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RE: USB vs. SATA for Disk to Disk Backup

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Summary: Trying to decide which connection standard to use, USB or SATA, for your Disk to Disk backup solution can be confusing if you're unfamiliar with the technical differences between the two standards. It is the intention of this paper to help you with that decision.

USB or SATA which one? There are other connection standards which you may encounter such as iSCSI, Fiber Channel (FC) and Firewire. This paper does not discuss those. However, iSCSI and Fiber Channel are typically much more expensive implementations and FireWire does not appear to have the success of adoption or longevity of the USB and SATA.

USB History: Universal Serial Bus (USB) is a widely used hardware interface or connectivity standard for attaching peripheral devices to computers. It was developed and introduced in the mid 1990's by an interest group that included Compaq, DEC, IBM, Intel, and Microsoft. USB 1.0 was released in 1995, but it took three more years and several improvements to the original standard before a more widespread adoption occurred with the introduction of USB 1.1 in 1998.

USB was developed to simplify the installation procedure of various peripheral devices, which at the time used serial and parallel ports, required all sorts of drivers, and was slow and cumbersome. The original USB afforded an impressive 12 Mbps transfer rate (ideally about 4GB per hour), connection of up to 127 devices at a time, and had a plug-and-play installation, which (at least on paper) required no drivers, making addition of new peripherals easy for end users.

Although USB 1.1 turned out to be a success, it was

still too slow for certain applications that required higher bandwidth, such as storage and video. In the late 1990's, because of licensing costs of other standards, Intel decided to push the development of its own high speed connection, which led to the introduction of the 480 Mbps (ideally about 160GB per hour) USB 2.0 in 2000.

The USB 2.0 was an almost immediate hit and today it is the most common PC and peripheral connection incorporated in billions of devices worldwide, such as DiskOnKeys, cameras, mice, keyboards, TVs, and more. Over the years, several extensions to USB were developed including USB On-The-Go, allowing devices such as cameras, pocket PCs, and printers to transfer data directly to one another without the mediation of a PC.

USB's ability to connect simultaneously to dozens of peripheral devices led to the development of USB hubs so that the limited number of ports doesn't limit the number of devices that can be connected simultaneously to a computer. Using a USB hub, four or more peripherals may be connected to the same computer.

SATA History: If you have looked at computer store's shelves lately, you have probably noticed that SATA hard drives are becoming more prevalent and cheaper. SATA means Serial ATA. ATA being the newer name for IDE drives. SATA I or SATA 1.5 (1.5Gb/s, ideally about 540GB per hour) has been around for a while since 2001. SATA was originally created to solve the problem of connecting hard drives to their controllers or motherboards. Until SATA, hard drive connections required large amounts of space on the motherboard and expensive wide cables which could obstruct air flow needed for cooling inside of computers.

Recently, in the summer of 2005, SATA II or SATA 3.0 drives became available offering higher levels of performance with a data rate twice that of SATA 1.5 (3Gb/s, ideally about 1.1TB per hour). Addition features are also provided fruther improvements to the SATA 3.0 performance.

eSATA has the same performance as SATA 3.0 but is designed for “out of the box” cabling. The ‘e’ of eSATA means external.

Both USB and SATA have worthy features for consideration. Your choice of which format to choose should bare heavily on your present needs and secondarily on your future needs. USB offers longer cable lengths, better support for hot swappability and wider ranges of drivers allowing use across more platforms and configurations. But SATA is catching up.

However, USB 2.0 can only transfer up to 160GB per hour in a situation with zero overhead. SATA II on the other hand offers a zero overhead throughput of 1.1TB per hour - over 6 times faster! However, most of that performance difference can not be seen today because the speed at which the data goes and comes from the

drive is limited to a zero overhead pace of 480 GB per hour. Typically, 7,200 rpm drives today are only carrying 180 GB per hour or less in everyday use. USB 2.0 has the capacity to handle most of the speed of today’s average hard drives but there is not room for growth. As faster devices become available, USB 2.0 will limit their throughput to USB’s maximum throughput. Also, USB is not a native drive interface which means that SATA or PATA (IDE) drives must go through a converter or bridge circuit further hurting performance.

SATA however has plenty of headroom for device speed increases. But, SATA has physical limitations of cable length and can be trickier to install. In many systems, the addition of a SATA controller is required making server hardware changes more complex. As faster higher capacity drives enter the marketplace, customer’s who’s disk to disk systems are SATA based should be able to scale alongside these increases for sometime.

	USB 1.1	2.0	SATA 1.5	3.0
ZO* Backup Speed	4GB/Hr	160GB/Hr	500GB/Hr	1TB/Hr
Max Cable Length	<10ft	16ft	3.5ft	
Max ports per channel	127	127	1	1,5eSATA

*ZO = Zero Overhead