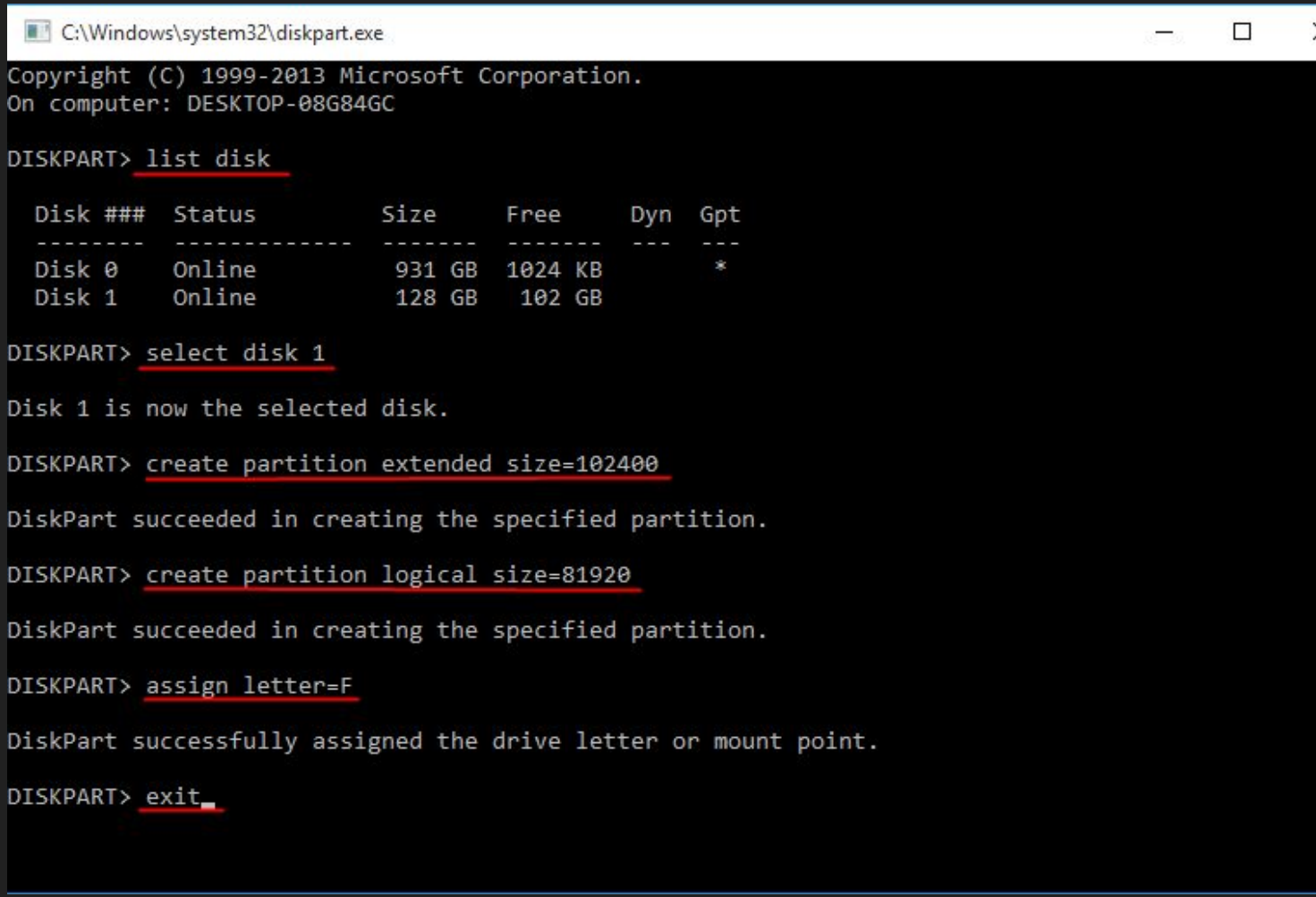
Using Windows DiskPart

- Logical partition only exists in Extended partitions
- Creating an Extended partition from unallocated space is the first job you need to do
- If there is no available unallocated space on the hard drive, you can shrink redundant partition to generate one
- To do this start the Disk Management tool and right click on the C: drive and then select Shrink Volume
- Secondly, type in the amount of space that you want to shrink by or click the up and down arrows behind the box
- Finally, you will see the unallocated space (space not assigned a logical drive letter) next to C drive.
- You could also do this using the Diskpart command line tool as follows:

- **Diskpart**
- **list volume**
- **select volume x** (x is the volume number you want to shrink)
- **shrink desired=10240** (size stands for the capacity you will shrink by and the unit is MB)
- **exit**



Create Logical Partition Using Diskpart



Questions and Exercises

1. **When was the FAT format first developed and used? With which OS?**

FAT was first developed in 1977 and used with MS-DOS

2. **What about FAT32?**

FAT32 was introduced in 1996 with Windows 95 OSR2

3. **What about NTFS?**

NTFS was introduced in 1993 with Windows NT

4. **How does Zero Filling work to erase files completely from a HDD?**

By changing all bits to zero

Questions and Exercises cont.

5. Explain two features of using NTFS.

File permissions for security

Supports large files and volumes

6. Do some research and explain the steps to make a flash drive compatible with Macs and PCs.

1. Back Up Data: Save files elsewhere before formatting.
2. Format Drive:
    a. On Windows: Use exFAT in File Explorer.
    b. On Mac: Use exFAT in Disk Utility.
3. Verify: Test on both Mac and PC for compatibility.

exFAT ensures cross-platform compatibility without file size limits.

7.Does the Sony Playstation work with NTFS?

No

8. Which XBOX series is compatible with NTFS?

Series X and series S

9. Which Playstations support exFAT?

PS4 and PS5

10. What is FAT an acronym for? What about exFAT? NTFS?

FAT: File Allocation Table exFAT: Extended File Allocation Table NTFS: New Technology File System

Questions and Exercises cont.

11. What is a volume?
A storage partition or logical drive on a disk
12. How is a partition or partitions related to a volume?
A volume is created from one or more partitions on a disk
13. Do some research and explain what RAID is it as it relates to storage.
RAID (Redundant Array of Independent Disks) combines multiple drives for redundancy, performance, or both
14. What is RAID1 and how does it relate to volumes?
RAID 1 mirrors data across two drives, creating a redundant volume for fault tolerance
15. What are some other RAID options?
RAID 0 (striping for speed), RAID 5 (striping with parity), RAID 10 (mirroring + striping)

Exercises

16. Log onto your computer running the windows os. Enter the search bar and type create hard disk and format partitions and hit enter.

17. Analyze the main screen. Indicate the number of disks and partitions you have, the file format in each partition and its size as well as the types of status they have.

18. Let's create a new partition using available space in your C: drive which should be one of your primary partitions. Start by right clicking on that partition. Then select the menu option "Shrink Volume". Shrink the volume to half of the available size. Note that you have now created a new partition with unallocated space (space that has no current use). Right click in this new partition and select "New Simple Volume". Click Next on the wizard screen all the way to the end (choose all default values). When done open File Explorer and look for the new drive letter. You now have a new partition in your computer where your files and folder are separated from your main drive.

19. Create a new partition out of the one you just made but this time format it to use fat32 file types.

20. Delete the two new partitions you made so that you have all the unallocated space you had when you first shrunk your original C: drive partition.