5.5.3 File System Facts

This lesson covers the following topics:

- File system components
- Formatting
- NTFS
- ExFAT

File System Components

A *file system* is a means for organizing and storing data and information on a storage device. The file system and the operating system work together to ensure data availability, integrity, and accessibility. The following table gives a description for the four main components of a file system:

Component	Description
Partition	A *partition* is a logical division of a storage device associated with a hard disk drive. Multiple partitions can be assigned to a single device, in which case a drive letter is assigned to represent each partition. Multiple letters do not always mean that there are multiple devices, just multiple partitions. Some reasons why you may consider partitioning your hard drive are: ▪ Assigning the boot system to a different partition than application and data files can help many computers run more smoothly and minimize damage in a system crash. ▪ Storing the swap file on its own partition is sometimes necessary or useful. ▪ Creating a separate partition for your operating system can help it run properly. Some operating systems can't run on a large partition. ▪ Assigning log files to be stored on distinct partitions can help minimize the effects of a system crash due to excessively large log files. ▪ Assigning distinct operating systems to run on assigned partitions allows a dual boot system setup. Unallocated space is space on a partition that has not been assigned to a volume. You cannot store or read data in unallocated space
Volume	A *volume* is a single accessible storage area within a file system. A volume can encompass a single partition or span across multiple partitions depending on how it is configured and what operating system you are using. Volumes are identified by drive letters.
Directory	A *directory* (also called a *folder*) is a container in a volume that holds files or other directories. It is used to logically sort and organize data to keep related files grouped together. Most operating systems use a hierarchal filing structure.
File	A *file* is a one-dimensional stream of bits treated as a logical unit. Files are the most basic component that a file system uses to organize raw bits of data on the storage device itself. The file name is made up of the directory path plus the file name. An extension can also be added to the filename to identify the file type and the program used to create, view, and modify the file.

File systems take many forms. Some common ones beside exFAT, FAT32, and NTFS include:

- Compact Disk filing system (CDFS), a virtual file system used with Linux.
- Network File System (NFS), a distributed file system that allows client computers to access files over a computer network.
- Ext4, the default Linux file system (and its predecessor ext3, which is still in use).

Formatting

Formatting is the process of preparing a partition to use a specific file system. Be aware of the following facts regarding formatting:

- When you format a disk, you identify the file system type and identify the cluster size used to store data.
- Reformatting removes the existing file system and replaces it with the new file system type. Reformatting a drive deletes all existing data.
- If your system or disk supports multiple operating systems, be sure to select a file system supported by all necessary operating systems.
- NTFS is not recommended for disks smaller than 10 MB.
- When using NTFS on removable devices, you must use Safely Remove Hardware before removing the flash device to prevent file corruption.
- If you run a Full Format, files are removed from the volume you scan and the system checks the hard disk for bad sectors. If you run a Quick Format, the system removes files from the partition, but does not scan the disk for bad sectors.

When configuring your hard drive, you must choose a file system that will be implemented on your computer. The following table explains the characteristics of the file systems supported in Windows systems:

Property	FAT32	NTFS
Partition size	2 terabytes*	256 terabytes
Volume size	2 terabytes*	256 terabytes
File name length	Long File Names (255 characters, spaces)	Unicode (255 characters, anything but /)
File size	4 gigabytes	16 terabytes
Amount of files	268,435,437	4,294,967,295

*FAT32 partitions/volumes can be up to 2 terabytes in size. Windows can read partitions up to the 2 terabyte size, but cannot create them.

NTFS

For Windows systems, you will likely choose NTFS over FAT for hard drives to take advantage of additional features not supported by FAT such as:

- The ability to format larger partition sizes in Windows.
- Smaller cluster sizes for more efficient storage with less wasted space.
- File and folder permissions to control access to files.
- Encryption to hide the contents of a file.

- Compression to reduce the amount of space used by files.
- Disk quotas to restrict the amount of disk space that files saved by a user can use.
- Volume mount points that allow you to map disk space on another partition into an existing volume.

ExFAT

The Extended File Allocation Table (exFAT, sometimes called FAT64) file system is a special file system that is designed to support large flash drives. Using NTFS on flash drives is usually not a good idea due to its high overhead and risk of corruption if the device is not stopped properly prior to removal. However, many flash drives exceed the 32 GB limit discussed above. Microsoft introduced native exFAT support in Windows 7 to allow large removable flash storage devices to continue to use a FAT-type file system.