

- » Physical disk drives are aggregated using RAID-10 to create a unified disk image that has built-in redundancy. RAID-10 is, in effect, the first layer of virtualization. This layer is managed entirely by the SAN.
- » The storage available on the SAN is abstracted by the hypervisor to create data stores. This is, effectively, a second level of virtualization.
- » Portions of a data store are used to create volumes that are then presented to virtual machines. Volumes represent a third layer of virtualization.
- » The guest operating system sees the volumes as if they're physical devices, which can be mounted and then formatted to create usable disk storage accessible to the user. This is the fourth layer of virtualization.

Although it may seem overly complicated, these layers of virtualization give you a lot of flexibility when it comes to storage management. New disk arrays can be added to a SAN, or a new NAS can be added to the network, and then new data stores can be created from them without disrupting existing data stores. Volumes can be moved from one data store to another without disrupting the virtual machines they're attached to. In fact, you can increase the size of a volume on the fly, and the virtual machine will immediately see the increased storage capacity of its disk drives, without even requiring so much as a reboot.

Understanding Network Virtualization

When you create one or more virtual machines on a host system, you need to provide a way for those virtual machines to communicate not only with each other but also with the other physical computers on your network. To enable such connections, you must create a *virtual network* within your virtualization environment. The virtual network connects the virtual machines to each other and to the physical network.

To create a virtual network, you must create a *virtual switch*, which connects the virtual machines to each other and to a physical network via the host computer's network interfaces. Like a physical switch, a virtual switch has ports. When you create a virtual switch, you connect the virtual switch to one or more of the host computer's network interfaces. These interfaces are then connected with network cable to physical switches, which effectively connects the virtual switch to the physical network.

Then, when you create virtual machines, you connect each virtual machine to a port on the virtual switch. When all the virtual machines are connected to the