



## Media Entertainment

### *High-Performance, Scalable Storage Solution for Digital Film Scanning*

#### Higher resolution demands new storage paradigm

New High Definition (HD) formats 2K (2048x1560 pixels per frame) and 4K (4096x3120 pixels per frame) represent a fundamental change for the systems designed to ingest, create, store, manage, edit, and deliver digital media. In storage terms a single frame of video is anywhere from 12MB (2K) to around 40MB (4K), so data storage is not linear when doubling the resolution. Take into consideration that each second of video is 24 frames and you can see why there is such a large storage requirement.

This advancement of larger image size is over loading traditional storage systems and requires a new networked architecture for media applications. An architecture that can deliver higher performance and better accessibility at lower cost, enabling a wave of new HD media applications from editing and distribution to content archiving, and on-demand and streaming applications.

#### MB/sec is not the only focus in post-production video

Consistency is crucial when capturing in real-time from film. In traditional data environments, a spike in performance simply causes the workload to slow down slightly. The data stream never stays at the max limit - it always fluctuates slightly, sometimes significantly for very short periods. With film scanning, on the other hand, there is absolutely no margin for error because it is literally scanning in real time. If storage gets too slow for more than a second or two beyond what the buffers in the software can handle, frames are dropped and this represents a complete failure of the scan progress. For 4K, this represents a minimum SLA of 500MB/s, but in reality the storage actually has to do at least 650MB/s AT ALL TIMES on writes in order to handle any small fluctuations in performance (i.e. spike in performance for 1-2 seconds max) in storage performance. This overhead allows the software to empty the buffers after the performance recovers and continue to operate with the "safety net" of the buffer for the next spike.

#### DPX Scanning is NOT fully sequential

You may not think that write requirement sounds all that difficult. After all, Coraid SRX4200 units with 1TB SATA can typically operate at around 1,800MB/s on writes for EACH shelf. In fact many storage vendors pitch the massive throughput capabilities of their storage systems. However, this is when doing relatively sequential writes as with traditional video (i.e. opening and writing a single large file to disk). Because of the unique nature of the new DPX video standard, each frame of video is actually a separate image file that gets stored to disk. So instead of writing one continuous file for each video as in the past, we are actually doing 24 new file "creates" of substantial size (many MB each) to disk EVERY SECOND. Each video is therefore made up of hundreds of thousands (or more) individual photo

#### Abstract

A motion picture film scanner is a device used in digital filmmaking to scan original film to disk storage as high-resolution digital intermediate files. The scanner scans the film frames into a file sequence, whose single file contains a digital scan of each still frame. These systems require scalable storage area network (SAN) disk space that can match the ingest performance of the latest state-of-art scanner and scale to store the massive amount of data created by these systems. This Solutions Brief provides detailed information on how the Coraid EtherDrive Ethernet storage array provides unmatched price/performance and virtually unlimited growth in capacity to meet the storage requirements of the latest film scanning technology.

frames. This is why traditional SAN vendors struggle to meet these requirements even with expensive 8Gb fibre channel and SAS drives.

## Playback is just as important

When the video is done processing, typically the next steps will involve transfer to videotape or some other playback medium. As with writes, frame drops cannot be tolerated at all. Playback must maintain the same MB/s requirements as described above for writes.

## Latency is extremely important

Video operators use a process called "shuttling" where they scan back and forth very quickly (think fast-forward and rewind on your DVR but more precise) looking for frames of interest while producing clips, etc. If there is too much latency, the storage will cause this process to lag and will severely deteriorate productivity (and the attitude) of the operator(s).

## No other storage vendor can provide this price performance in NAS

Coraid's post-production package is the first solution Digital Film Technology (DFT) has qualified that actually is able to use SATA disks. We have done a dramatic amount of engineering and tweaking to build a file system that can auto-tier and leverage these disk types. Inbound random writes are gathered in the NAS head and are then pushed to the SATA disk in a highly sequential manner, allowing faster performance from the EtherDrive shelves. RAID is also handled in the NAS head so that all of the EtherDrives are actually running in our Turbo JBOD mode. This enables extremely fast performance and almost zero latency getting from the initiator to the actual raw disk.

Coraid is the first solution that DFT has qualified that is able to be accessed as a NAS and not a SAN, as mentioned above in greater detail. This can substantially simplify workflow for video production because customers don't have to connect and disconnect LUNs constantly when switching workflows from one machine to the next. Coraid was one of the first and only vendors DFT has qualified that was able to handle 4K HD write streams.

4K is quickly becoming the new gold-standard for raw video capture. Because each frame is so large, the frames-per-second has to be capped at 10-15fps for the scanner to keep up. This amounts to a write stream of around 500MB/s across 15 files each second.

## Scanning is only part of the workflow

Even after the scans are complete, the editors may wish to render out produced and edited clips back up to storage. Editing requires a lot of IOPS as it is reading and writing many files at once. The NAS head does intelligent read-ahead to assist in consistent playback. This also makes it a great fit for render-only environments that one may also encounter in post-production and video spaces.

Coraid is the highest price/performance storage ever to be successfully used with DFT products - It handily outperforms competitive fibre channel and iSCSI solutions.

### Technical specifications for the entire solution

- NAS Software runs on Coraid SP3000 Server
- 1 x Coraid SP3000 Server Platform with 4 x Intel 64GB SSD
- 3 x SRX4200 Storage Arrays
- 108 x 1TB SATA Drives (7200rpm) ( 108TB RAW)
- 1 x BLADE Networks G8100 10GbE 24 port CX4 copper switch

Connectivity to the switch was via 1 x 10GbE CX4 link per SRX chassis, 2 x 10GbE CX4 from the HBAs on the SP3000, and 1 x 10GbE CX4 from the NIC cards on both the NAS head as well as the workstations accessing the SAN switch. Figure 1 below reviews the complete architecture.

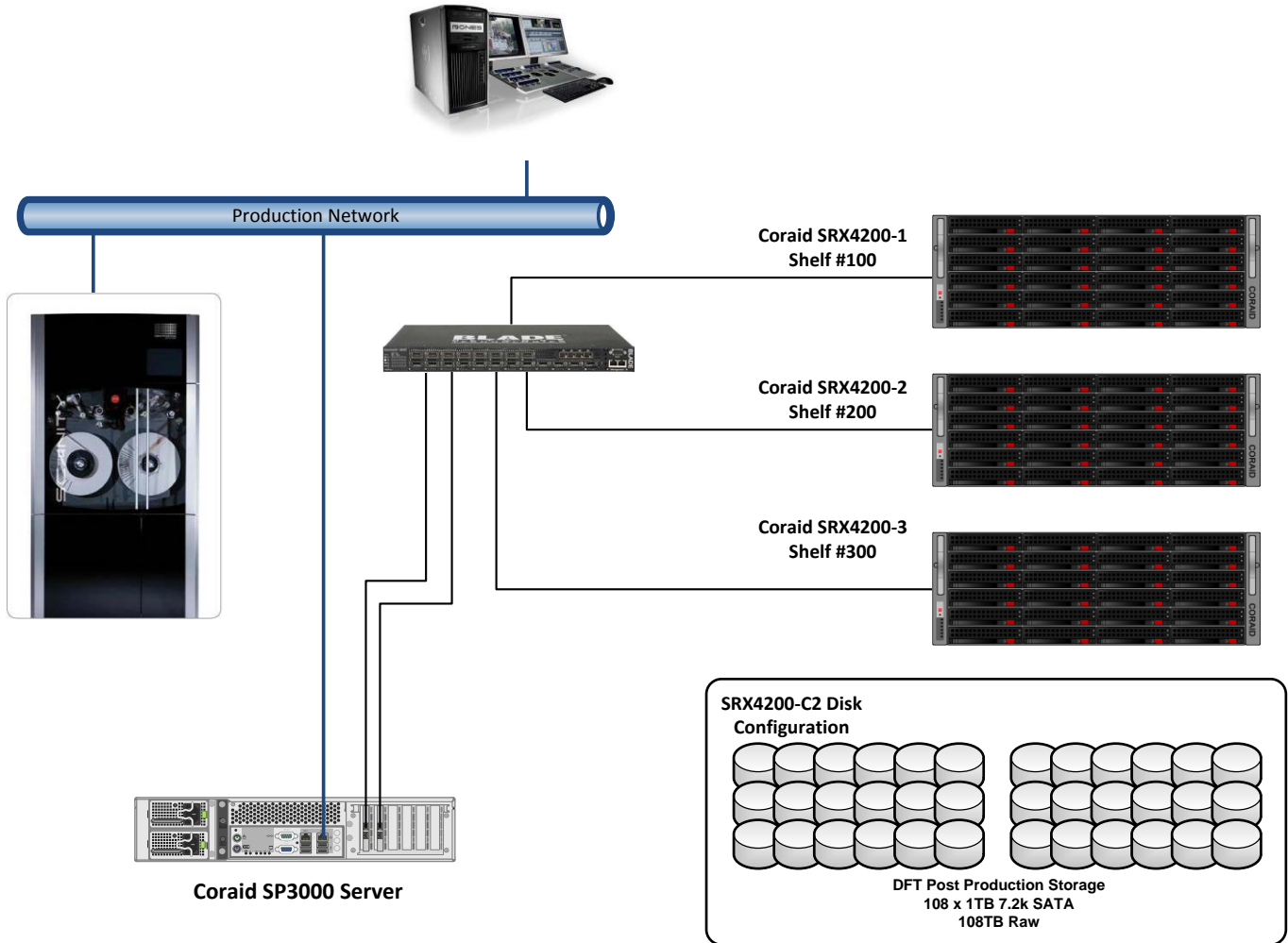


Figure 1: Scanner to Disk Configuration

### Conclusion

The Coraid EtherDrive SRX-Series storage array is designed to help media environments accelerate time to results with a highly scalable, yet easily manageable storage area network. By leveraging the power of Ethernet, the Coraid SRX is able to maximize the capabilities of a NAS head by eliminating the bottleneck associated with traditional network storage solutions. The resulting performance benefits coupled with the ability to offer a scalable storage solution makes the Coraid SRX an ideal solution for multiple media applications.