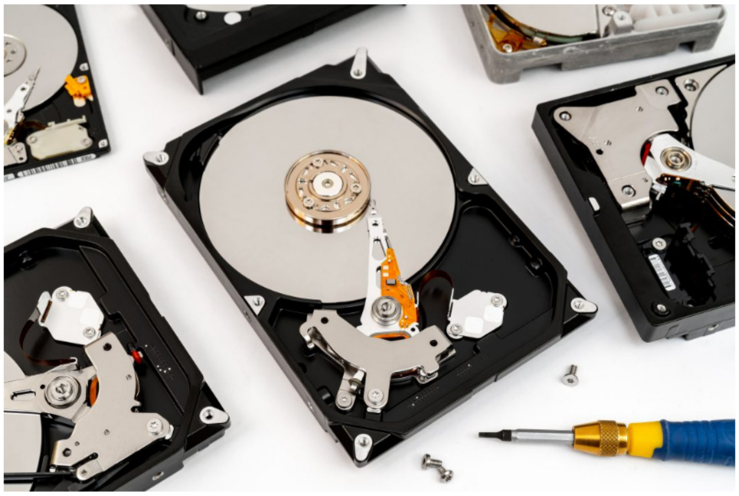
Hard Disk Drive Basics

Hard drives are typically where a lot of digital evidence is stored and collected, so understanding how hard drives work and where data can be hidden is important, allowing you to collect artifacts in future lessons. This lesson will cover the following HDD basics.

- Platters
- Sectors
- Clusters
- Slack Space

WHAT ARE HDDs?

A hard disk drive (HDD) is a non-volatile memory hardware device that controls the positioning, reading and writing of the hard disk, which furnishes data storage. Hard disk drives are commonly used as the main storage device in a desktop computer or laptop. HDDs will typically store an operating system, software programs and user-created files such as documents. Hard disk drives are commonly found in drive bays and are connected to the motherboard via an ATA, SATA or SCSI cable, and also connected directly to a power supply unit (PSU).



PLATTERS

A **hard disk drive platter** (or disk) is the circular disk on which magnetic data is stored in a hard disk drive. The rigid nature of the platters in a hard drive is what gives them their name (as opposed to the flexible materials which are used to make floppy disks). Hard drives typically have several platters which are mounted on the same spindle. A platter can store information on both sides, requiring two heads per platter.

SECTORS

In computer disk storage, a **sector** is a subdivision of a track on a magnetic disk or optical disc. Each sector stores a fixed amount of user-accessible data, traditionally 512 bytes for hard disk drives, while newer HDDs use 4096-byte (4 KiB) sectors.

The sector is the minimum storage unit of a hard drive. Most disk partitioning schemes are designed to have files occupy an integral number of sectors regardless of the file's actual size. Files that do not fill a whole sector will have the remainder of their last sector filled with zeroes. In practice, operating systems typically operate on blocks of data, which may span multiple sectors.

In modern disk drives, each physical sector is made up of two basic parts, the sector header area (typically called "ID") and the data area. The header may also include an alternate address to be used if the data area is undependable. The *address identification* is used to ensure that the mechanics of the drive have positioned the read/write head over the correct location. The data area contains the sync bytes, user data and an error-correcting code (ECC) that is used to check and possibly correct errors that may have been introduced into the data.

CLUSTERS

A cluster, in the context of a hard disk, is a group of sectors (described above) within a disk and is the grouping by which disk files are organized. A cluster is larger than a sector, and most files fill many clusters of disk space. The hard drive is able to find all the clusters on a disk because each cluster possesses its own unique ID value.

SLACK SPACE

Slack space is the leftover storage that exists on a computer's hard disk drive when a computer file does not need all the space it has been allocated by the operating system. The examination of slack space is an important aspect of computer forensics as we can find remaining data from previous files allocated in the same cluster. For example, if a user deleted files that filled an entire hard drive cluster, and then saved new files that only filled half of the cluster, the latter half would not necessarily be empty. It may include leftover information from the deleted files that we can retrieve, and may potentially include evidence.

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