

# COLLABORATIVE EDITING USING EMC ISILON AND FILMPARTNERS MXFSERVER

EMC® Isilon® OneFS 7 and FilmPartners BV MXFserver™ 4.6

- Streamlined support for Avid video editing workflows using open storage
- Scalability for application-agnostic video editing workflows
- Simplified data management, robust data protection and reduced TCO

This white paper explains how to configure a collaborative video editing environment using EMC® Isilon® OneFS 7 and FilmPartners BV MXFserver™ 4.6. MXFserver is an open architecture SQL-based production media asset management solution that allows Adobe® Premiere Pro®, Apple® Final Cut Pro®, Avid®, and Grass Valley® EDIUS® video editing applications to share media files and projects via an innovative method of linking virtual files to managed assets and project metadata.

September 2013

Copyright © 2013 EMC Corporation. All Rights Reserved.

EMC believes the information in this publication is accurate as of its publication date. The information is subject to change without notice.

The information in this publication is provided “as is.” EMC Corporation makes no representations or warranties of any kind with respect to the information in this publication, and specifically disclaims implied warranties of merchantability or fitness for a particular purpose.

Use, copying, and distribution of any EMC software described in this publication requires an applicable software license.

For the most up-to-date listing of EMC product names, see EMC Corporation Trademarks on EMC.com.

EMC2, EMC, the EMC logo, Isilon, OneFS, InsightIQ, SmartConnect, and SmartPools are registered trademarks or trademarks of EMC Corporation in the United States and other countries.

VMware is a registered trademark or trademark of VMware, Inc. in the United States and/or other jurisdictions. All other trademarks used herein are the property of their respective owners.

Part Number H11439.2

## Table of Contents

<b>Reference architecture overview</b> .....	<b>4</b>
Document purpose and audience .....	4
Isilon Scale-out NAS for media and entertainment applications.....	4
Introduction to MXFserver .....	5
The infrastructure challenge for media and entertainment.....	5
Solution purpose .....	5
The technology solution.....	5
The solution benefits .....	6
<b>Solution infrastructure configuration</b> .....	<b>7</b>
Isilon cluster configuration.....	7
MXFserver configuration .....	8
Network topology.....	8
<b>Solution architecture</b> .....	<b>10</b>
<b>Solution configuration</b> .....	<b>13</b>
Optional Ubuntu Linux installation for OneFS 6.5.4 and earlier .....	13
MXFserver user account .....	14
MXFserver folders on OneFS.....	14
MXFserver folder permissions .....	15
MXFserver share permissions.....	15
Optional - MXFS_OneFSHandler configuration for legacy OneFS v6.5.4 and earlier .....	16
Optional MXFserver.ini modifications for legacy OneFS v6.5.4 and earlier .....	17
<b>Conclusion</b> .....	<b>18</b>
<b>References</b> .....	<b>19</b>
<b>Appendix A.</b> .....	<b>20</b>

## Reference architecture overview

### Document purpose and audience

This document describes reference architecture for configuring a collaborative video editing environment using EMC® Isilon® OneFS 7 and FilmPartners MXFserver™ 4.6 which was validated and tested by the EMC Solutions Group. MXFserver is an open architecture SQL-based production media asset management solution that allows Adobe® Premiere Pro®, Apple® Final Cut Pro®, and Avid® video editing applications to share media files and projects via an innovative method of linking virtual files to managed assets and project metadata.

This Reference Architecture document is intended for media and entertainment professionals familiar with non-linear editing solutions from Adobe, Apple, and Avid. Readers should have a basic understanding of network and server administration techniques. Readers should also have some familiarity with the EMC Isilon X-Series hardware and the EMC Isilon OneFS operation system. For more information, please see the [EMC Isilon X-Series Product Brochure](#) and [EMC Isilon OneFS Operating System White Paper](#).

### Isilon Scale-out NAS for media and entertainment applications

EMC® Isilon® scale-out NAS has long set the standard for addressing the challenges of managing large, rapidly growing file-based and unstructured data. Isilon is an ideal storage platform for media and entertainment environments that require a storage infrastructure that is highly scalable in capacity and performance.

EMC Isilon scale-out storage provides unimaginable room for media storage needs—from 18 terabytes to over 20 petabytes of capacity per cluster in a single file system and volume. EMC Isilon is a powerful yet simple scale-out NAS solution for organizations that want to invest in managing their data, not their storage. Isilon storage systems are simple to install, manage, and scale at virtually any size. Every Isilon solution can seamlessly scale on the fly, enabling you to add hundreds of terabytes of storage or expand capacity and performance within minutes. And, unlike traditional NAS storage, our solutions stay simple no matter how much storage is added.

To support demanding, large-scale content workloads for media applications, the Isilon OneFS® operating system scales to deliver over 100 gigabytes per second of system throughput. EMC Isilon is the world's fastest NAS platform with the world-record performance of 1.6 million SPECsfs2008 CIFS operations per second.

To help organizations minimize costs, Isilon delivers over 80 percent utilization with a single pool of shared storage. Our industry-leading storage efficiency, combined with our simple, easy-to-manage approach, helps you to reduce capital expenditures as well as ongoing operating costs. You can further optimize resources with EMC Isilon SmartPools™ software to provide automated storage tiering that continually optimizes your Isilon storage environment for performance and economy. You can easily set policies to automatically move inactive content to more cost-effective storage, streamlining workflows for your most current data while remaining completely transparent to users and applications.

To safeguard media asset data and deliver the high availability required, Isilon is highly resilient and provides robust data protection including data backup and provisions for disaster recovery. EMC Isilon SyncIQ® software allows local and remote data replication, and provides push-button failover and failback simplicity, thereby helping you to increase the availability of your content.

## Introduction to MXFserver

Based in the Netherlands, FilmPartners BV has over 30 years of experience in the media industry. The MXFserver product is a result of FilmPartners' work on the Big Brother<sup>®</sup> reality television series in 1999, where teams of editors working on a wide variety of editing platforms required a solution for collaborative editing. Adobe Premiere Pro and Apple Final Cut Pro 7 inherently allow a certain degree of editing workflow compatibility with open storage solutions through their native support of standard camera file formats such as Sony<sup>®</sup> XDCAM<sup>®</sup> and Panasonic<sup>®</sup> P2<sup>®</sup>. Avid editing systems, however, require a combination of expensive, highly complicated storage and asset management solutions in order to support collaborative editing workflows.

## The infrastructure challenge for media and entertainment

Avid typically sells a bundled solution for collaborative video editing that includes IP-based storage, production asset management, and the editing application. Media professionals frustrated with the cost, complexity, limited scalability, instability, and lack of standard protocol support in Avid's proprietary storage solution now have an alternative.

Avid's production asset management framework is based on a legacy requirement where individual video and audio tracks must be wrapped in individual Op-Atom Material Exchange Format (MXF) wrappers rather than in the widely used Op-1a wrapper format. The Op-Atom MXF wrapper format used by Avid requires individual files for the video track and all associated audio tracks within a single clip of motion video. By contrast, the Op-1a format encapsulates the video track and audio tracks into a single, easy to manage file. Avid's media asset management framework also relies upon a proprietary folder structure in (and media object index database to keep track of) Op1A MXF media files. In an Avid collaborative editing environment, the proprietary Avid format media files cannot be accessed by the Avid editing software unless the indexes for all online media are constantly kept up to date. This can become a Herculean task in edit environments where dozens of editors are constantly creating new media files and project metadata. In a large editing environment using Avid's proprietary editing storage solution, a disruption to the services that index terabytes of media files can result in a service outage lasting hours while the media indexes are rebuilt by individual servers. While multiple media index servers may be used in a single Avid storage system, only one server may actively rebuild the media indexes for a single directory tree at a given time. As a result, most large Avid proprietary storage solutions are partitioned into multiple volumes in order to reduce the risk of data loss or over-subscribing a media index server.

## Solution purpose

MXFserver is a Microsoft<sup>®</sup>.NET Framework-based application and SQL database that acts as a light-weight MAM that controls access to media stored on EMC Isilon. MXFserver has Microsoft Windows and Apple Mac OS X client applications that provide integration between the MXFserver server application and client editing applications from Adobe, Apple, and Avid.

MXFserver clients connect to MXFserver to control access to media and projects stored on EMC Isilon. The MXFserver application manages the creation of virtual SMB shares on EMC Isilon storage, allowing the client to mount a volume containing links to just the media files needed for a specific project or set of projects. Once the client has mounted a virtual share from EMC Isilon, MXFserver simply tracks metadata updates and access control to media on the EMC Isilon storage.

## The technology solution

MXFserver clients connect directly to the EMC Isilon scale-out NAS to mount the virtual SMB shares created by MXFserver. SMB client connections to the EMC Isilon storage are load balanced by EMC

Isilon SmartConnect. SmartConnect optimizes storage performance by presenting a single host name that is distributed over multiple network interfaces on every node of the EMC Isilon scale-out NAS cluster. Clients and storage nodes can be added, and the cluster can be scaled without disruption while the system is in production.

Like EMC Isilon OneFS, MXFserver is based on open protocols. MXFserver may be integrated with existing media asset management or workflow automation systems via an open API. MXFserver also integrates with media ingest servers from EMC Isilon partners EVS® and Telestream®.

When paired with EMC Isilon scale-out NAS, MXFserver provides a simple, highly scalable, high-availability solution for mission-critical editing environments. Unlike traditional storage systems where file system metadata is a single point of failure that requires a dedicated metadata controller server, EMC Isilon OneFS is a truly clustered file system. File system maintenance and metadata management are distributed services handled natively by every storage node in the cluster. As Isilon cluster grows to accommodate more capacity and client bandwidth, the compute resources required to support your growing file system scale-out in tandem, eliminating the pain and downtime typically associated with storage infrastructure administration.

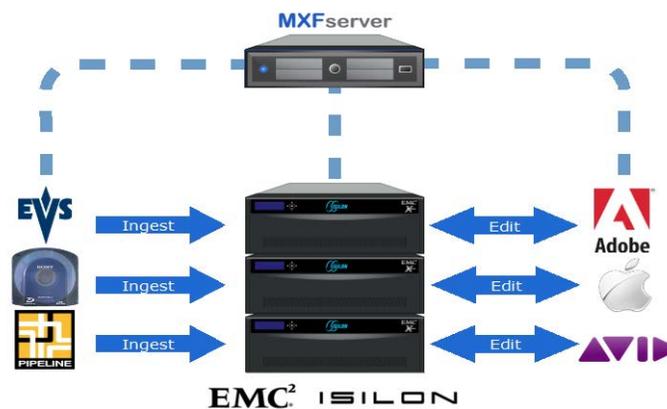


Figure 1. EMC Isilon and MXFserver scale-out edit workflow

### The solution benefits

The FilmPartners MXFserver solution eliminates the risk of lengthy Avid media index rebuild times by virtualizing a one-to-one relationship between editing projects and the media indexes required to support those projects. For instance, if the index of a single Avid project needs to be rebuilt, the client workstation currently assigned write access to said project rebuilds the index for just one project versus the media index for every media file on a shared volume. While the media index is being rebuilt, all other Avid editing clients are working from individual media indexes for each connected projects, unaffected by the re-index of a single project. In contrast, when the server responsible for managing media indexes on a proprietary Avid shared editing storage environment is rebuilding a media index, all projects with media residing on the affected volume are unavailable for editing.

In addition to providing a simple solution to enable collaborative Avid video editing workflows on open storage solutions from EMC Isilon, MXFserver simplifies the management of media and project

metadata for collaborative Adobe Premiere, and Apple Final Cut Pro editing workflows. MXFserver also provides support for Avid ProTools® workflows on EMC Isilon storage.

MXFserver and EMC Isilon enable video editing environments to grow and adapt to an application-agnostic workflow without disrupting deadline-driven business processes. Ideally suited to the demands of data-intensive, high performance computing environments, Isilon scale-out NAS storage delivers the requisite performance and scalability needed in media and entertainment environments, all while simplifying data management, providing robust data protection, and lowering operating costs.

## Solution infrastructure configuration

### Isilon cluster configuration

The EMC Isilon cluster used in this reference architecture runs OneFS v7.0.2.1, firmware version 8.2, and drive firmware version 1.5. The cluster contains 5 X200 nodes and 5 X400 nodes. Each X400 node contains 34 1TB SATA drives, 2 400GB SSD drives, and 24GB of RAM. Each X200 node contains 11 1TB SATA drives, 1 200GB SSD drive, and 24GB of RAM. The X200 nodes and X400 nodes form 2 distinct disk pools within a single OneFS file system. Using the EMC Isilon SmartPools feature, the cluster is configured with a disk pool that allows us to migrate the data contained in the Workspaces and UserWorkspaces directories from the X200 to X400 disk pools for performance testing purposes. Alternatively, a disk pool policy could be created to keep files ending with .mxf on the X200 disk pool and files ending with .mov on the higher performance X400 disk pool. Any metadata in the OneFS filesystem may be used to configure a disk pool policy. Since OneFS is a single file system that utilizes the SmartPools feature to determine which data exists in different disk pools, the disk pool policies may be configured to run at any time without the need for downtime or file copies between volumes. For more information on SmartPools see the [EMC Isilon SmartPools Data Sheet](#).

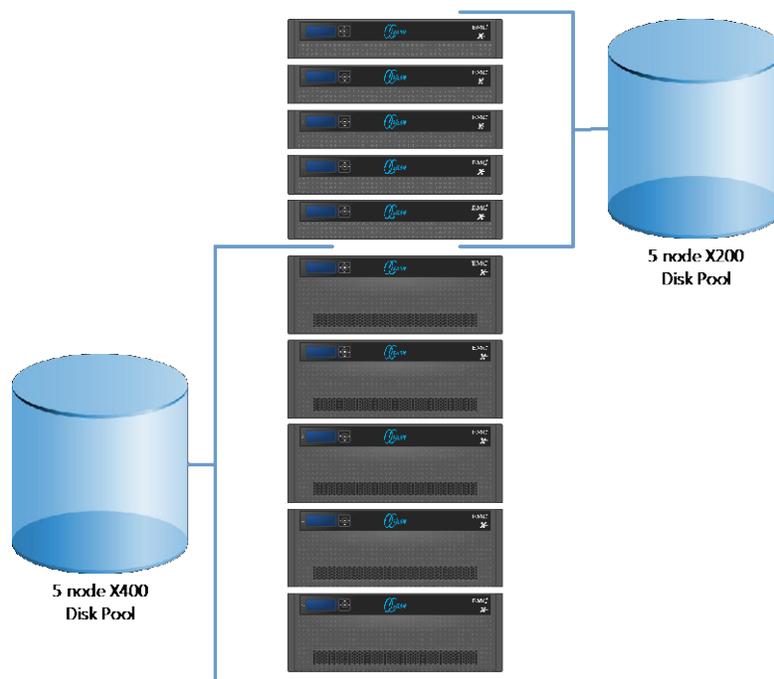


Figure 2. EMC Isilon X200 and X400 Disk Pools.

## MXFserver configuration

When using versions of OneFS older than 6.5.5, the MXFserver product for EMC Isilon is a two-part solution. The first part, *MXFserver.net*<sup>™</sup>, is a Microsoft .NET framework based application that runs on Windows Server 2008 R2. The second part, *MXFS\_OneFSHandler*, is a web services agent for Ubuntu® Linux 10.04.4 LTS server. A physical Microsoft Windows Server 2008 R2 server hosts both the *MXFserver.net* application framework and a VMware® Player 5.0 environment. The VMware Player 5.0 environment hosts the Ubuntu Linux image distributed with EMC Isilon InsightIQ 2.0.1 where *MXFS\_OneFSHandler* is installed.

In a stand-alone configuration where MXFserver manages local-attached SCSI or Fibre channel storage, the *MXFserver.net* application creates hard links between ingested media files directly from the host Windows Server 2008 operating system. Since Windows-based operating systems can only create hard links on NTFS file systems, the MXFserver configuration for EMC Isilon requires an additional web services component, the previously mentioned *MXFS\_OneFSHandler*, running on Linux to handle the creation of hard links on OneFS.

In this reference architecture configuration, the Isilon operating system is OneFS 7.0.2.1. Starting with OneFS 6.5.5, the ability for Microsoft Windows clients to create hard links on the OneFS file system is handled natively by the EMC Isilon OneFS operating system.

The following software versions of the MXFserver application and client applications are used in this reference architecture:

- MXFserver version 4.6.0
- MXFserver Windows client version 4.6.0
- MXFserver Mac OS X client version 4.6.b.2

## Network topology

Each node in the cluster has a 1 Gigabit Ethernet connection to an Arista Networks® 7050T-52 Ethernet switch and a 10 Gigabit connection to an Arista Networks 7050S-64 10GbE Ethernet switch. The 1 Gigabit Ethernet network runs at a standard 1500 MTU. The 1 Gigabit Ethernet network is the default network interface for all client in the reference architecture. All MXFserver application transactions, authentication, and the default gateway exist on the 1 Gigabit Ethernet network.

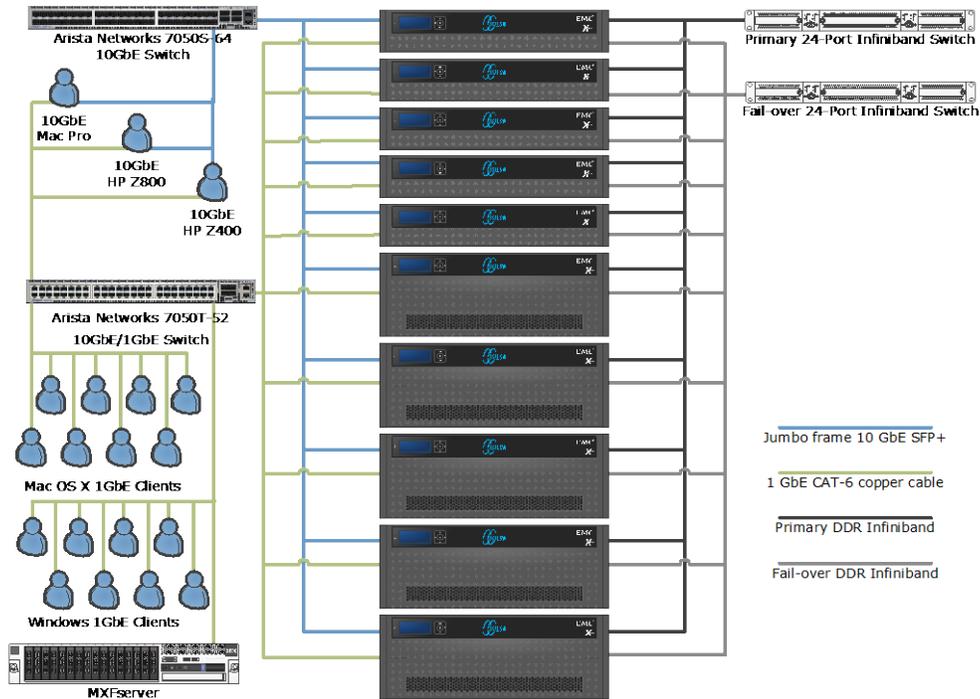


Figure 3. EMC Isilon Network Configuration

### Performance tuning

The 10 Gigabit network in this reference architecture is an isolated network running jumbo frames (MTU 9000) for optimal performance in high bandwidth workflows such as uncompressed HD or 2K editing. The Arista switch does not require any configuration in order to enable jumbo frames, as the switch is configured to pass jumbo frames by default. When configuring a network that uses jumbo frames, it is important to make sure all clients on the jumbo frames subnet are configured to use the same MTU of 9000. Therefore, the jumbo frames subnet cannot be routed or in any way accessible by packets configured for a standard MTU of 1500. Clients using jumbo frames enabled 10 Gigabit Ethernet must be dual-homed, with the 1 Gigabit Ethernet interface configured as the primary interface with a default gateway, while the 10 Gigabit Ethernet interface is not configured with a gateway.

For best performance using SMB v2.1 shares with Windows 7 clients, open the windows registry editor and create the DWORD `DisableLargeMtu` in the following Windows registry location:

```
HKLM\System\CurrentControlSet\Services\LanmanWorkstation\Parameters
```

The DWORD `DisableLargeMtu` should be left at the default value of 0 and the computer should be restarted to enable the change.

The two primary Windows 7 workstations used in this reference architecture are the Hewlett Packard® Z800 and Z400. The integrated Broadcom® Gigabit Ethernet interface in the Z800 and Z400 has a rather small transmit and receive buffer compared to the Intel 10 Gigabit Ethernet card. The on-board Gigabit Ethernet interface is tuned to use the maximum number of receive packet descriptors by increasing all instances of the `RxStdDescCnt` registry key from the default value of 200 to 511. These simple performance modifications do not improve the overall throughput of SMB2 connectivity, but the latency for data buffering into the Adobe Mercury Playback Engine and Avid Media Playback engine is reduced. Video playback reliability may be degraded at extremely high data rates if the Ethernet transmit and receive buffers are not sized accordingly. Customers that do not have a 10

Gigabit Ethernet infrastructure are advised to use an Intel® Pro series server NIC in lieu of the on-board Broadcom Ethernet chipset. Please see Appendix A for the full Windows configuration details.

The eight remaining Windows 7 clients in this reference architecture are Lenovo E31 workstations with single 3.4 GHz Xeon E3-1245 V2 CPUs and 8GB of 1,600MHz ECC-UDIMM RAM each.

The Apple workstation in this reference architecture is a Mid 2010 Mac Pro with dual 2.66 GHz 6-Core Intel Xeon CPUs and 16GB of 1,333 MHz DDR2 RAM. The Apple workstation graphics card is an ATI Radeon HD 5770 in PCIe 2.0 x16 slot #1.

The eight remaining Mac OS X clients are Apple Mac Mini computers with quad core Intel i7 CPUS and 16GB of 1,600MHz DDR3 SDRAM each.

The Mac OS X client performance tuning in this workflow requires the creation of the file `/etc/sysctl.conf`. The `sysctl.conf` file contains the entries listed in *MXFS\_OneFSHandler*.

```
net.inet.tcp.sendspace=2097152
net.inet.tcp.recvspace=2097152
net.inet.tcp.delayed_ack=2
```

The `sendspace` and `recvspace` `sysctl` settings ensure the maximum amount of data per window are used, limiting the TCP overhead and total number of network transactions. To determine the best `sendspace` and `recvspace` buffer sizes for your network, use the following formula:

Total network bandwidth (in bytes/second) x round-trip delay (in seconds) = approximate send/receive buffer (in bytes, round to a multiple of 512)

The `delayed_ack` `sysctl` setting sets Mac OS X to use “compatibility mode” when determining when to use TCP delayed acknowledgment.

For additional information about Mac OS X performance tuning, please see the EMC Isilon support document [Using Mac OS X Clients with Isilon OneFS 6.5 – Resources for Integration and Configuration](#).

At this time, MXFserver only supports the SMB protocol when integrating Mac OS X clients with EMC Isilon storage. To learn more about integrating MXFserver Mac OS X clients with EMC Isilon using the NFS protocol please contact MXFserver support at [support@mxfserver.net](mailto:support@mxfserver.net).

## Solution architecture

As seen in Figure 1, there are two main folders of the EMC Isilon OneFS file system that form the core of the MXFserver workflow. The folder `/ifs/Workspaces` contains a read-only repository of all the managed content under MXFserver control. The `/ifs/Workspaces/UserWorkspaces` folder contains all the user generated project metadata for Adobe Premiere, Apple Final Cut Pro 7, and Avid versions of a project as well as any user ingested or rendered media files. When a new MXFserver project is created, a series of subfolders containing the following subfolders is created:

- ALE
- AMA Pool
- Adobe Premiere Pro Preview Files
- ArchivedLayouts
- Audio Render Files
- Autosave Vault
- Avid MediaFiles
- Capture Scratch

- Encoded Files
- Layouts
- MXFProject
- Media
- Media Cache
- Media Cache Database
- OMFI MediaFiles
- OP1A MediaFiles
- QuickTime
- Render Files
- Settings
- TEMP\_OPAtom
- Thumbnail Cache Files
- Unmanaged\_Folder
- Waveform cache Files

The template includes a unified folder structure that supports all media and project metadata formats supported by Adobe, Apple, and Avid. The template for each project type is stored in the Workspaces folder. When a new project is created, a copy of the template set of folders is created in the UserWorkspaces folder. MXFserver allows an editing workflow administrator to create custom project templates and restrict which project templates are available to specific users or groups.

Both the `/ifs/Workspaces` and `/ifs/Workspaces/UserWorkspaces` folders are set to “streaming” data access pattern via the I/O optimization settings in the EMC Isilon web UI File Explorer. This setting ensures that file data is written to disk in a pattern optimized for streaming media playback. Filesystem metadata is stored on SSD using the default metadata read acceleration settings. Storing metadata on SSD ensures that edit client streaming playback performance will not be disrupted by disk seeks during metadata intensive activities such as searches and media management tasks where thousands of files may be deleted or modified in a single action. For additional write performance improvement, folders assigned to the X200 disk pool may be set to a +1 protection level. X400 disk pools should maintain a minimum +2:1 protection level in order to shorten parity rebuild time in the event of a disk or node failure.

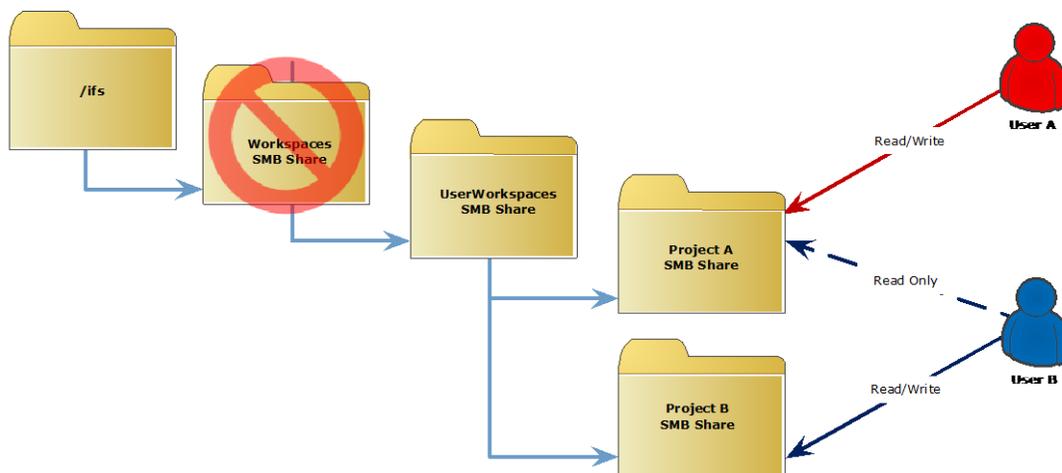


Figure 4. MXFserver creates virtual shares for project files on-the-fly.

Both the Workspaces and UserWorkspaces folders are shared using the SMB protocol. The Workspaces share is only accessible to the MXFserver server application. MXFserver users have no read or write access to the Workspaces share. Users are given full control access to the UserWorkspaces SMB share. In order to prevent project corruption from multiple users accessing the same project, MXFserver creates virtual SMB shares based on the subfolder structure for projects. Each user mounts the subfolder for their project as a unique share with full control access. Each user may also mount other user's projects in order to collaborate on projects where media is shared. MXFserver supports "bin-locking" functionality in order to prevent multiple users with write access to a project overwriting each other's changes and corrupting the project. If User A has Project A open with read/write access, User B may have Project A open with read only access by default. This will allow User B to play media in Project A and link Project B metadata to media in Project A.

If User B wishes to make changes to project metadata contained in subfolders or "bins" of Project A, User A may unlock certain bins, thereby allowing User B to lock the bins. When bins within a Project A are unlocked by User A and locked by User B, User B gains read/write access to the bins while User A is demoted to read only access to said bins.

The MXFserver client application uses a hidden user account to mount the virtual shares created from subfolders on UserWorkspaces folders. The password for this account is stored in an encrypted format on the MXFserver client configuration files. When MXFserver creates a virtual project share mount point at the subfolder level of a project, the stored credentials for this single user account are used to map the share. The same credentials for mapping project shares are used on all MXFserver clients.

When a user saves changes for a project back to the virtual project share created on their edit workstation, MXFserver creates a link to this data back in the secured Workspaces share. MXFserver creates this link as a hard link on the OneFS POSIX complaint file system. The hard links on the Workspaces share act as replicas of project metadata and media stored in each project on the UserWorkspaces share. The map of hard links between the Workspaces SMB share and UserWorkspaces share make it possible for the user to work from a protected reference to a protected file. This hard linking process controls the risk of accidental deletion of media referenced by multiple MXFserver editing projects and allows all users referencing hard links to see changes to the linked file simultaneously.

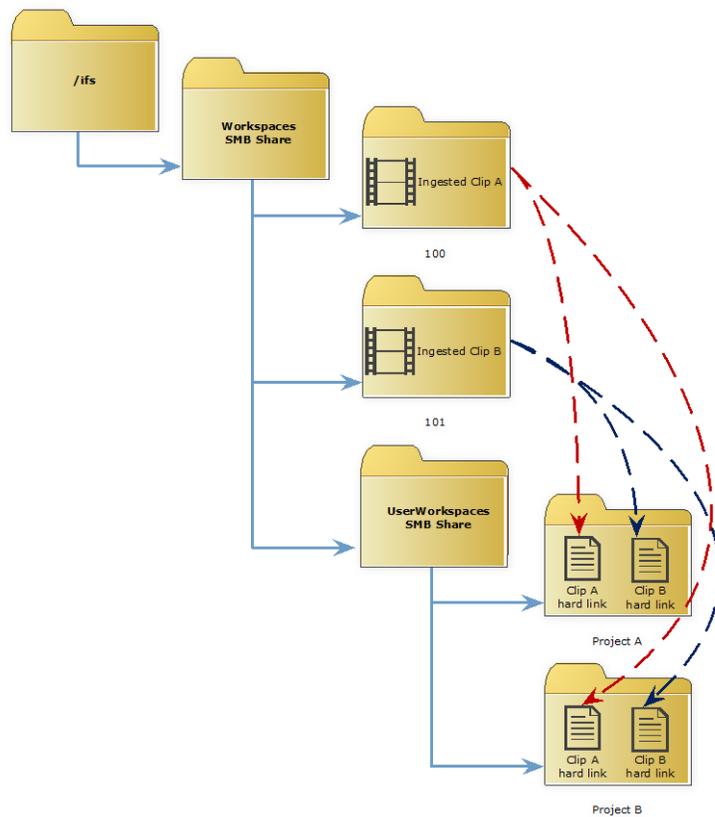


Figure 5. MXFserver virtualizes access to protected files via hard links

## Solution configuration

### Optional Ubuntu Linux installation for OneFS 6.5.4 and earlier

The MXFS\_OneFSHandler web services application required for OneFS 6.5.4 and earlier runs on [Ubuntu Linux 10.04.4 LTS server](#). The Linux server may run as a virtual machine on the Windows 2008 R2 server(s). In a redundant server configuration, the Linux VM runs on the stand-by Windows 2008 R2 server. To simplify the installation, the EMC Isilon Ubuntu Linux VM for [InsightIQ](#) is preconfigured to run on the freely distributed [VMware Player](#) application. The EMC Isilon InsightIQ VM and installation instruction are posted for download here:

<ftp://ftp.isilon.com/outgoing/InsightIQ/2.1.0>

InsightIQ does not need to be licensed or configured in order run the MXFserver.

Communication between the core MXFserver service and *MXFS\_OneFSHandler* will occur over port 11010. MXFserver will communicate with the SQL server over port 3307. The MXFserver clients connect to MXFserver over port 11000.

The MXFS\_OneFSHandler web service is not required on EMC Isilon clusters running EMC Isilon OneFS operating system version 6.5.5 and later.

## MXFserver user account

MXFserver mounts virtual project shares using a hidden user account. Before installing MXFserver, you must either configure a Microsoft Active Directory Domain user or EMC Isilon OneFS local user account to be used in the MXFserver configuration settings.

For **Domain mode** installations create a domain user with these settings:

```
User name: MXFuser
Password: *****
User cannot change password
Password never expires
```

For **Workgroup mode** installations create a local account under the EMC Isilon web administration interface:

Under File Sharing → Authentication Sources → Local Users → Add user

```
User name: MXFuser
Password: *****
Home Directory: /ifs/home/MXFuser
User ID: Auto
Primary Group: Isilon Users
Shell: nologin
Account: Enabled
Password expiry: Never
```

## MXFserver folders on OneFS

Before the SMB shares for MXFserver are created, the folders are created with very specific permissions.

In the MXFserver install disk there are 3 subfolders

- Client
- Manuals
- Server

Inside the Server folder you will find *Folders-SHARES to Create on Server*.

In this reference architecture, the SMB settings are all set at the default values and the factory default `ifs` is still available. In order to create the MXFserver folder structure, the `ifs` SMB share is mapped using the credentials for the local EMC Isilon account name `root`, or `clustername\root` where `clustername` is the name of the EMC Isilon cluster. The `ifs` directory is shared in the default EMC Isilon OneFS configuration as `\\smartconnect-zone\ifs`, where `smartconnect-zone` is the EMC Isilon host name for SmartConnect client connection load balancing.

Copy the following folders and their contents from the *Folders-SHARES to Create on Server* subfolder to `\\smartconnect-zone\ifs` or a similar common subfolder on the EMC Isilon OneFS file system:

- MXFserver
- Workspaces

Copy the following folder from the *Folders-SHARES to Create on Server* subfolder to [\\smartconnect-zone\ifs\Workspaces](#) on the EMC Isilon OneFS file system, creating the path [\\smartconnect-zone\ifs\Workspaces](#):

- UserWorkspaces

The `MXFserver` folder simply contains a copy of the client software installers and playout folders.

The `Workspaces` folder contains the templates for new projects. As we mentioned earlier, the `Workspaces` folder is also the repository for hard linked media files that will not be directly accessible to `MXFserver` clients.

The `UserWorkspaces` subfolder is where user generated projects and media will be stored.

### MXFserver folder permissions

An `MXFserver` client has no access to the main `Workspaces` folder. All connections to the EMC Isilon storage are managed by the `MXFserver` software. The `MXFserver` software will use the local EMC Isilon root user account to manipulate the virtual workspaces.

The following procedure is used to create the `MXFserver` folder permissions:

1. With `\\smartconnect-zone\ifs` still mapped as root, modify the folder permissions for the `Workspaces` subfolder by right-clicking and selecting folder properties and selecting the *Security* tab:
2. Select the *Advanced* button in the `Workspaces` folder properties window.
3. Select the change permissions button.
4. Deselect the *Include inheritable permissions from this object's parent* check box.
5. Select *Add* from the resulting dialog to convert and add inherited parent permissions as explicit permissions of this object.
6. Select *Replace all child object permissions with inheritable permissions from this object*.
7. Select the user `root` and click the *Edit...* button.
8. Grant the `root` user *Full control* access.
9. Change the *Apply to:* drop down menu from *This folder* to *This folder, subfolders and files*.
10. Apply all changes and close the resulting windows
11. Right-click the `UserWorkspaces` subfolder to select properties and repeat steps 1-9.
12. Grant the `MXFuser` account *full control* to the folder `UserWorkspaces`
  - a. If you are using `MXFserver` in `Domain` mode, you may grant the `DomainName\MXFuser` account *full control* access to the `UserWorkspaces` folder at this time. The `MXFuser` account is granted full control using the same steps outlined above for the EMC Isilon local user `root`.
  - b. If you are using `MXFserver` in `Workgroup` mode, Connect to the EMC Isilon OneFS command line interface using an SSH client such as PuTTY and log in as root. From the EMC Isilon OneFS command line, change directories to the `UserWorkspaces` subfolder:

```
cd /ifs/Workspaces/UserWorkspaces
```

Run the following `chmod` command for grant `MXFuser` *full control*:

```
chmod +a user MXFuser allow generic_all,object_inherit,container_inherit .
```

### MXFserver share permissions

The following procedure is used to create the `MXFserver` share permissions:

1. Log into the EMC Isilon web interface to create the MXFserver, Workspaces, and UserWorkspaces shares under the File Sharing→SMB→Add Share menu option.
  - a. When creating the Workspaces and UserWorkspaces shares, deselect the *do not change existing permissions* button in order to preserve the previous work in steps 1-11. Create shares using the following share permissions:

<b>Folder</b>	/ifs/MXFserver
<b>Share name</b>	MXFserver
<b>Users</b>	Domain Users or Everyone
<b>Share Permissions</b>	Read for Everyone Full Control for DomainAdministrators

<b>Folder</b>	/ifs/Workspaces
<b>Share name</b>	Workspaces
<b>Users</b>	Domain Administrators <sup>1</sup>
<b>Share Permissions</b>	Full Control

<b>Folder</b>	/ifs/Workspaces/UserWorkspaces
<b>Share name</b>	UserWorkspaces
<b>Users</b>	Domain Administrators and MXFuser
<b>Share Permissions</b>	Full Control

2. Please secure the EMC Isilon Cluster by changing the default SMB share permissions for the **ifs** share. By default the group everyone is granted *Full control* to /ifs. Please change the access rights for *Everyone* from *Full control* to *Read*.

### Optional - MXFS\_OneFSHandler configuration for legacy OneFS v6.5.4 and earlier

The Linux server VM requires the following configuration in order to run the MXFserver OneFSHandler application:

1. Add the following line to **/etc/fstab** to mount the default NFS share from Isilon as **/mnt/ifs** on the Ubuntu Linux server.<sup>2</sup>

```
smartconnect-zone.domain.com:/ifs /mnt/ifs nfs defaults 0 0
```
2. Mount the /ifs export
 

```
mount /mnt/ifs
```
3. Copy the file **MXFS\_OneFSHandler** from the Installation disk to **/usr/sbin/MXFS\_OneFSHandler** on the Ubuntu Linux server.

<sup>1</sup> The EMC Isilon root user account has full control by default.

<sup>2</sup> The root for the MXFserver folder structure may be set anywhere within OneFS if /ifs is not an option. Please see the section on the MXFserver.ini file modifications in this document to see how this path may be modified.

For the highest level of availability, please use a [SmartConnect Advanced](#) zone configured for dynamic IP addressing and NFS failover. This option requires the creation of a 2<sup>nd</sup> SmartConnect zone, but ensures the OneFSHandler application will not lose connectivity to the NFS export in the event of a network failure or EMC Isilon cluster “rolling upgrade” procedure.

To start OneFSHandler, run the following command:

```
/usr/sbin/MXFS_OneFSHandler
```

The OneFSHandler application will output the following line when running:

```
Run linkserver on port 11010
```

The NFS export for the `/ifs` directory is secured by entering the Ubuntu Linux server’s IP address into the `Clients:` field in the `/ifs` NFS export settings.

### NFS > Edit Export

Specify the directories, hosts, and other settings for an NFS export.

The screenshot shows the 'Settings' window for an NFS export. The 'Description' field is empty with '(recommended)' text. The 'Directories:\*' field contains '/ifs' with a 'Delete' link. The 'Clients:' field contains '10.10.10.11', which is circled in red. The 'Permissions:' section has two checked checkboxes: 'Enable write access' and 'Enable mount access to subdirectories'. A note at the bottom right says 'Allow subdirectories below the path(s) to be mounted.'

Figure 6. NFS `/ifs` export client restriction for MXFserver

This setting will block access to the NFS export for all IP addresses except the Ubuntu Linux server, thereby protecting the permissions and contents of the MXFserver managed media.

### Optional MXFserver.ini modifications for legacy OneFS v6.5.4 and earlier

The following values are changed in the configuration file for MXFserver. The MXFserver configuration file is located in the following path on the physical Windows 2008 R2 server running MXFserver.net:

```
C:\Program Files(x86)\FilmPartners\MXFserver
```

The following values are modified to configure MXFserver for EMC Isilon OneFS support:

- `connectionpool` is set to 100
- `maxWorkerThreads` is set to 8000
- Under [Storage], the type value is set to Storage-Remote
- `filehandler_ip` is set to the IP address of the Linux VM running MXFS\_OneFSHandler
- `filehandler_storage_ip_replacement_path` is set to the path of the MXFserver root folder structure as mounted on the Linux server running MXFS\_OneFSHandler. In this case, the path is `/mnt/ifs`.

Example MXFserver.ini file

```
[DataBase1]
ip=127.0.0.1
port=3307
```

```

user=root
password=sTAgafzqQ8acXcL+7fdj5A==
dbname=system5
status=
connectionpool=100

[Server]
ip=127.0.0.1
port=11000
AutoDetectFilesInUserWorkspace=False
maxWorkerThreads=8000

[Storage]
type=Isilon-Remote
name=Isilon
id=12346
concurrency=2
workspace_share=Workspaces
userWorkspace_share=UserWorkspaces
storage_ip=smb.sc-isi-a.alliances.isilon.com
filehandler_ip=10.10.10.11
filehandler_storage_ip_replacement_path=/mnt/ifs
storage_user=UNIX_USERS\root
storage_password=nAA3YUQFdU1q7jULQGOTag==
storage_client_user=Domain\MXFuser
storage_client_password=0Uy57uXTR0aEmvd8Sn5pFQ==
makeMXFReadOnly=True
MixedNLEEnvironment=False
useAvidTimeStamps=False
checkForReadOnlyFlagTempOPatom=false

```

Finally, the `linkerclient.exe` executable must be present in the C:\Program Files(x86)\FilmPartners\MXFserver folder for the MXFserver windows service to communicate with the Linux MXFS\_OneFSHandler web services application.

To see full instructions on installing MXFserver, please consult the MXFserver version 4.5.0.96 configuration guide for EMC Isilon or contact [support@mxfserver.net](mailto:support@mxfserver.net).

## Conclusion

MXFserver is a unified project sharing solution for Adobe Premiere, Apple Final Cut Pro, Avid Media Composer and ProTools running on a standard SQL database with open API controls and XML interoperability. Edit clients using the MXFserver client and Isilon storage for their editing project gain full support for Avid bin locking. MXFserver stores ingested content in the native media file format and makes the content available for editing without the need for time-consuming transcode or rewrapping procedure.

MXFserver manages editorial access to ingested content using virtual file wrapper formats and metadata expected by Avid Media Composer, Apple Final Cut Pro, and Adobe Premier without moving or modifying the ingest content resident on the Isilon OneFS file system.

Client connections are evenly distributed across multiple nodes in the Isilon scale-out NAS system, eliminating any single point of bandwidth congestion. Isilon OneFS is a truly scalable, clustered operating system designed from the ground up to simplify media workflows at any scale with minimum administrative requirements.

OneFS distributes all metadata and file system operations across every node in the cluster, eliminating the risk of performance degradation or file system corruption from a separate metadata controller or from indexing service tracking too many media objects. As the cluster grows, performance and availability for new client connections increases linearly.

This reference architecture provides a validated collaborative editing solution enabled by MXFserver asset management system and Isilon scale-out NAS storage cluster. The solution is able to support and scale to thousands of non-linear editing clients.

## References

EMC Isilon Video Editing Application Sizing Guide

[EMC Isilon X-Series Product Brochure](#)

[EMC Isilon OneFS Operating System White Paper](#)

[EMC Isilon Next Generation Storage Tiering with EMC Isilon SmartPools White Paper](#)

FilmPartners' MXFserver version 4.6 Configuration Guide for EMC Isilon

## Appendix A.

Windows 7 Client workstation #1 in this reference architecture is an HP Z800 with the following specifications:

- BIOS version 3.54 with the following changes:
  - Hyper-Threading enabled
  - Memory Mode Interleave enabled
  - Runtime Power Management disabled
  - MWAIT-Aware OS disabled
  - Idle Power Savings set to Normal
  - “Option ROM download” feature disabled on slot #4 in support of an Intel X-520-SR2 10GbE NIC
- Dual Intel 6-Core Xeon® X5650 Processors @ 2.66GHz 12MB cache
- 12 GB of RAM, fully interleaved on 12 x 1 GB 1,333 MHz DIMMs
- NVIDIA Quadro 4000 2GB PCI-e graphics card and NVIDIA driver version 275.89

Windows Client workstation #2 in this reference architecture is an HP Z400 with the following specifications:

- BIOS version 3.19 with the following changes:
  - Runtime Power Management disabled
  - MWAIT-Aware OS disabled
  - Idle Power Savings set to Normal
  - “Option ROM download” feature disabled on slot #4 in support of an Intel® X-520-SR2 10GbE NIC
  - Intel Xeon W3503, 2.40GHz, 4MB cache, 1066 memory, 4.8GT/s QPI processor
- 8 GB of 1066 MHz RAM
- NVIDIA Quadro FX 3800 2GB PCI-e graphics card and NVIDIA driver version 275.89

Both Windows 7 Workstations contained the following configurations:

- Intel® X-520 PCIe Gen 2 10GbE NIC and Intel® PROSet driver version 17.0.200.2
- Installed in PCIe Gen2 slot #4
- Jumbo Packet size set to 9014 under the X-520 advanced driver settings
- Set Transmit Buffers and Receive Buffers to 4096 under the X-520 advanced driver settings performance options
- Microsoft Windows 7 Professional 64 bit Service Pack 1
- The AD user group Domain Users is added to the local Windows 7 local Administrators group.
- Under the system control panel advanced performance settings, the visual effects settings are set to “best performance”

The following software is installed on each Windows 7 workstation:

- Adobe Premiere Pro 6.0.3
- Avid Media Composer v6.0.1
- Apple QuickTime® 7.6.9
- MXFserver Windows client version 4.6