STORAGE VIRTUALISATION

Although the cost of storage has fallen considerably in recent years, at the same time the need for storage has risen immensely, so that we can observe of a real data explosion. The administrative costs associated with these quantities of data should not, however, increase to the same degree. The introduction of storage networks is a first step towards remedying the disadvantages of the server-centric IT architecture (Section 1.1). Whereas in smaller environments the use of storage networks is completely adequate for the mastery of data, practical experience has shown that, in large environments, a storage network alone is not sufficient to efficiently manage the ever-increasing volumes of data.

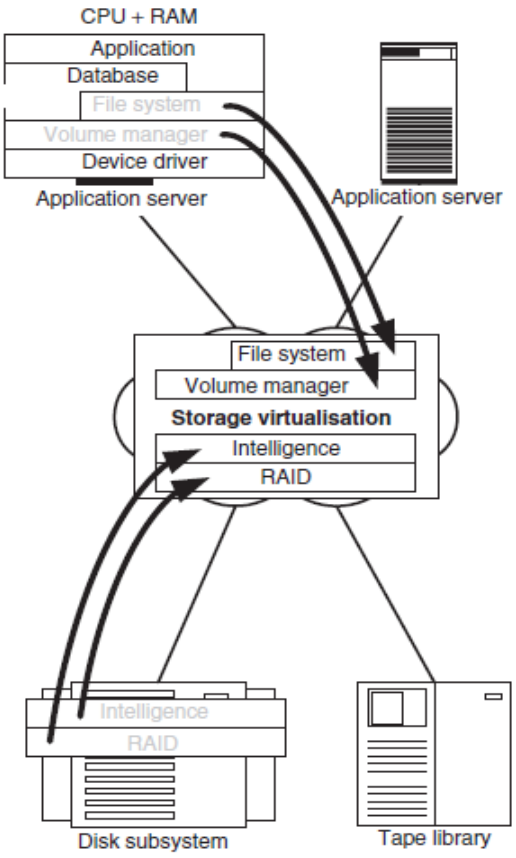

Figure 6.1 Storage virtualisation in the storage network moves virtualisation functions from servers and storage devices into the storage network.
This creates a new virtualisation entity which, as a result of its central position in the storage network, spans all servers and storage systems and can thus centrally manage all available storage resources.

DEFINITION OF STORAGE VIRTUALISATION

The term ‘storage virtualisation’ is generally used to mean the separation of the storage into the physical implementation level of the storage devices and the logical representation level of the storage for use by operating systems, applications and users. In the following we will also use the term ‘virtualisation’, i.e. dropping the word ‘storage’. This is always used in the sense of the above definition of storage virtualisation. Various uses of the term ‘storage virtualisation’ and ‘virtualisation’ are found in the literature depending upon which level of the storage network the storage virtualisation takes place on.
The various levels of the storage network here are the server, the storage devices and the network. Some authors only speak of storage virtualisation if they explicitly mean storage virtualisation within the network. They use the term virtualisation, on the other hand, to mean the storage virtualisation in the storage devices (for example, in the disk subsystems) or on servers (such as in a volume manager). However, these different types
of storage virtualisation are not fundamentally different. Therefore, we do not differentiate between the two terms and always use ‘storage virtualisation’ and ‘virtualisation’ in the sense of the above definition.
In Section 5.1 we revised various types of storage virtualisation on the various levels of the storage network and we will pick these up again later. First of all, however, we want to deal in detail with the conceptual realisation of storage virtualisation. Storage virtualisation inserts – metaphorically speaking – an additional layer between storage devices and storage users (Figure 5.11). This forms the interface between virtual and physical storage, by mapping the physical storage onto the virtual and conversely the virtual storage onto the physical. The separation of storage into the physical

implementation level and the logical representation level is achieved by abstracting the physical storage to the logical storage by aggregating several physical storage units to form one or more logical, so-called virtual, storage units. The operating system or applications no longer have direct access to the physical storage devices, they use exclusively the virtual storage. Storage accesses to the physical storage resources take place independently and separately from the storage accesses to the virtual storage resources.

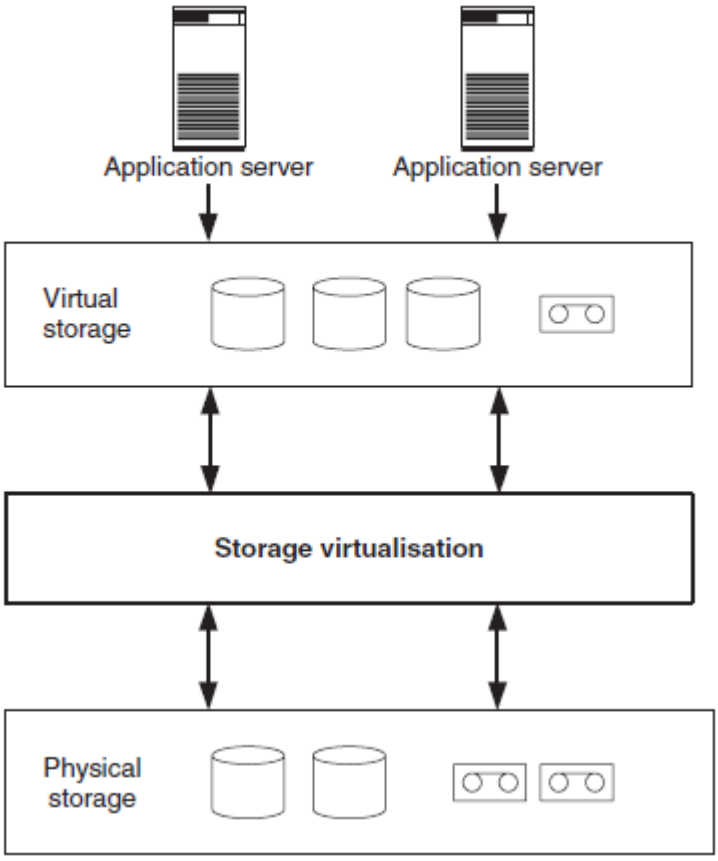

Figure 6.11 In storage virtualisation an additional layer is inserted between the storage devices and servers. This forms the interface between virtual and physical storage.

For example, the physical hard disks available on a disk stack (JBOD) are brought together by the volume manager of a server to form a large logical volume. In this manner the volume manager thus forms an additional layer between the physical

disks of the disk stack and the logical and thus virtual volume with which the applications (e.g. file systems and databases) of the server work. Within this layer, the mapping of physical hard disks onto logical volumes and vice versa is performed. This means that storage virtualisation always calls for a virtualisation entity that maps from virtual to physical storage and vice versa. On the one hand it has to make the virtual storage available to the operating system, the applications and the users in usable form and, on the other, it has to realise data accesses to the physical storage medium. This entity can be implemented both as hardware and software on the various levels in a storage network. It is also possible for several virtualisation entities to be used concurrently. For example, an application can use the virtualised volume of a volume manager on server level, which for its part is formed from a set of virtualised volumes which are exported by one or more disk subsystems (Section 5.1).

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