Solid State Storage
Random Video Streaming Demonstration

What is the demo depicting?

The demonstration uses a solid state storage (SSS) card to provide random access to 256 distinct streams from eight seasons of Stargate SG-1. Since there are only 173 episodes to choose from, 83 are repeated using different start times while ensuring that there is no sharing in any cache. In point of fact, this demo would pretty much overwhelm any reasonable cache.

It takes a lot of server horsepower to keep up with the solid state storage card. Each of the four servers is kept busy decoding 64 episodes. All 256 are simultaneously shown on the four screens (sorry, we couldn't afford 256 LCD screens and associated graphics cards). Any single instance can be expanded to show the full DVD quality. There is nothing up our sleeve here. There is no substitution of a lower quality stream of any episode to reduce bandwidth when not expanded or displayed. Each of the 256 instances can be fast forwarded, paused, reversed, and restarted in real time. Every stream being read is full DVD quality.

What is so cool about it?

If you tried to do this with a regular disk drive, the drive would spend most of its time moving the head back and forth, not getting data. Yes, a hard disk drive (HDD) can stream one thing pretty well (okay, not even close to this fast, but certainly good enough for a couple of DVD quality episodes if provided with enough buffer space – just don't ask for instantaneous fast forwarding or other changes in the stream). In point of fact, it would take around 100 HDDs to accomplish what you see here.

First, it is extremely important to note that the PCI-Express Solid State Storage card's driver runs under the Fedora Core 8 without any O/S modifications; it looks to the O/S just like a HDD or SSD – except for its speed, of course. All software used is "off the shelf."

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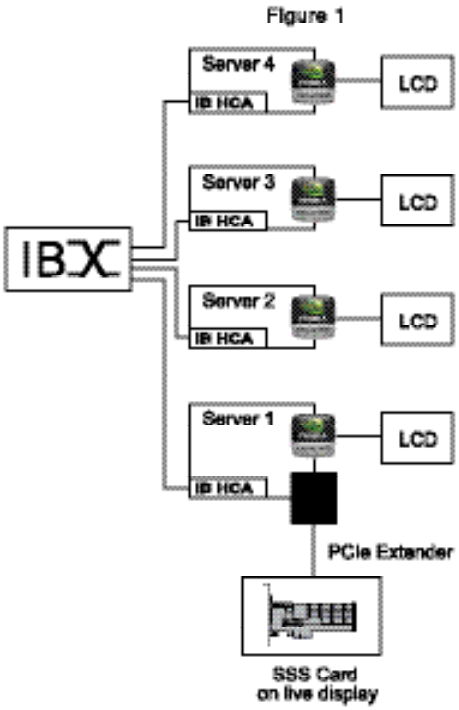

Per Figure 1, below, each server runs 64 instances of VideoLan (VLC) to decode each of the 64 DVD streams. These VLC instances export to a common X11 windows manager that configures the nVidia Quadro card to display various combinations of the VLCs on a dedicated LCD. These VLCs run continuously. For example, when selecting a single VLC for display on the LCD, the other 63 VLCs continue to operate at full bandwidth in the background.

As shown in Figure 2, the PCI-e SSS card is attached to one of the four servers, which mounts the SSS card and serves it up over an Infiniband network to the other three using SCSI RDMA Protocol (SRP). The other three mount this first server for file access. To allow visibility to the card during the demonstration, the SSS card is connected to its usual PCIe slot with a PCIe expansion cable.

What isn't demonstrated?

While the demonstration is visually impressive, the PCIe SSS card is running well below its capability. If we had an additional 12 servers, graphics cards, IB host channel adapters and LCDs, we could show 1,000 discrete DVD quality streams running simultaneously. Or, if we had the equipment, we could be showing 256 HD quality streams (HD has 4X the BW requirement of DVD). Additionally, this demonstration does not show how well the SSS card can write random data.

Many SSDs excel in random reads, which is what is being done here. Some have a reputation for not doing much better than an HDD at random write, sequential read, or sequential write. This is not the case with a PCIe SSS card. We could just as well have shown 256 DVD quality video cameras storing compressed data to the SSS card. But, a more practical application might be randomly storing uncompressed DVD or even HD quality video while simultaneously allowing random access to the uncompressed data.