

The Advanced Format sector, the old sector and the MTF record size

by Alexandre Borges (JAN/11/2015)

Yesterday, I heard a strange statement: “In a disk, the sector size is always 512 bytes and a single MTF file record has always 1024 bytes”. It is NOT true. Indeed, most disks have a the sector size and a single MTF file record equal to 512 bytes and 1024, respectively. However, new disks can have larger values. To check the current value for your disk, execute the following command on your Windows:

```
C:\Users\Administrator\Desktop> fsutil fsinfo ntfsinfo c:
```

```
NTFS Volume Serial Number :      0xe6f2908af290609b
Version :                          3.1
Number Sectors :                   0x00000000573b7fff
Total Clusters :                   0x00000000ae76fff
Free Clusters :                    0x00000000012b743a
Total Reserved :                   0x00000000000037b0
Bytes Per Sector :                  512
Bytes Per Physical Sector :         4096
Bytes Per Cluster :                4096
Bytes Per FileRecord Segment :     1024
Clusters Per FileRecord Segment :  0
Mft Valid Data Length :            0x000000001a180000
Mft Start Lcn :                    0x000000000000c0000
Mft2 Start Lcn :                   0x00000000000000002
Mft Zone Start :                   0x00000000002852700
Mft Zone End :                     0x00000000002852720
RM Identifier:                      B9BCD866-E859-11E1-AE0B-806E6F6E6963
```

This output brings another question: what’s the real sector size?

This case, the real sector size is 4096 bytes (**Bytes Per Physical Sector**) because the operating system (Windows 7 and newer) supports new disks that uses Advanced Format sectors, which its size is 4096 bytes. Additionally, to keep the backward compatibility (old operating systems were projected to read and write in sectors with 512 bytes), it emulates the old sector size with 512 bytes (**Bytes Per Sector**). This emulated sector (with 512 bytes) is also known as **virtual sector**.

By using the old sector size (512 bytes), we have the following format:



By using the Advanced Disk format (4096 bytes), the sector has the following scheme:



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Thus, there are some points to highlight as shown below:

1. One **Advanced Format sector** (4096 bytes) is equivalent to 8 old sectors (virtual sectors).
2. By using Advanced Disk format sectors, there is less overhead because there is only 1 GAP/SYNC/ADDRESS MARK and 1 ECC per sector.
3. The Advanced Format sector (4096 bytes) presents an ECC size equal to 100 bytes and the old sector presents an ECC size equal to 50 bytes. Therefore, only ONE Advanced Format sector (4096 bytes) takes only 100 bytes of ECC, but the equivalent size by using old sectors is equal to 400 bytes of ECC (8 x 50 bytes).

Returning to second part of original question, the MTF record size (**Bytes per FileRecord Segment**) is 1024 bytes, but new disks have a bigger MTF record size that cause the \$MFT size to grow to many GBs.

I hope you have liked it.

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