

WHITE PAPER

EditShare in Education: Choosing the Right Storage for your Media Studies Lab





Choosing the right centralized storage system can make all the difference between an environment that is perfectly suited for a media studies laboratory and that facilitates learning and collaboration, versus one that is ill-suited for that purpose.

This white paper will review what's important when selecting a media-engineered storage system, and in particular, what's important in an educational environment.

Introduction

Thousands of colleges and universities around the world today teach or support video and film production. It might be a major focus of the university – something students can major or minor in. It might be something centered around sports production to support a collegiate athletic program. It might be about teaching a useful life skill; after all, video reaches into every part of business and academic life today – whether it's for communications, marketing, internal presentations, or scholarly meetings. It might even be just focused on providing an extracurricular activity to give students access to video communications tools that are ubiquitous today.

Whatever the purpose of a college or university media lab, all labs probably share some common challenges and needs:

- There may be dozens of editing workstations that must be shared by hundreds if not thousands of students and faculty, so the most efficient way to utilize those workstations is to make it possible for users to sit down at the first one that is free. Local storage doesn't work here! Content needs to be in a central place that can be accessed by every workstation.
- Students will rotate every year, so there is a need to turn on and off access in bulk

- Users expect to “edit in place” – that is, have their non-linear editing application stream video and audio data in real time from the central storage without having to copy files to the workstation first; Nothing will frustrate students and faculty more, and cause more wasted time, than having to download and manually exchange media and project files because they can’t be played smoothly from central storage.
- Users expect to work collaboratively – that is, access the same media files and the same projects at the same time without everybody corrupting each other’s work. This is a fundamental assumption in classes that teach film, news and sports production, or any class that uses Hollywood “assembly line” methods of production. It is also convenient for any class where all students need to access the same “practice media”.
- Users expect to be able to use every conceivable content creation tool – Adobe Premiere Pro, Avid Media Composer, Apple’s Final Cut Pro X, DaVinci Resolve, Autodesk Flame and Maya and 3DS Max, The Foundry’s Nuke, Avid Pro Tools, Adobe Audition, Apple’s Logic Pro and other applications.
- Some users will need to work with content that can put extreme demands on the system – like uncompressed HD, UHD, or 4K video – sometimes in file-per-frame formats like DPX and Open EXR.

The reality is, most general-purpose IT-centric storage solutions weren’t built to meet the specific challenges described above and they will fall down on many of those requirements. That’s why it’s important for educators to focus on media-engineered solutions such as EditShare’s uniquely qualified EFS Storage.

Media Lab Storage Requirements – all covered by EFS

Performance

Many storage solutions make big claims about performance – but are they talking about the kind of performance you need? When a vendor starts mentioning maximum single stream sequential read/write numbers or IOPS (input/output operations per second), they are talking about numbers that are almost irrelevant to your needs. For instance, IOPS is maybe be crucial for high transaction database work, but IOPS numbers are not a good measure to judge whether a storage system will be good at supporting video workflows.

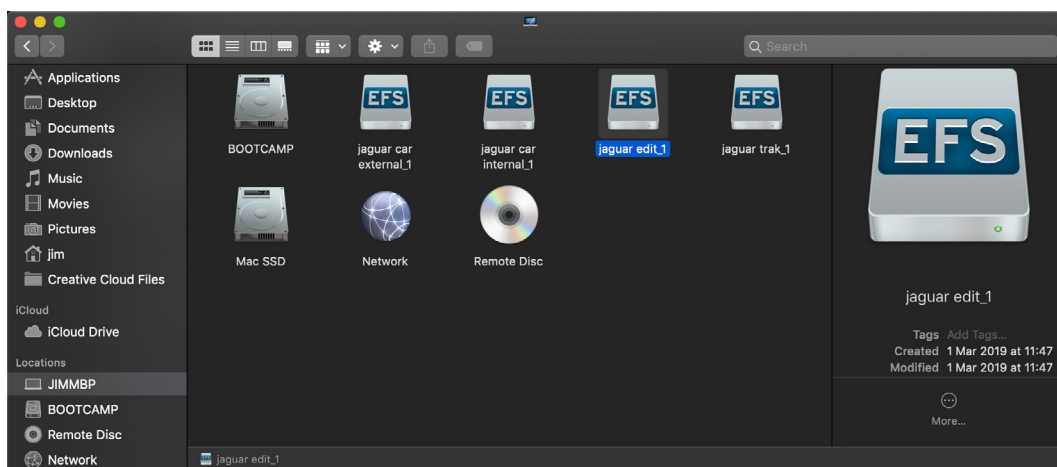
The most important thing in storage for media production is a system’s ability to support multiple parallel streams of video and audio – to keep the data coming at a steady rate in real time so your video application doesn’t skip or drop frames. If you have 30 or 50 or 100 workstations, and each one of them is reading or writing data at 20 or 40 or 100 MB/sec, and you need assurance that each of those streams gets handled just on time. Only a media-centric company such as EditShare tests video workloads and optimizes the system to guarantee success.

That’s why EditShare talks about performance in terms of numbers of streams supported without dropping any frames, at a range of specific bitrates. EditShare guarantees you will get the streams we say you will get.

EditShare storage is based on the EFS parallel distributed file system. Files written to EFS get split up

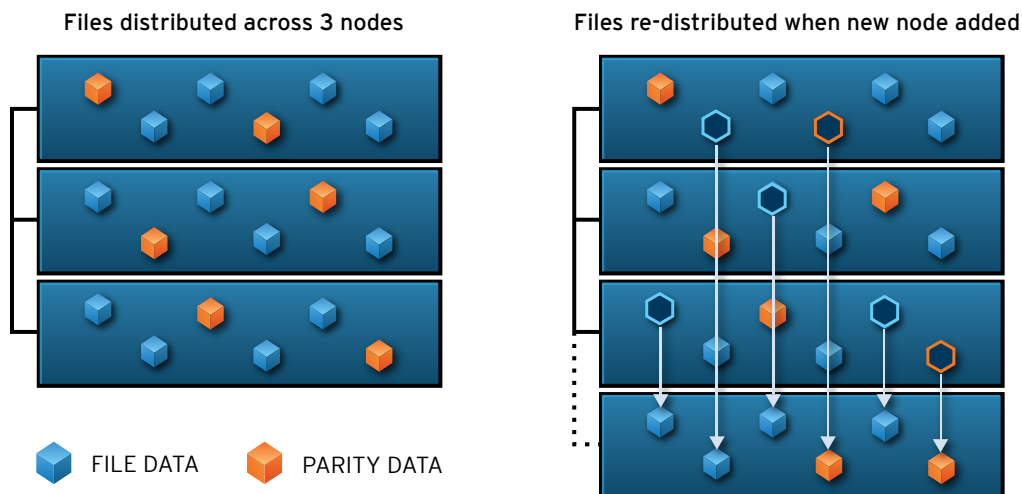
into smaller chunks, and if you have multiple storage nodes the chunks get “striped” across a group of nodes, meaning more than one node contributes to the read or write speed of a given file.

EFS Storage also has native file system drivers for Windows, macOS and most flavors of Linux. Because EFS native drivers talk directly to storage nodes, they can read from or write to all nodes in parallel. This leads to superior throughput and lower latency compared to distributed file systems that rely solely on standard network protocols such as SMB or NFS. With most other distributed file systems, a workstation connects to any one node in a round-robin or load-balancing fashion, and that node then has to read data chunks over the network from the other nodes – making two hops across the network. With EFS, data chunks travel directly between storage nodes and clients, meaning data makes just one hop. (Of course, EFS supports connecting by SMB and NFS as well, but performance will be comparable to systems that don’t have native file system drivers).



EFS media spaces - Mac

As you expand an EFS system by adding more nodes, the total bandwidth capacity of the system goes up in proportion to the number of nodes.

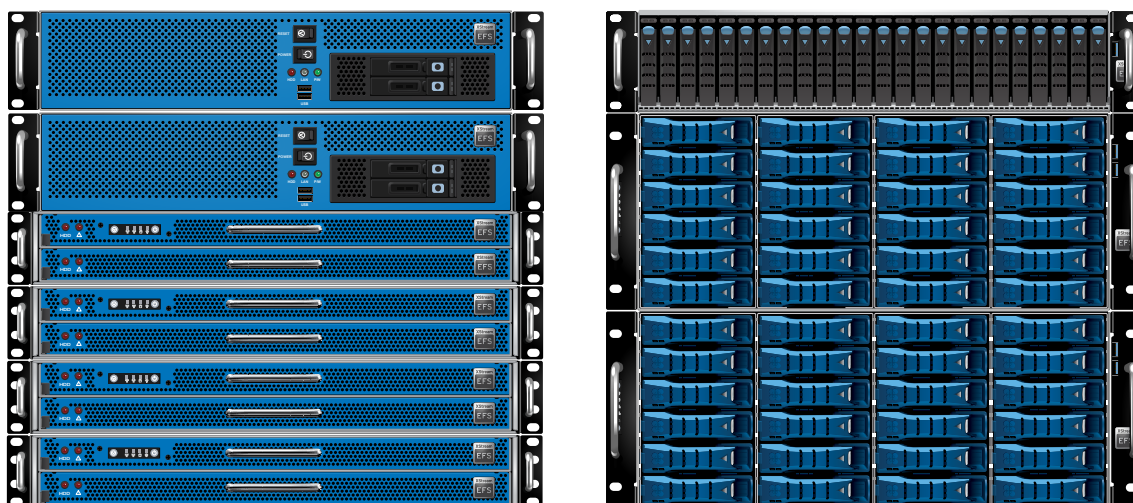


One final note about EFS Storage. We have special optimizations for reading and writing file per frame formats such as DPX, DNG and Open EXR. These specific graphical and video file formats are extremely bandwidth intensive and most file systems fall apart when working them, because every frame of video is a separate file - and this puts tremendous strain on a centralized storage system. Not a problem for EFS.

Tiering

Not all media content needs to be on the fastest storage. Sometimes you just need to park content for a while on inexpensive but slow storage and move it to higher-performing but more expensive storage just before you plan to work with it. Sometimes you need to have many people working on content, and other times it's just one or two.

With EFS, you can easily promote or demote content between different tiers of storage that each have different performance characteristics and cost profiles - from the least expensive 40NL “parking” or “nearline” storage, to the standard mid-cost HDD (spinning disk) storage, to the highest performing but most expensive SSD storage. With EFS, no matter what tier you move your content to, your applications will always see it in the same place.



EFS - Metadata Controllers, 450s, SSD, 40NLs

Scalability

There are a lot of ways to take a small system and make it bigger, but do you make the system more complex when you grow it? Adding more servers or disk shelves is one way to grow a storage system, and a lot of storage companies take this approach, but when you grow your system in that manner you can end up with a lot of separate volumes or LUNS - and now you have to decide what content and projects to put where.

The node-based EFS has a scale-out design that provides a single namespace no matter how big you grow the file system. As you add more nodes, existing chunks get redistributed in the background until there's an equal amount of free space on all nodes. This design ensures you are using each node the same amount as every other node. No hot spots. No bottlenecks. It also ensures that as your media department expands - as students start working with bigger video files, or as more students sign up to work in the lab - you can grow your system to keep up with the demand.

No Single Point of Failure

With any storage system, there's always a risk that some component could fail, so in the ideal world the storage system you buy should be able to tolerate the failure of any component without any data loss or interruption of workflow.

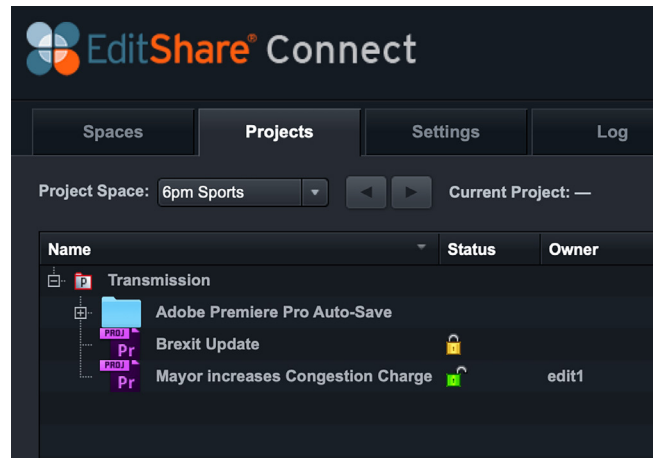
While EditShare systems can start as small as a single node -- and for smaller media programs that can be a good way to get going with central storage -- when you get to an EFS system with at least 3 nodes (or grow it to that size), EFS can now write file chunks across all of the nodes in such a way that even if one node were to get disconnected, the remaining nodes have enough information to still play back all your files. In EFS we call this "writing with XOR parity" or "writing with erasure coding". It's all based on some simple, well-understood mathematical calculations that have optimizations in virtually every modern CPU, and the end result is you are protected if a node totally fails. This sort of protection isn't a backup - you should always have a second safety copy of your data on another devices somewhere - but it does provide an excellent level of comfort that you can weather even some fairly bad hardware disasters.

Project Sharing

Most Hollywood movies and episodic television shows are produced in a sort of "assembly line" process, where many people work on the project in parallel. Assistant editors help with sifting through content and logging and making assemblies. Craft editors do the fine cuts. Visual effects editors provide the magic. Sound mixers and color correction experts get involved towards the end of the production. Producers, directors, and writers always need to review an edit in progress, and sometimes look for alternate shots and takes. News production is much the same - where stories are often edited down to the wire and the promo editor needs to see what can go in the "coming up next" teases. Even in the classroom it's convenient for a student and teacher to be able to view or work or comment on a single project, rather than making multiple copies of media and project files. The fact is, however, many - if not most - storage systems (SAN and NAS) don't really support this kind of collaboration, and if you try to work collaboratively your projects will get corrupted.

One of the unique features of EFS Storage is that it has a built-in intelligent project sharing system that allows content creators to work collaboratively on the same project -- without the possibility of one person accidentally overwriting the work of another person. What this means under the hood is that in a "shared project", only one editor at a time can open a bin or project file with read/write access. Opening the bin or project locks it, and now when anybody else opens it they'll be limited to read-only access. This

system allows editors to work together as a team. Everybody can see what everybody else is doing and copy logged clips and edits and effects from each other.



EditShare Connect

Compatibility with all major content creation applications including Avid Media Composer

EditShare routinely tests its Storage and MAM software and hardware with all of the leading content creation applications, including Adobe's full suite of Creative Cloud applications such as Premiere Pro, Apple's Final Cut Pro X, Avid Media Composer, Davinci Resolve, Autodesk Flame, and Maya and 3DS Max, The Foundry's Nuke, Avid Pro Tools, Adobe Audition, Apple's Logic Pro and many other applications. For students to be prepared for what they will encounter in industry once they graduate, they need an opportunity to use all of the standard professional tools during their education. We can assure you we have the broadest compatibility with the widest number of applications, and we will always address any issues that come up.

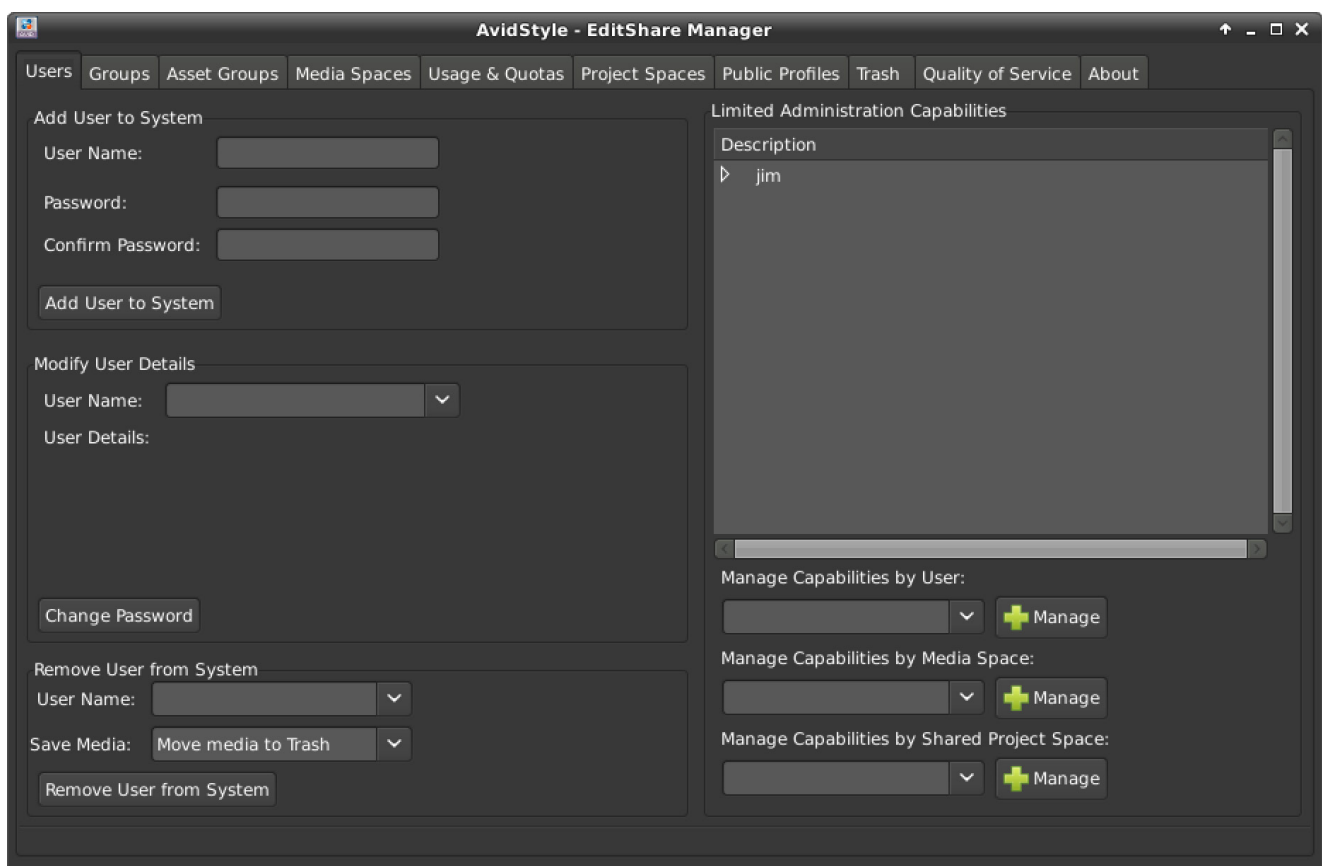
When it comes to Avid Media Composer, most generic IT storage systems have only limited support. You can probably create a volume for each individual student and let him or her put Avid media into a unique volume and edit with that media (assuming the storage can keep up). However, you can never let multiple editors access the same content simultaneously, or else the Avid applications will crash and their media databases and bins will get corrupted. If your hope is to put class practice media into one volume and have everyone use that same volume to do their editing assignment, you need to have a storage solution that understands Avid and knows how to enable media sharing and project sharing. It's the same thing if you want to teach Avid editing for news, and you need your students to all access and work with shared content.

Products from most of the biggest competing storage companies do not support Avid sharing at all; these systems require a 3rd party solution that's both costly and difficult to deploy reliably. On the other hand, all EditShare EFS systems support Avid sharing - for projects and media - right out of the box.

Easy and intuitive user and permissions management

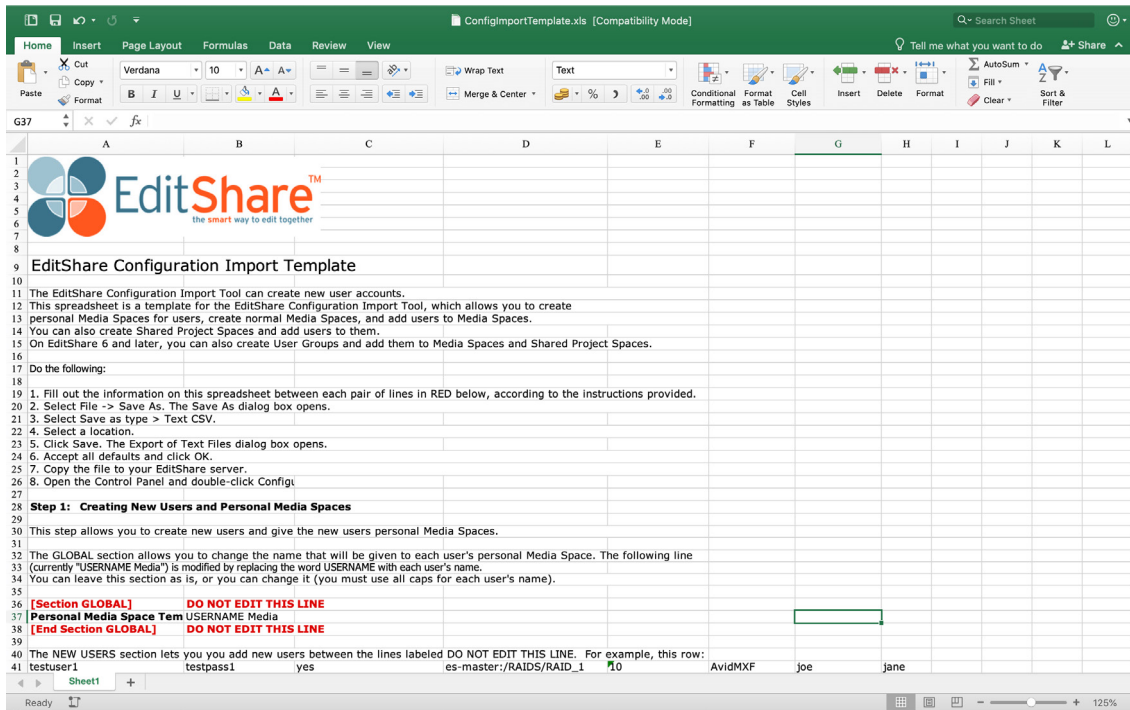
In Education environments, it's fundamental that it be easy for media lab staff to create discreet "Spaces" or "Volumes" for different classes, departments, and individual students -- and that controlling access to those Spaces doesn't become an administration burden. One thing that doesn't work for sure is that everybody can access everything - especially when many storage systems will be shared across different departments of the university.

EditShare has a whole suite of tools to make User and Space management a breeze. It starts with the EditShare Manager application, where you can quickly create user accounts, set passwords, create distinct Spaces that are logically walled off from one another, dynamically change the size of those Spaces, and select who has permissions to access the Space, and whether the access is read-write or read-only.



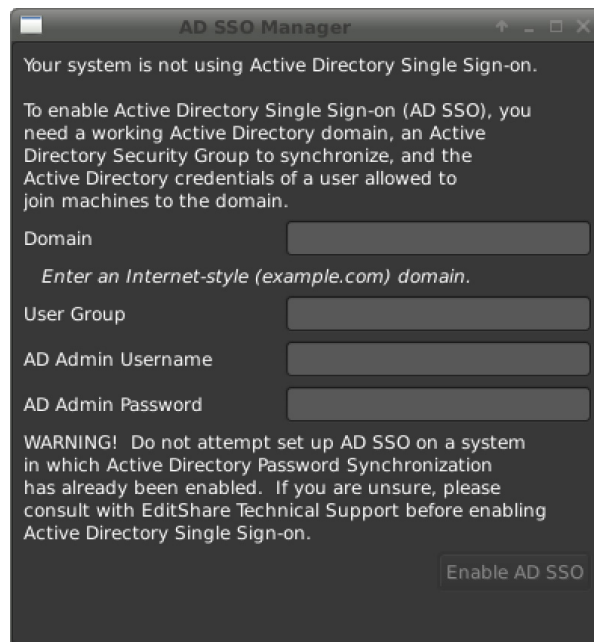
EditShare Manager

Then there is EditShare's unique Configuration Import Tool, that lets you lay out all of your User Accounts and Spaces in a spreadsheet, including which users will have what sort of access to each Space, and how big each Space is supposed to be. At the beginning of a semester, all you need to do is import the spreadsheet and the system gets set up in just a minute or two. At the end of the semester, you can use the Clean Slate Tool to remove user accounts and Spaces in preparation for the next semester.



Example configuration spreadsheet

If you want to integrate your EditShare Storage into a campus-wide Active Directory domain, it's very simple to set this up. Any AD accounts listed in a special "editshare-users" group in the Domain will automatically become authorized users in EditShare environment - so there's no need to create the user accounts manually. From then on, you can add those users to Spaces in EditShare Manager or add them to Spaces that being defined by the Configuration Import Tool. Best of all, your Active Directory



Active Directory Wizard

users will be able to use Single Sign On to connect to the EditShare system.

Finally, based on feedback and suggestions from media professionals, EditShare has built one of the industry's most intuitive implementations of ACLs (Access Control Lists). If you find you want to go

Media Space: ACLDemo

Directory: .

Basic Permissions ☐ Apply?

Type Name R W X Inherit Group (SetGID) Sticky Bit

Owner: editshare ☒ ☒ ☒ ☒

Group: ACLDemo (Group) ☐ ☐ ☐ ☐

Others: ☐ ☐ ☐ ☐

Change Owner to Highlighted Change Group to Highlighted

ACLs Search for user or group + -

Apply?	Name	Type	Read	Write	Execute	Inherit
<input type="checkbox"/>	acl managers	group	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	ACLDemo (Group)	group	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	ACLDemo (Read Only)	group	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	interns	group	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	power users	group	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	restricted	group	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

How changes will be applied:

☐ To this directory only ☐ To this directory and immediate contents (top level) ☒ Recursively

☒ Modify selected entries ☐ Clear and replace all entries

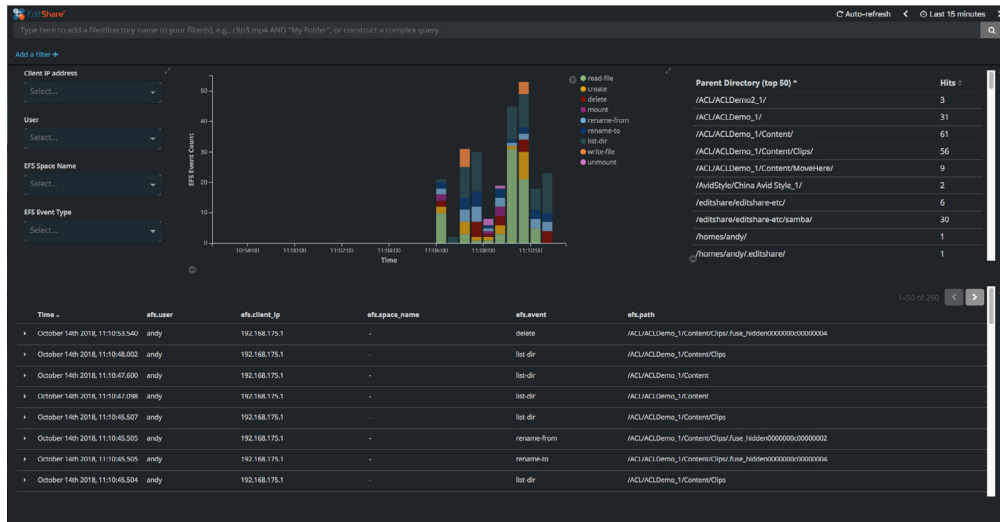
Apply Revert Close

EditShare ACL

behind the simple rules of “User can access a Space or not” and “Access is read/write or read-only”, you can create fine-grained ACLs for individual users or user groups.

Auditing

When you have hundreds of students using a storage system working in a collaborative fashion, they're getting a great experience that's just like to working in the real world. However, students being students, sometimes they make mistakes. Files get deleted by accident. Rules sometimes get broken and certain types of files get put in the wrong place. Also, there's the possibility that a student might engage in a prank and intentionally alter, delete or hide another student's files. With EFS real time File Auditing, you get complete accountability about who did what, when, to what files and directories. If anything unexpected ever happens, you can go back and piece together precisely how it happened. That EFS Storage provides its own real time Auditing web interface is unique among storage solutions today. Most only send audit data to a 3rd party tool, which you would have to purchase separately.

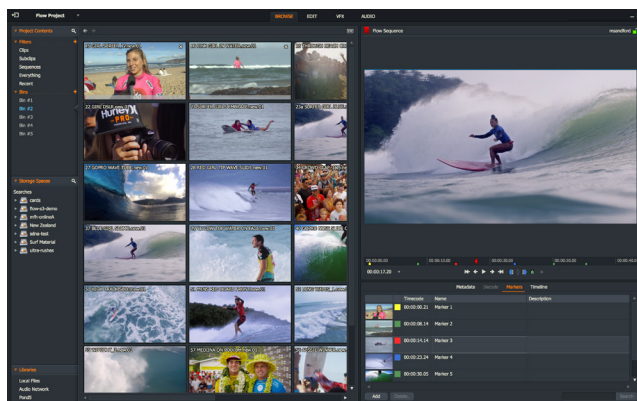


File Auditing

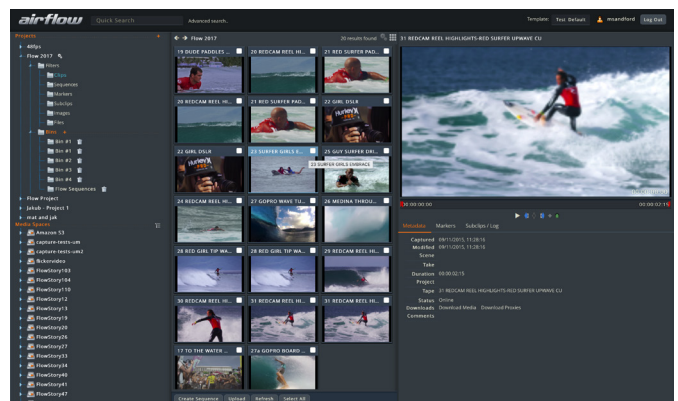
Remote Access

In this day in age of Cloud apps and Cloud storage, use of products such GSuite and Google Drive - or Microsoft Office 365 and One Drive - has become ubiquitous. People increasingly just expect to be able to access their documents, photos and media from anywhere in the world, on any device.

With the addition of Flow, our Media Asset Management add-on to EFS Storage, EditShare can solve that problem for the students and faculty members who want to access their media outside the lab. While you are free to use any MAM you want with EFS Storage, there are some big advantages to choosing Flow. Not only does it understand and respect the User and Space management rules set up in storage, but Flow includes an On-Premise Private Cloud feature that provides access to proxy versions of any media file stored in EFS or in your archive. You can browse, log, organize and play them in AirFlow, our web browser-based app. Or you can do full multi-layer timeline editing in Flow Story. And best of all, Flow Story understands other editing applications such as Avid Media Composer and Adobe Premiere Pro- so it's easy to start something in Flow Story and then move it to Avid or Adobe, or vice versa.



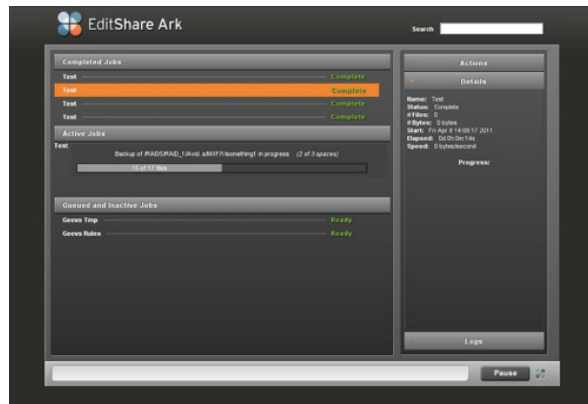
Flow Story



AirFlow

Integrated Backup and Archiving, as well as Disaster Recovery options

No mission critical storage system – no matter how resilient or safe – is complete without regular backups of content. While you are free to use a wide variety of backup solutions with EFS Storage, EditShare also has its own **integrated backup and archive solution called Ark**, that can regularly and automatically backup your content to LTO tapes, and that Flow can control to restore individual files back to EFS Storage.



EditShare Ark

In addition, EditShare's lower-cost EFS 40NL series can form the basis of an economical off-site **Disaster Recovery solution** that lets you keep an ongoing mirror of your primary storage in a separate geographically distinct location. While the main function of the 40NL is to hold a second copy of your data as inexpensively as possible, in a pinch the 40NL can be used for real time editing by a small number of users – for instance, to finish a production on a very tight deadline.



EFS-40NL nearline

Summary

EditShare solutions are uniquely positioned to facilitate the teaching of media productions and to help train the next generation of film directors, editors, journalists, sound designers and creatives. By supporting demanding real-world collaboration workflows in a class led environment, EditShare can help ensure that students leave their educational institution with invaluable hands-on experience that will help graduates gain a foothold in their chosen career path. EditShare today has hundreds of colleges and universities dotted across the globe already benefiting from having a production and teaching environment centered around EditShare storage and MAM products. Talk to any of our offices and we will be happy to set up a demonstration.