

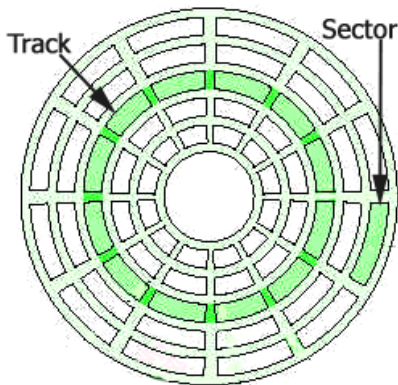
## 4 Basic Concepts

This chapter explains terms and ideas that show how the program works. To understand these helps to obtain a general notion of the operation performance and makes it easier for the user to operate the program.

### 4.1 A Hard Disk Layout

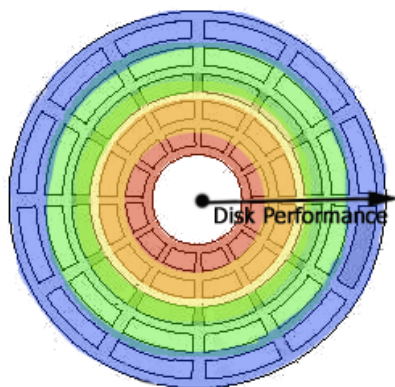
Before optimizing any system we need to understand it. Speaking about a file system of your computer we should picture how files are stored on a hard disk.

In appearance a hard disk resembles a set of mirror-smooth CD/DVDs or platters (they are even called the same). Every disk platter is divided to tracks and sectors. Tracks are concentric circles. Sectors are radial wedges. Mentioning a track and a sector we can easily find any place on the disk:



Sectors have a fixed size and contain a certain number of bytes (512, for example), which depends on an operating system.

As in the case of platters a computer starts reading (or writing) information from external tracks. The main reason for that is the next – a hard disk works faster on these tracks (having a permanent angular velocity we have the maximal linear velocity exactly on the external tracks). Please pay your attention on this important fact. If you keep data recorded in the beginning of the disk, it will be found and operated faster than data kept on the internal tracks.

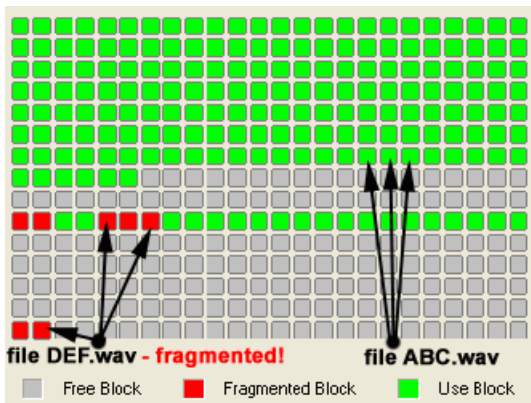


Dividing the disk to tracks and sectors are named low-level formatting. However before we are able to place our files on the disk we should create special high-level structures, which help to organize our records and to manage them. Similar structures form a file system. When we are performing high-level formatting, we are creating such structures as a file allocation table (FAT), data blocks (where our future files can be stored) and some others.

### 4.2 File Fragmentation

A wish to optimize the hard disk work might be caused by many reasons – from a simple habit to put a place in order to unpleasant occurrences of system failures. But any way a main obstacle you meet here will be the progressive fragmentation of files. Data is written irregularly on the disk. The same file might be stored in different sectors. While updating files, the system tends to save updates on the largest continuous space of the hard disk. This space is often on a sector different from sectors where

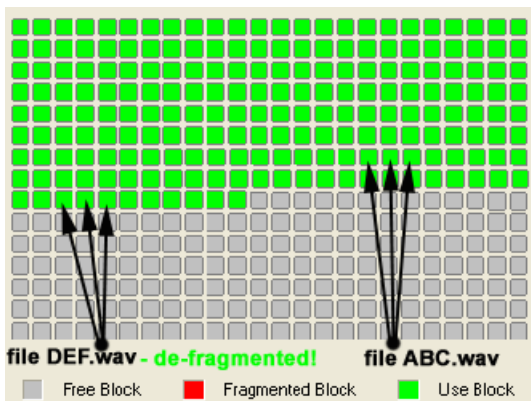
the other parts (fragments) of the file are stored. In the case of fragmented files the system has to search the hard disk every time the file is opened to find all of its fragments what noticeably slows down the response time.



Service files of operating systems may be also fragmented. The NTFS file system has for example a special file, the *Master File Table* (MFT), which is a well-organized catalogue of all files on a partition. The table keeps records about every file allocation, about its attributes and even contents of small size files. MFT is a system file, which is stored on a protected part of the NTFS partition (the so-called MFT zone). Usually the \$MFT file is inaccessible for standard defragmentation tools (not for Total Defrag!) although it is subject to fragmentation as any other file.

## 4.3 De-fragmentation

The medicine against the fragmentation is evident. We should rewrite different parts of any file to contiguous sectors on the hard disk. This process is called de-fragmentation. It often helps to increase the speed of file access and data retrieval.



Total Defrag enables to re-write files in an optimal way depending on peculiarities of the file system and on your tasks. So it allows taking into account the following conditions:

- ❑ If you work with big size files (multimedia or CAD files are usually big), then it is reasonable to place them into those sectors of the disk where your computer could operate them faster, i.e. to the first sectors of the disk. It might be done during the defragmentation procedure (see the [Defragmenting a Partition](#) chapter).
- ❑ If a hard disk has a great number of directories (for example it may be a data base or your favorite music collection), then you should also place directories on the sectors with the highest disk performance to make search files faster.
- ❑ And at least placing most frequently updating files to the first sectors of the disk will provide the performance increase too.

Before starting the defragmentation procedure we also recommend to draw your attention to PAGEFILE.SYS and HIBERFIL.SYS system files that are used in the NTFS system as the temporary ones. They are re-initialized at the beginning of every Windows session and they are absolutely unimportant between the sessions. Excluding them from the processing files you save time.