STORAGE VIRTUALISATION ON BLOCK OR FILE LEVEL

we saw that the virtualisation of storage requires an entity that maps
between virtual and physical storage and vice versa. The virtualisation entity can be located on the servers (for example, in the form of a volume manager), on the storage devices (for example, in a disk subsystem) or in the network (for example, as a special device).

Regardless of which level of the storage network (server, network or storage device) the virtualisation entity is located on, we can differentiate between two basic types of virtualisation: virtualisation on block level and virtualisation on file level. Virtualisation on block level means that storage capacity is made available to the operating system or the applications in the form of virtual disks (Figure 5.12). Operating system and applications on the server then work to the blocks of this virtual disk. To this end, the blocks are managed as usual – like the blocks of a physical disk – by a file system or by a database on the server. The task of the virtualisation entity is to map these virtual blocks to the physical blocks of the real storage devices. It can come about as part of this process that the physical blocks that belong to the virtual blocks of a file in the file system of the operating system are stored on different physical storage devices or that they are virtualised once more by a further virtualisation entity within a storage device.

By contrast, virtualisation on file level means that the virtualisation entity provides virtual storage to the operating systems or applications in the form of files and directories (Figure 5.13). In this case, the applications work with files instead of blocks and the conversion of the files to virtual blocks is performed by the virtualisation entity itself. The physical blocks are presented in the form of a virtual file system and not in the form of virtual blocks. The management of the file system is shifted from the server to the virtualisation entity.

To sum up, virtualisation on block or file level can be differentiated as follows: in virtualisation on block level, access to the virtual storage takes place by means of blocks, in virtualisation on file level it takes place by means of files. In virtualisation on block level the task of file system management is the responsibility of the operating system or the applications, whereas in virtualisation on file level this task is performed by the virtualisation entity.

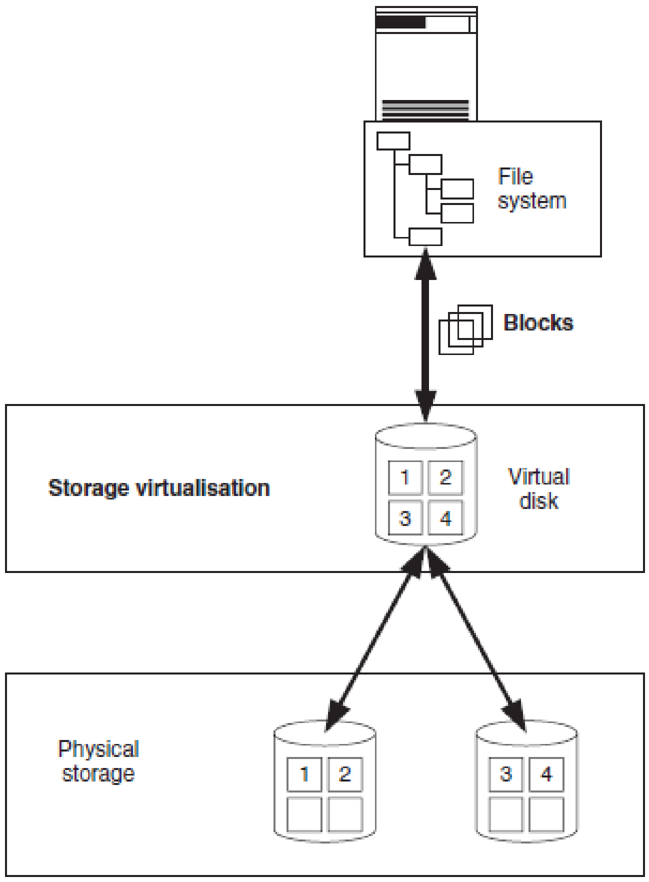

Figure 6.12 In virtualisation on block level the virtualisation entity provides the virtual storage to the servers in the form of a virtual disk.

Virtualisation on block level is suitable if the storage is to be virtualised for as many different operating systems and applications as possible. Virtualisation on block level is actually necessary when dealing with applications that handle their storage access on block level and cannot work on file level. Classic representatives of this category are, for example, databases that can only work with raw devices. Virtualisation on file level, on the other hand, is indispensable for those who want to establish data sharing between several servers. To achieve this, the virtualisation entity must allow several servers access to the same files. This can only be achieved if the file system is implemented in the form of a shared resource as in a network file system (Section 4.2) or a shared disk file system (Section 4.3) or, just like virtualisation on file level, is held centrally by the virtualisation entity.

In this chapter we constrain the virtualisation on block level to the virtualisation of disks. Later on in Chapter 11 we will expand this approach and discuss the virtualization of removeable media like tapes and opticals.

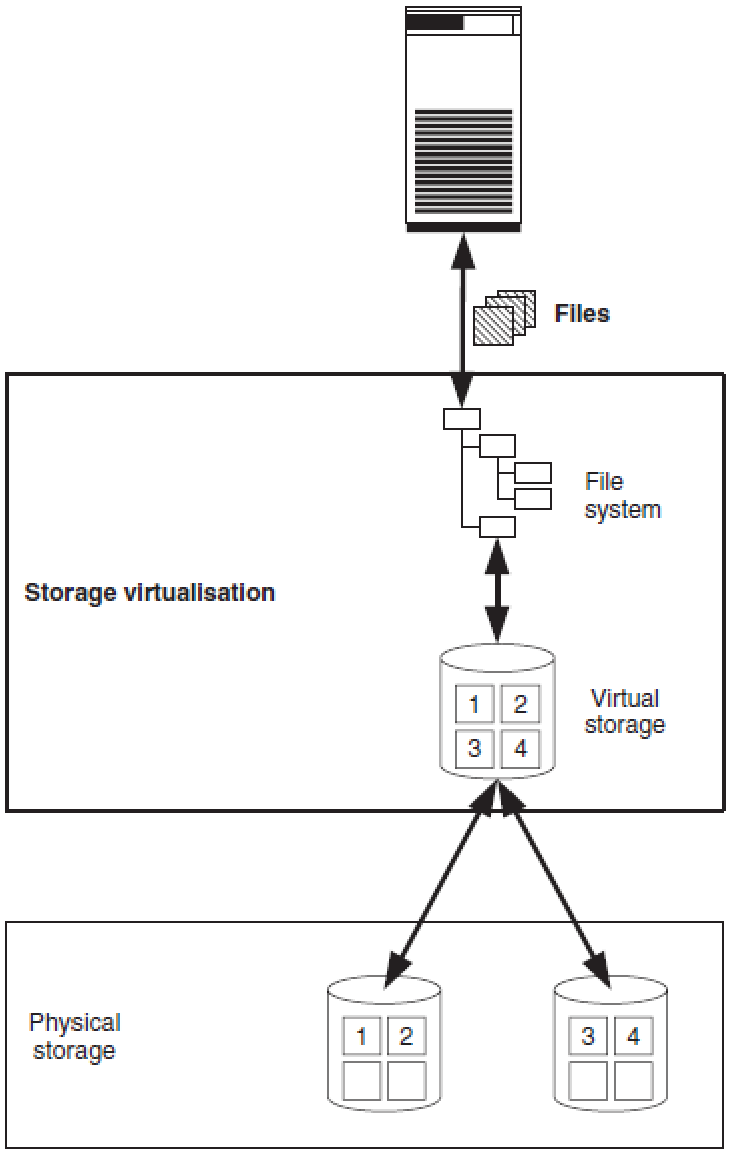

Figure 6.13 In virtualisation on file level the virtualisation entity provides the virtual storage to the servers in the form of files and directories.

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