

## Shared Storage – Big, Fast and Better Managed

*with the Dell Fluid File System and axle Video's Gear appliance*

Sure, you've got plenty of great footage – the challenge is storing and keeping track of it all. The growing tide of video files is turning into a flood, with HD and 4K cameras pumping out the terabytes. Just a few years ago, you could set up a small RAID or SAN, put a few projects on it and be productive right away. But nowadays, project complexity and the sheer amount of footage often require a team of editors who need shared access to project files. As shorter deadlines, increasing consumer demand and faster distribution in more formats require more efficient production, it's also essential for video editors, loggers, producers and directors to have concurrent and speedy access to the same media.

To solve this problem, you'll need a fast, scalable pool of shared file storage. Dell has developed an architecture – the Fluid File System (FluidFS) – to address this need. FluidFS is an industrial-strength storage backbone that provides simultaneous cross-platform connectivity to many workstations and processing farms, delivering high-res video streams to those workstations very quickly.

Meanwhile, axle Video has developed a new way to catalog, review and annotate media – by streaming proxy versions of your high-res media and showing them through any browser on Macs, PCs, tablets and smartphones.

Unlike many traditional media workflow systems, the axle Video system is fully open and easy to integrate using simple watch folders and standard network protocols. No special device drivers or API integrations are required.

### Making It Work

To demonstrate and verify the capabilities of these two technologies, we configured an end-to-end media workflow with a FluidFS storage system and an axle Gear appliance. We set up a mix of Adobe Premiere Pro® CC, Avid Media Composer® 7 and Apple Final Cut Pro® 10.1 workstations, and incorporated ingest and near-line archiving steps with solutions from MOG and XenData.

We put this configuration to the test by doing postproduction work on a documentary project – *Cave Dwellers of the Himalayas*. This environment let us closely observe the system's ability to support and accelerate collaborative production workflows with full resolution editing and ingest, archive, and workflow processes, as well as contributors performing concurrent search, selection, annotation and review. We discuss the test and subsequent results in sections 6 and 7.

# “The benefits of media management are now within reach of virtually any professional media producer or distributor.”

## 1 Why Media Management?

Odds are, you are well aware of the need for media asset management software, especially if you or your team regularly hunt around in a large folder system for a specific video or try to explain which section of a clip to use for a project. Note, though, that “management” conveys only half the story. Equally important, and for many people even more valuable, is the role these systems play in enabling media workflows. When everyone working on a project can share content easily and quickly, bottlenecks disappear. Throughput and quality increase. By coordinating communication flow, the system lets each contributor devote more time to his or her contribution to the project and spend less time on extraneous tasks, like searching for specific media and waiting for colleagues to complete their respective steps.

Media management systems gain even more value as they link and orchestrate processes such as ingest, transcoding, media file transport and archiving. They provide a crucial point of interoperation with other management systems, automating and accelerating a wide range of media production and distribution workflows.

Why then are media asset management solutions not in wider use? Legacy MAM systems have typically been expensive, complex and inflexible; custom-designed for upper tier media organizations that are able to afford them. MAM solutions simply have not been practical for most media producers. Until now.



## 2. Media Management Overview - Key Criteria

The benefits of media management are now within reach of virtually any professional media producer or distributor. So if you haven't already, it's a good time to start thinking about the capabilities you need, both now and in the future, as the number of users and the demands each user places on the system grow. Key considerations include:

- **Search.** Know which search criteria are important to you and understand the system's ability to add custom metadata. You will certainly need your own search fields as well as the ability to change and add to those fields in the future. Also evaluate the ability to search across different storage pools – i.e. one or more on-line, near-line and archival storage domains.
- **Proxy generation.** Low bit rate media proxies make collaborate-anywhere, browser-based workflows possible. Look for automatic proxy generation, tight integration with transcoding systems and the ability to handle a wide range of codecs.
- **Storage and workflow.** Some products work only with their own storage brand or impose specific workflow steps, so look for solutions that support a wide range of storage subsystems to fit your workflows and add rather than limit flexibility.
- **Output formats.** Ideally, the transcoding system handling proxy creation will also support a wide range of output formats, or can easily be upgraded to do so.
- **Client and browser support.** Full-capability client access from Mac, Windows and tablet browsers; smartphone support is a plus.
- **Scale.** What may initially seem a lofty number for supported users or assets can quickly become a growth limitation. Look for a vendor's track record of extending system capability, understand the expansion process for both users and assets, and verify that growth doesn't increase system complexity.
- **Deployment and administration.** Look to limit deployment cost and disruption with an easy-to-implement system that also simplifies administration and minimizes downtime.

- **Import and export.** The process for importing and exporting media and metadata between systems should be simple and, ideally, automated.

- **Ease of use.** Often overlooked, this may be the most important capability of all. Even the most powerful MAM system won't help much if users can't get up to speed easily, or don't keep using it.

Overall, the key to successful system implementation for most media producers is finding the right balance of benefits to user productivity and minimal capital expenditure (CAPEX) and operating cost (OPEX), both upfront and over time.

“Axle leverages several key trends ... to ensure that its systems are compelling for a wide range of media workflows.”

## 3. Axle Video Management Overview

Axle is changing the status quo of complex MAM systems with a simple, highly affordable solution that can be installed in a matter of hours with minimal user and administrative training. In addition, axle leverages several key technology trends – the transition to simpler, browser-based interfaces and the rise of mobile computing – to ensure that its systems are compelling for a wide range of media workflows.

With axle's Gear media management system, you can build on an open standards-based file system, such as Dell's FluidFS, adding key MAM capabilities that meet the needs of a wider production team. These include the ability to search across multiple storage volumes, annotate media as it is ingested, remotely review streamable low-resolution footage and collaborate with colleagues using simple browser tools.

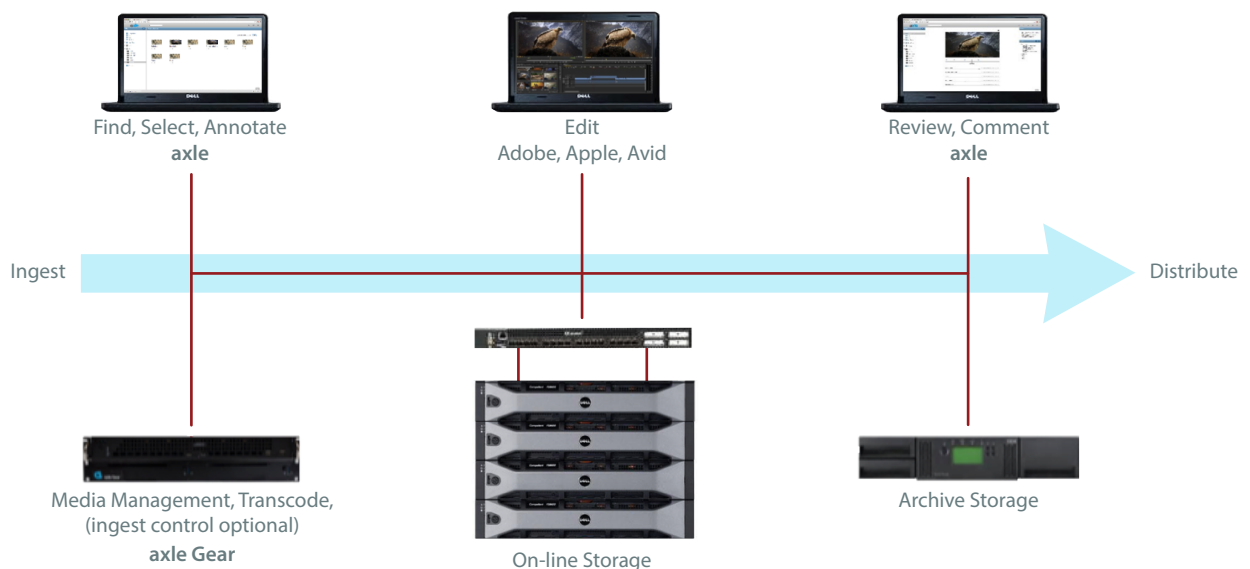
Also, because axle Gear is capable of importing and exporting simple XML formatted metadata, you can use it to easily bring in live-logging data from tools like MOG's SpeedRail Xpress appliances or send it out to archiving appliances like XenData's SX-10. In this media workflow study, we have used both of these applications in addition to axle Gear's core media management and transcoding subsystems.

Digital media files and workflows place unique demands on the storage infrastructure, beyond those of the traditional IT environment. Keep the following key attributes in mind when considering the optimal storage investment for your media workflow:

- **Performance.** Very fast, reliable media availability is table stakes for media production, but the growing number of users and increasing resolutions place constantly increasing performance demands on the storage. The ability to handle high-res media is essential, and you'll need efficient and linear performance scalability.
- **Robustness.** The more people and processes that depend on a storage pool, the more important its availability. Storage systems vary in degree and sophistication of protection, so consider the availability and speed of recoverability you need. Be ready to invest accordingly.
- **Capacity.** Shortage of storage capacity is a common constraint for media producers and distributors. Ideally, capacity expansion is straightforward and available in affordable increments. But too often traditional data storage providers do not offer affordable growth options,

## 4. Storage for Media Production - Key Criteria

In addition to an effective media management solution, shared storage is essential for enabling collaborative editorial workflows and supporting key processes like acquisition, file conversion, transport, distribution and archiving.



instead requiring a forklift upgrade from one model to the next. Before you invest, know the logistics and costs of scaling.

- **Flexibility.** Perhaps most overlooked is the need for storage to adapt to changes in workflow and business expansion. Instead of imposing rigid volume structures or costly and time-consuming reconfiguration, the storage should be easy to expand, reconfigure and manage.
- **Openness.** Look for the use of open standards and the fewest system-specific device drivers, protocols and applications.
- **Connectivity.** For client connections, some vendors use Fibre Channel and others Ethernet. Fibre Channel can have some advantage when working in highest resolutions, but the ubiquity, relative simplicity and long term cost advantage of Ethernet make it a good choice for most facilities.

“... efficient and linear performance scalability is essential.”

## 5. Dell Storage Overview

Dell storage solutions for digital media deliver a unique balance of optimal performance, efficiency and scalability. Based on open industry standards, Dell storage has been developed from the outset not only to address the need for rock-solid reliability, but also to provide high performance capable of supporting digital media and its associated applications. The Dell storage architecture delivers excellent performance for both small and large video production environments, easily scaling both capacity and performance on demand as the business grows.

All this adds up to a storage system that easily becomes a central, primary engine for media operations, scaling cost-efficiently as hours and terabytes grow, as client attachments proliferate, as transcoding, transport and render services are added, and as media distribution and non-media applications are added. Its combination of performance, efficiency and scalability makes Dell storage a natural fit for digital media workloads.

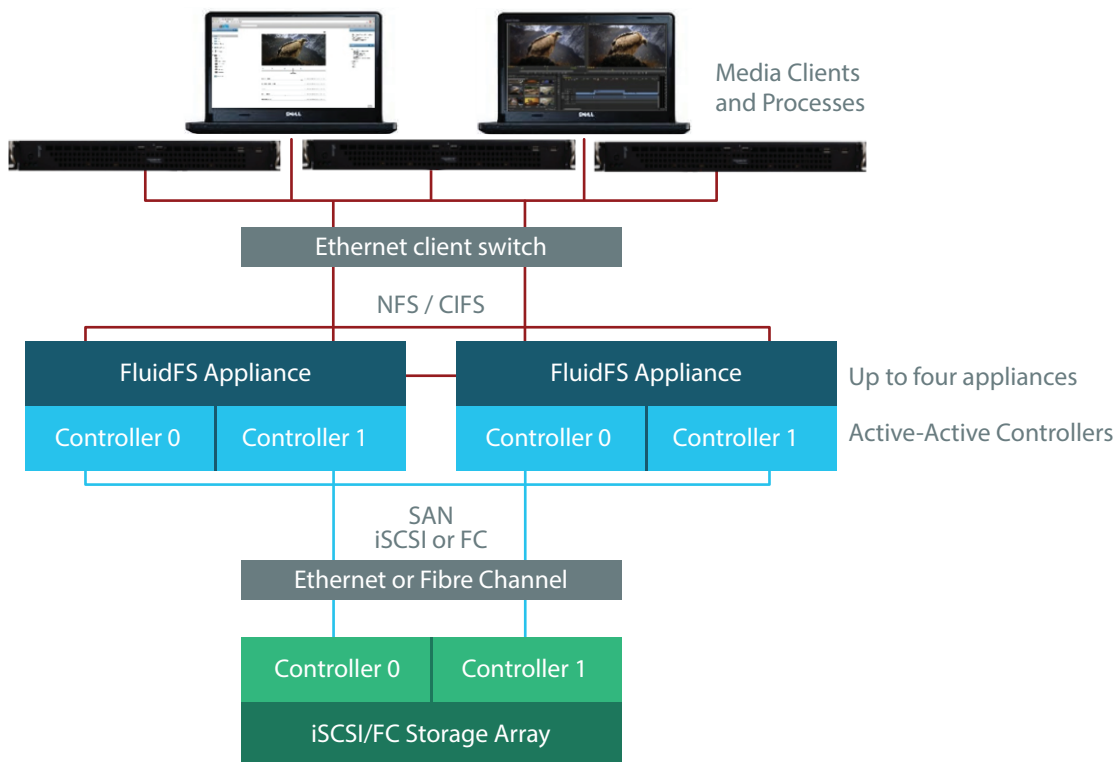
## 6. Dell Fluid File System

Dell FluidFS is designed to overcome the limitations of traditional file systems to meet the needs of diverse workloads in media environments.

It ensures performance through a fully distributed, clustered architecture. Sophisticated caching and data management policies maximize performance while making very efficient use of the physical storage system.

FluidFS operates across a symmetric cluster of purpose-built NAS controllers (housed in active-active pairs, each within a 2U rackmount appliance), which interface to several flexible back end disk array options.

The FluidFS software architecture uses enterprise-class techniques to support high capacity, performance-intensive workloads via scaling up (adding capacity to the system) and by scaling out (adding nodes, or performance, to the system). This section details those mechanisms.



Dell Storage architecture with FluidFS

### Massive Throughput - Fully Parallel Architecture

The FluidFS architecture is a fully parallel, virtualized and active-active design. The NAS controllers feed directly into the LAN (10 Gigabit, GigE or both). Each NAS controller serves any file request across the system, and all physical resources are available for I/O simultaneously. This means that client I/O activity can be distributed across the cluster to take advantage of multiple physical uplinks and parallel I/O processes.

### Quicker Access: Read-Ahead for Files and Directories

FluidFS employs a sophisticated read-ahead algorithm to identify sequential read operations for large files and complex directories. This special handling enhances performance by pre-fetching from disk, mitigating application and network-associated latencies.

### Open Systems Protocols

Traditionally, media-centric storage systems have resorted to proprietary client driver software to achieve best performance. This creates a number of limitations in a shared environment, since every system needing high-speed access must have the correct type and version of driver software installed. As Windows, OS X and client applications are upgraded, the driver software must keep pace, and compatibility issues are common. Furthermore, clients such as Linux and ChromeOS often do not even have drivers available for these proprietary systems.

In contrast, FluidFS takes the approach of supporting standard network protocols – SMB and NFS – and then backing this connectivity with massive throughput across standard network hardware which can be wired up through industry-standard network switches from a wide range of vendors.

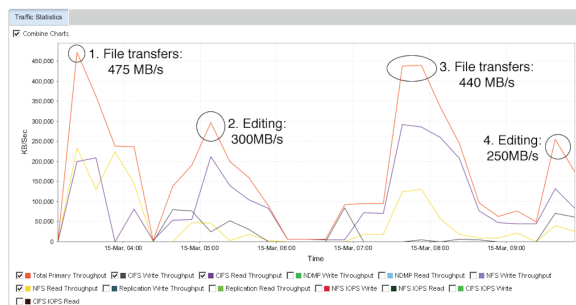
## 7 Workflow

axle Video conducted a test with Dell FluidFS and 60TB of Dell Compellent FS8600 storage, simulating a mid-sized video production workflow. Using documentary footage of *Cave Dwellers of the Himalayas*, we assembled a mixed editing environment including:

- 8 workstation-level editing systems
  - (4 OS X 10.9 Macs, 4 Windows 8-based PCs)
  - 3 Adobe Premiere Pro CC
  - 3 Apple Final Cut Pro 10.1
  - 2 Avid Media Composer 7
- 1 dual-CPU (8 core) axle Gear appliance serving axle 2013 media management software and Telestream Episode Pro 6.4 transcoding software
- 1 MOG SpeedRail file-based ingest system
- 1 XenData media archiving system
- 2 Mac laptops accessing the browser-based axle application

Every editing system was set up for long-running workflows requiring playback of dual-stream ProRes 1080p video with four channels of 48kHz audio simultaneously. In addition, between 2 and 4 ingest operations, 1 and 2 archiving operations, and 2 concurrent HD transcoding sessions were conducted at the same time. Last, users on the laptops searched and selected media in the frame-accurate axle media player, with scrubbing back and forth on the timeline to find, shot select, and annotate media, a common process in pre-editing or planning workflows.

In all, a total of 22 x 100Mbit/sec simultaneous video streams and 44 x 48kHz audio streams were served, in addition to file copying and low resolution streams. No media underruns were reported on any of the editing systems, and no video dropouts or video stuttering was observed. From the Dell storage, we were able to measure the total system I/O throughput across the network, which averaged between 200 and 300 MBytes per second and peaked at 475 MBytes per second during heavy ingest, editing and archiving operations. A time-based display of the FluidFS network throughput during burst mode testing is shown below.



In short, we sought a fair simulation of processes that, in various combinations, form the core of nearly every media production workflow. The tests showed that FluidFS is indeed able to meet and exceed the needs of media production environments like this one.

Extrapolating these results, and given the ability of the Dell Fluid File System to scale efficiently and near-linearly in both capacity and performance, we believe that decision-makers can safely conclude that the Dell system can address a wide range of media workflows with headroom to spare.

**FluidFS takes the approach of supporting standard network protocols ... and then backing this connectivity with massive throughput.**



# 8

## Summary

Demands on production and distribution processes continue to grow as audiences consume more content, making a faster and more efficient workflow essential. For almost everyone in the media production industry, the ability to quickly find, use and share media is key to success.

Media management from axle lets you know what resources you have and instantly put them to use. Moreover, the platform accelerates production and enables collaboration anywhere. Yet unlike complex and expensive MAM systems, axle's radically simple approach makes it easy to install, use and own.

Storage has never been more critical to digital media operations, and the days of investing solely based on capacity and price per gigabyte are over. As the engine of performance that powers the entire production process, your storage needs to expand reliably, efficiently and predictably to handle increasing resolutions, user counts, workflow processes and applications.

Building upon the safety and confidence of a well-proven foundation, Dell storage elevates digital media workflow with the innovative Fluid File System, efficiently delivering performance as well as near-linear scaling of both capacity and performance. In a realistic video production simulation, axle Video was able to confirm that even a modestly sized Dell storage solution does, in fact, deliver ample performance and flexibility to meet the current and future needs of a typical media production environment.

For more information on axle media management solutions, visit [axlevideo.com](http://axlevideo.com).

For more information on Dell Compellent Storage with FluidFS, visit [dell.com/mediastorage](http://dell.com/mediastorage).



“... the days  
of investing  
solely based on  
capacity & price  
per gigabyte  
are over.”



radically simple  
media management

