DELL EMC ISILON AND ADOBE PREMIERE PRO CC
Windows and macOS video editing client workflows

ABSTRACT
This reference architecture covers the integration of Dell EMC Isilon® OneFS® 7.2 and Adobe Premiere Pro® CC running on both Microsoft® Windows® and Apple macOS®. Historically, Dell EMC has recommended NFS for macOS connectivity to OneFS if a workflow requires support for a high-bandwidth stream or many concurrent streams to a single client. In this latest version of the Adobe Premiere Reference Architecture, we look at improvements to the SMB stack in macOS starting with OS X 10.10.

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EXECUTIVE SUMMARY

This reference architecture covers the integration of Dell EMC Isilon® OneFS® 7.2 and Adobe Premiere Pro® CC running on both Microsoft® Windows® and Apple macOS®. Adobe Premiere Pro video editing workflows that do not require support for high throughput real-time video streams are best served by sharing volumes from the Dell EMC Isilon OneFS filesystem over the SMB protocol exclusively. SMB provides the highest level of interoperability, reliability, and ease of administration in a workflow combining Windows and macOS. Historically, Dell EMC has recommended NFS for macOS connectivity to OneFS if a workflow requires support for a high-bandwidth stream or many concurrent streams to a single client. In this latest version of the Adobe Premiere Reference Architecture, we look at improvements to the SMB stack in macOS starting with Mac OS 10.10. Those interested in maintaining a mixed protocol environment with NFS v3 and SMB3 access to the same directory structure should reference the guide at the end of this document.

This document also provides some sample performance data from an environment that supports 10 gigabit Ethernet client connectivity to a single volume and a single set of media files over the SMB3 protocol. The details of this configuration provided to facilitate your own testing of a workflow supporting mixed operating systems.

AUDIENCE

This reference architecture is for Dell EMC Isilon customers with a basic understanding of the Dell EMC Isilon OneFS v7.2 operating system and the UNIX command line. Optional sections of this document require domain administrator rights to a Microsoft Active Directory and an architectural understanding of the reader’s existing directory services infrastructure. Please contact Dell EMC Isilon support before implementing changes to a production Dell EMC Isilon cluster.

ADOBE APPLICATIONS

The Adobe CC suite comprises a collection of applications for creative professionals:

- Adobe® Premiere® Pro CC is a professional video editing application that serves as the hub for Adobe production workflows. Adobe Premiere Pro runs best with ample memory and powerful CPUs and graphics - especially when working with large file formats or VR content.

- Adobe® After Effects® CC is an industry leading motion graphics and visual effects tool. The application makes good use of fast storage for the application’s global performance cache technology, especially for easy access to complex compositions.

- Adobe® Media Encoder CC provides ingest, transcoding and final output for virtually any viewing platform. It can be automated via watch folders and scripting and benefits from powerful CPUs and GPUs.

- Adobe® Audition CC is a professional audio workstation with Dynamic Link integration to Adobe Premiere Pro CC. Since audio files are smaller than video content, they are less of a concern for storage and performance, but the tight integration between the tools means much greater workflow efficiency for users and facilities.

Key benefits of using Adobe tools with Dell EMC Isilon

Integration

- Adobe interoperability with many different Media Asset Management (MAM) systems enables selection of best-of-breed applications to suit demanding and unique workflows.

- The integration between all the applications in the Adobe CC suite streamlines many common production workflows – for example, the Dynamic Link between Adobe Premiere Pro and After Effects.

Collaboration

Performant shared storage is an essential foundation of any collaborative workflow, and Dell EMC Isilon may be deployed with Adobe creative tools for streamlined and efficient operations:

- Adobe Team Projects supports collaborative production workflows using shared project files and connected user-designated storage locations for assets.

- Adobe interoperability with other applications, such as broadcast graphics or project management tools, provide connected production pipelines across the facility.
Speed and Efficiency

- Adobe Premiere Pro allows users to edit native files directly from their storage for greater speed and efficiency and a simplified infrastructure. Working in this way demands high performance storage – such as Dell EMC Isilon.

- The Adobe CC suite of applications support native workflows – where source material can be incorporated and manipulated in its native form, without the need for transcoding. This results in less transcoding - saving time and improving efficiency.

ARCHITECTURE

The Dell EMC Isilon cluster used in this architecture is a 3 node X410 cluster. Each node in the cluster has 64 GB RAM used as read/write cache, 32 SATA disks, and 4 SSD disks. The SSD disks are configured for the default 'L3' cache configuration of caching recent metadata and ‘hot’ random IO data as it exits the cluster coherent DRAM cache of the cluster. At the time of this document writing, L3 cache will not accelerate the sequential read performance typical of video editing workflow. In the battery of tests run to build this architecture, cache utilization was cleared at the beginning of each test and recorded during testing. 100% of the filesystem metadata was read from L3 SSD cache during the tests, with the cluster filled to 80% capacity, while an average of only 3% of the filesystem data was read from L3 SSD cache.

The OneFS L3 caching algorithm is optimized to take advantage of SSD caching for random IO to files such as XML updates in project files, while leveraging the raw sequential read throughput of multiple SATA spindles for media file playback. Additionally, OneFS heavily leverages the L1 and L2 DRAM cache of each node to prefetch media files from disk in advance of the client read request. In each test run for this architecture the DRAM cache for the cluster was flushed prior to testing using the isi_flush command to ensure previously pre-fetched media files were not still resident in L1 cache. Even with forcing the test to leverage more disk IO by clearing the cache, an average of 23% of reads were serviced by local L1 DRAM cache due to OneFS prefetching the streaming content. Obviously, latency and performance for the editorial workflow can be increased even further by adding up to 256GB of cluster-coherent DRAM cache to each node in the cluster.

While the tested playback streams in this workflow do not directly benefit from L3 cache, it is worth noting that in a real-world media production environment, the editorial client stream requests are not the only traffic on the cluster. L3 or metadata R/W caching of metadata on SSD will protect streaming media to edit clients from dropping frames by eliminating disk latency created by other applications performing metadata intensive activities such as tree walks, deleting thousands of media files during a media management activity, or indexing of media files during an import.

The Isilon cluster in this reference architecture is connected to an Arista 7050S-53 switch via 6 10 Gigabit Ethernet (10GbE) ports. All macOS clients in this architecture are connected via a single 10GbE interface to the same switch as the cluster in order to minimize latency between the client and storage. The Windows 8.1 client in this architecture is connected to Arista switch via dual 10 GbE interfaces and each interface is configured with a unique IP address. This dual 10GbE configuration allows the Windows 8.1 client to leverage the full throughput of SMB3 multi-channel connectivity to the Isilon cluster by balancing single stream traffic across both interfaces.

A reference Mac Pro® (2013) system (Mac #1 in this document) and Windows 8.1 Lenovo® D30 system (Win #1 in this document) with appropriate GPU configurations for Adobe Premiere Pro are used to gauge playback and maximum render speed performance for playback without dropping frames. Additional macOS systems with lesser GPU configurations are used to generate additional load when testing high-concurrency connectivity. The client configuration details are outlined at the end of this document in appendix A.
PROJECT SETTINGS

The workflow in this document is tested with the default Adobe Premiere Pro settings for a project created on a network volume, with the exception of the ‘Automatic peak file generation’ setting in the audio preferences. Automatic peak file generation is disabled to prevent network IO overhead from indexing audio files stored on Isilon.

![Automatic peak file generation setting](image)

**Figure 1. Disable Audio File Waveform Indexing**

A project management database such as MXFserver from FilmPartners or the Adobe Anywhere Collaboration Hub is a valuable tool for managing projects in a collaborative Adobe Premiere Pro workflow. Users storing project files on shared storage in the same folder structure as the shared media files run the risk of project corruption if multiple editors open the same project simultaneously and save changes to the same bins within the project. In an unmanaged media environment, users must resolve issues with media cache integrity using the Media Cache Database preference for database cleaning. Unmanaged media files that are moved or modified on shared storage must manually locate the modified files when a project is reopened. Users must also manually locate the first file in a project if the path changes due to operating system or UNC path differences. AD group policy objects and macOS Server managed user preferences are used to provide consistent network volume mount paths and mapped network drive letters across.

PERFORMANCE TUNING

Unlike previous versions of this reference architecture, all data connections to the Isilon cluster are over a standard 10GbE network connections running at a standard MTU of 1500. No jumbo frames network connections or dual homed network connectivity is used.

The default OneFS network interface buffer sizes and performance tuning sysctl settings are configured for 1 GbE client connectivity. Since we are using high performance 10 GbE client connections in this architecture, the OneFS sysctl settings are modified for optimal performance over 10GbE. **WARNING:** please consult Dell EMC support before making any changes to OneFS sysctl settings. To view the current sysctl settings, run each of the following commands:

```bash
isi_for_array -s sysctl net.inet.tcp.recvspace
isi_for_array -s sysctl net.inet.tcp.sendspace
isi_for_array -s sysctl kern.ipc.maxsockbuf
isi_for_array -s sysctl net.inet.tcp.sendbuf_max
```
To increase the buffer settings from the CLI use the following commands:

```bash
isi_sysctl_cluster net.inet.tcp.recvspace=524288
isi_sysctl_cluster net.inet.tcp.sendspace=524288
isi_sysctl_cluster kern.ipc.maxsockbuf=16777216
isi_sysctl_cluster net.inet.tcp.sendbuf_max=2097152
isi_sysctl_cluster net.inet.tcp.recvbuf_max=2097152
isi_sysctl_cluster net.inet.tcp.sendbuf_inc=16384
isi_sysctl_cluster net.inet.tcp.recvbuf_inc=32768
isi_sysctl_cluster net.inet.tcp.inflight.enable=0
```

For more information about OneFS sysctl settings, please see Dell EMC support knowledgebase articles 89232 and 89334.

The macOS clients equipped with Myricom 10 GbE network adapters have the following settings in the macOS /etc/myri_settings.conf configuration file:

```bash
net.myri10ge.en*.lro_cnt=8
```

The macOS clients with ATTO 10GbE network adapters have the following settings in the macOS /etc/sysctl.conf configuration file:

```bash
net.inet.tcp.sendspace=1048576
net.inet.tcp.recvspace=1048576
net.inet.tcp.delayed_ack=3
net.inet.tcp.rfc1323=1
```

The Window 8 client with the ATTO FastFrame NS112 10GbE network interface card has the transmit and receive buffer sizes increased to 4096 in the network interface ‘advanced’ driver settings under the ‘performance’ options. As mentioned earlier in this document, the Windows client is also leveraging SMB3 multi-channel over dual 10GbE network interfaces that are each configured with unique IP addressing, as SMB3 multi-channel load balancing and interface bonding protocols such as LACP can be counter-productive when trying to increase network throughput for a single stream.

For additional ATTO FastFrame network adapter performance tuning guidelines, please contact ATTO Technology Product Support.

For additional information on macOS performance tuning, please see the Using macOS Clients with OneFS 7.x document

**PERFORMANCE**

In order to monitor the playback performance in Adobe Premiere Pro, two methods of collecting metrics are used. On the client side, a text overlay of the playback performance statistics is invoked from the Premiere Pro console. To enable the overlay, open the console (Control+F12 in Windows and Command+F12 in macOS) and set the ‘EnableDogEars’ value to ‘true’ under the ‘Debug Database View’ drop-down panel view. The resulting overlay provides statistics on dropped frames, how many playback frames per second are rendered, latency prefetching the unrendered frames into the video RAM cache, and how many frames have been completed ahead of play.
The second method for collecting performance metrics during playback is the Dell EMC Isilon OneFS isi statistics command. For more information about the OneFS command line interface, please see Dell EMC Isilon CLI Administration Guide.

Adobe Premiere Pro predictably caches the advanced frames of video in a sequence to the client before playback. Client-side caching protects the real-time video streams from TCP anomalies that would otherwise result in dropped frames during playback. Given a media volume with low enough latency and sufficient bandwidth, the Adobe playback engine fills the client playback cache at a data rate in excess of the media composition’s target playback data rate. This “prefetching” of video frames into the Adobe playback engine often results in very high bursts of non-uniform network throughput while advanced frames of video are queued from playback on the client. Due to the “bursty” nature of this workflow, large network buffers and high performance, low latency Ethernet switches such as the Arista 7050 and other series with deep buffers are highly recommended.

In previous versions of this reference architecture, we have recommended multi-protocol access to the OneFS filesystem with Windows clients naturally using SMB and macOS clients using NFSv3. With the introduction of SMB2 performance improvements in macOS 10.9 and SMB3 performance improvements in macOS 10.10, we now recommend a simplified all SMB workflow for optimal playback performance in Adobe Premiere Pro. Figure 3 demonstrates the difference in peak read performance in the macOS SMB3 stack vs. NFSv3 using the AJA System Test to benchmark read performance of the uncompressed 2K QuickTime media files used in these reference architecture tests. The tests were conducted with the Mac #1 client using the following settings in the /etc/nfs.conf macOS configuration file for optimal read performance:

```
nfs.client.mount.options= tcp, rw, async, rdirplus, nfc, rwsiz=65536
nfs.client.allow_async=1
```
In testing this architecture, a sample of the various native media file formats supported by Adobe Premiere Pro are streamed concurrently in a stress test. Using the reference macOS and Windows 8.1 workstations described earlier in the document, the maximum number of stream supported for real-time playback without dropping frames is determined. The formats tested and streams tested per client are listed in Figure 3.

Table 1. Media Files Tested

<table>
<thead>
<tr>
<th>FORMAT</th>
<th>IMAGE SIZE</th>
<th>FRAME RATE</th>
<th>DATA RATE</th>
<th>STREAMS PER CLIENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>QuickTime 10bit RGB Uncompressed</td>
<td>2048 x 1080</td>
<td>29.98</td>
<td>265 MB/s</td>
<td>1</td>
</tr>
<tr>
<td>QuickTime ProRes 422 HQ</td>
<td>4096 x 2160</td>
<td>23.98</td>
<td>106.6 MB/s</td>
<td>2</td>
</tr>
<tr>
<td>DNxHD 440X</td>
<td>1920 x 1080</td>
<td>29.98</td>
<td>56 MB/s</td>
<td>2</td>
</tr>
<tr>
<td>XAVC-4K</td>
<td>3840 x 2160</td>
<td>29.98</td>
<td>38.5 MB/s</td>
<td>2</td>
</tr>
<tr>
<td>XDCAM-HD</td>
<td>1080</td>
<td>29.98</td>
<td>7.3 MB/s</td>
<td>8</td>
</tr>
</tbody>
</table>

Each Premiere Pro client is playing a unique set of files, with unique files for each stream of video superimposed over each other using a real-time Premiere Pro motion effect with an incremental reduction in scale for each overlapping image.

In addition to testing the maximum stream count per client and with all clients playing concurrently, copies of each project and media directory are made on the Isilon cluster for comparative testing of concurrent data access pattern and streaming data access pattern.
Figure 4. Data access pattern selection via Isilon OneFS Web UI file explorer.
In workflows with a high level of concurrent access to media files, the streaming data access pattern provides a marginal performance improvement, as shown in figures 5 and 6. Testing reveals that streaming data access pattern is only beneficial in the media formats that require over 200 MB/s per stream, such as the Uncompressed 2K QuickTime media format. Streaming data access pattern allocates single files to a larger subset of disks, providing more aggregate spindle throughput on a file read at the expense of possible spindle contention in highly concurrent read/write scenarios. Streaming data access pattern is essential for folders containing media encoded at data rates over 400 MB/s and optimal single stream performance in VFX workflows.

Data access patterns are applied on a folder by folder or even file by file basis via the OneFS isi set -l command or the OneFS Web UI file explorer. A folder containing uncompressed or 4K RAW media files can be configured for streaming data access pattern while a folder containing standard ProRes or MXF content could be configured for concurrent data access pattern.

For typical compressed video editing workflow with a large number of concurrent editors, Adobe Premiere Pro benefits from using the default concurrent data access pattern with uses the standard disk group size for each file.
As can be seen in figures 7 and 8, a scenario with all clients each simultaneously streaming 8 XDCAM-HD files for a total of 56 concurrent streams, the concurrent data access pattern offers slightly lower latency in delivering concurrent data streams to the clients. Given the “bursty” nature in which the Adobe Premiere Pro playback engine aggressively prefetches media files for rendering and playback in the client GPU, ensuring the lowest possible latency to the client is critical.

MIXED PROTOCOL ACCESS (OPTIONAL)

This optional section of the reference architecture provides guidance on mixing NFS and SMB protocol access to the same Adobe Premiere Pro project media using advanced OneFS identity mapping functionality. This document also details some of the configuration options for a more simplified environment used by numerous Dell EMC Isilon customers.

The cluster in this workflow is configured with the default global settings for file sharing protocols. This configuration ensures the highest level of support for dynamic workflow changes on a single filesystem. Non-standard configuration changes are implemented at the creation of a new share or subfolder. In the Dell EMC Isilon web administration interface, under the File Sharing menu, the global

---

1 Note that WinA and WinB represent dual 10 GbE interfaces being used in tandem by the Windows client via SMB3 multichannel

2 Note that WinA and WinB represent dual 10 GbE interfaces being used in tandem by the Windows client via SMB3 multichannel
SMB settings are at the default values for OneFS 7.2. The global NFS settings in this environment use the factory default values, yet the individual NFS exports are created with custom settings. In the file sharing advanced settings under ACL Policies, the environment value is set to balanced. The balanced ACL policy provides the best compatibility for workflows supporting multiple protocols and operating systems. In the file sharing authentication sources settings, the Active Directory settings are configured to join a Windows Server 2008 R2 domain.

In order to provide consistent user and group credential mapping between macOS and Windows, an Active Directory (AD) domain controller is established as the top tier source of authority for directory services and DNS resolution. The domain controller is either a standalone AD domain or a trusted domain within a larger corporate AD topology. Coherency of credentials and file permissions between Microsoft Windows security IDs (SIDs), macOS user IDs (UIDs), and macOS group IDs (GIDs) are governed by installing the Microsoft Windows Server 2008 R2 Identity Management for UNIX role services from the Windows 2008 Server Manager application. The installation of Identity Management for UNIX role services requires local administrator rights and a reboot of all affected domain controllers. Please read the optional Simplified Environment section of this document for configuration settings that do not require an AD schema extension for UID and GID mapping.

With the Identity Management for UNIX services are enabled, all AD users and groups are joined to the resulting NIS domain and populated with UNIX attributes.

1. From the Windows 2008 R2 AD Users and Computers console tree, right click the AD object and click properties.
2. In this AD object properties, choose the AD domain name from the drop down menu for NIS domain. The UID or GID automatically populates once the NIS domain is selected.
3. Once all the AD group objects utilized in the workflow are populated with a GID, the AD user objects are populated with a UID and assigned a primary group name. The NIS primary group name used in this workflow is AD group object DOMAIN\Domain Users.
4. In the Isilon web administration interface, navigate through the File Sharing drop down menu option to Authentication Sources, Active Directory and enable the SFU support using rfc2307.

The macOS Server in this workflow is bound to the Active Directory domain and configured as an Apple Open Directory master server. This configuration is referred to as “the golden triangle.”

**Figure 9. “Golden Triangle” macOS Directory Services**

In this configuration option, AD user and group objects are populated with UID and GID attributes and imported into OD. The macOS clients are primarily bound to the AD domain for authentication. The macOS clients are also bound to the macOS Server Open Directory service as a secondary directory service. In this example workflow, the golden triangle configuration simply provides managed macOS system preferences. In this example, consistent network drive letter mapping is maintained on all Windows clients using AD Group Policy Objects (GPOs). macOS Server offers a complimentary service to GPOs using managed user preferences.
The macOS Server Open Directory service is configured to push managed user preference profiles to macOS clients for network volume mapping. 

All macOS clients in this workflow example are bound to AD using the native Apple Directory Utility. The following advanced options are enabled on the Directory Utility mappings tab before the macOS computer is bound to the AD domain:

1. The Map UID to attribute value is changed to uidNumber.
2. The Map user GID to attribute value is changed to gidNumber.
3. The Map group GID to attribute value is also changed to gidNumber.

The Windows clients in this workflow are bound to the AD domain without any special configuration changes. The UID and GID mapping within the AD user and group objects is irrelevant to Windows clients. macOS clients bound to the AD domain use the UID and primary group GID from an AD user object to correctly populate the group and owner POSIX file attributes. macOS clients authenticating with an AD user object that does not have UNIX attributes populated will attempt to map POSIX permissions using a Windows Security Identifier (SID).

NETWORK SHARES AND PERMISSIONS

When sharing a single directory over multiple protocols, the interaction between POSIX permissions, share permissions, and Access Control Lists (ACLs) must be carefully planned. Please consult with Dell EMC Isilon support before implementing complicated changes to a Dell EMC Isilon cluster in a production environment.

WORKSPACES VOLUME

In this workflow example, the process of creating the shares starts with the OneFS command line interface. The storage administrator creates a directory named “workspaces” the Adobe Premiere Pro project files, imported media, and render files. Since the share will not use the default permissions or ACLs for an SMB share, the share is created using the mkdir UNIX command via an SSH connection to the cluster.

```bash
mkdir /ifs/workspaces
```

The resulting directory is created with the default ACLs, as indicated by the “+” symbol when listing the parent directory contents.

```bash
drwxr-xr-x 3 root wheel 0 Apr 1 12:00 workspaces
```

Next, the UNIX chmod command is used to remove existing ACLs and reapply the base POSIX permissions.

```bash
chmod -b 775 /ifs/workspaces
```

A directory listing now shows that the ACL has been removed, as seen in the example below where the “+” symbol is now absent.

```bash
drwxr-x 2 root wheel 0 Apr 1 12:00 workspaces
```

In the example below, the chmod command is used once more to apply a custom ACL to the workspaces directory. This ACL grants users in the group “Domain Users” of the AD domain “DOMAIN” all rights to the root of the share except “full control,” or the ability to modify ownership and changes permissions the share contents.

```bash
chmod +a group DOMAIN\domain\users allow
dir_gen_read,dir_gen_write,dir_gen_execute,std_delete,delete_child,object_inherit,container_inherit
//ifs/workspaces
```

The inheritable ACL propagates to any new files and folders created by Windows or macOS clients. The ACL inheritance occurs even if the client is using NFS.

The use of the standard AD “Domain Users” user group is interchangeable with any other AD user group as long as the UNIX UIDs, GIDs, and default groups are all properly configured in UNIX attributes of the AD object.

After defining the default ACL for the folder, the UNIX chown command is used to define the user “nobody” and the group “Domain Users” in the AD domain “Domain” as the owner of the workgroups directory.

---

3 In an unmanaged macOS environment, network volume auto-mounting is configured by manually dragging the mounted network volume icon from the Finder to the login items tabbed section of the Users & Groups preference pane. macOS clients that are not bound to AD do not attempt Single Sign On (SSO) authentication to network volumes.

4 The command is entered as a single line.
chown nobody:DOMAIN\domain\ users /ifs/workspaces

Below, we see that a directory listing using the `ls -le` command shows a new on `/ifs/workspaces`. The individual Access Control Entries (ACEs) are also visible. The matching POSIX permissions allow read/write access to the local user “nobody” and all users in the DOMAIN\Domain Users group. All other users governed by POSIX permissions and ACLs are restricted to read-only and execute access.

```
drwxrwxr-x  2 nobody DOMAIN\domain\domain\1 0 Apr 1 12:00 workspaces
OWNER: user:nobody
GROUP: group:ALLIANCES\domain\users
0: user:nobody allow dir_gen_read, dir_gen_write, dir_gen_execute, std_write_dac, delete_child
1: group:ALLIANCES\domain\users allow dir_gen_read, dir_gen_write, dir_gen_execute, std_delete, delete_child, object_inherit, container_inherit
2: everyone allow dir_gen_read, dir_gen_execute
```

**Figure 10. Preserving custom ACLs**

The underlying ACLs and POSIX permissions for the “workspaces” share are now in place. The “workspaces” SMB share is created via the Isilon web administration interface under File Sharing, SMB, Add Share. The Directory to share field is set to the `/ifs/workspaces` path we created earlier and the directory ACLs radio button is changed from the default Apply Windows default ACLs option to Do Not change existing permissions as demonstrated in Figure 2. The directory ACLs option must be modified before saving the SMB share settings in order preserve the custom ACLs we created via the command line interface.

![Directory ACLs setting](image)

**Figure 11. NFS access control settings**

In the Users and Groups section of the Add Share web interface, the “Domain Users” AD user group is added to the share and granted “modify” permissions.

The NFS export is created via the Isilon web administration interface under File Sharing and the NFS menu. The directory path of `/ifs/workspaces` from the SMB share is used again and the enable write access option is left enabled. Under the Access Control section of the NFS export configuration, the credential mapping setting is set to map root users with the user name is set to ‘nobody.’ The workspaces NFS export group membership setting is set to don’t modify.

The NFS export advanced settings are left at the defaults, however, older version macOS clients may benefit from changing the `readdirplus prefetch` performance value from 10 to 35. The `readdirplus` NFS mount option reduces the number of requests macOS will make to the NFS server when performing a directory listing. By increasing the number of objects macOS may prefetch in a single request, users may see a performance improvement in the macOS Finder when listing the contents of a single directory containing thousands of files.

---

5 The command is entered as a single line.
This workflow utilizes a second network share named “ingest” that contains managed media content named. The content contains full length camera masters and proxy footage ingested by Adobe Prelude. A single managed asset on this network volume is linked to a number of different Adobe Premiere Pro projects and users. The ingest workflow requires a more restrictive set of permissions. Changes to the name or path of a file referenced by multiple projects may result in a “Media Unavailable” error message for multiple users. In order to prevent this issue, the “ingest” share is read only to all users except accounts in the group “DOMAIN\ingest.” Users in the “DOMAIN\ingest” group are dedicated media administrators. One or more media administrators per shift are charged with managing the movement of media files to the “ingest” share from physical media such as XDCAM or P2. In the Adobe Prelude ingest dialog, a directory within the “ingest” share is defined as a transfer destination. Media administrators have the option of saving basic project metadata to as a read-only XMP metadata file on the “ingest” share or within the project folder on the “workspaces” share. One media has been ingested, hundreds of editors or Adobe Prelude logging users annotate the media files concurrently and save XMP metadata to the workspaces share.

Figure 12. Ingest and Workspaces folders in the editorial workflow

In order to construct the folder structure used in this environment within OneFS, a directory named “ingest” is created using the mkdir command.

```
mkdir /ifs/ingest
```

The chmod command with is used to remove the default ACLs and reapply a 775 mode.\(^6\)

```
chmod -b 775 /ifs/ingest
```

The chmod command is used once more to apply a custom base ACL to the workspaces directory. This ACL grants users in the group “ingest” of the AD domain “DOMAIN.”\(^7\)

```
chmod +a group DOMAIN\ingest allow
dir_gen_read,dir_gen_write,dir_gen_execute,std_delete,delete_child,object_inherit,container_inherit //ifs/ingest
```

The chown command is used to define the user “nobody” and the group “ingest” in the AD domain “Domain” as the owner of the workgroups directory.\(^8\)

---

\(^6\) If an existing folder is being modified, use the “-R” flag to remove ACLs and set the mode recursively to every file and subfolder within /ifs/ingest:

```
chmod -R -b 775 /ifs/ingest
```

\(^7\) In the example below, the ACL is redirected into a text file named ingest_acls.txt.

```
echo group DOMAIN\ingest allow
dir_gen_read,dir_gen_write,dir_gen_execute,std_delete,delete_child,object_inherit,container_inherit //ifs/ingest > /tmp/ingest_acls.txt
```

The text in ingest_acls.txt is then redirected back into the a chmod command to recursively apply the ACL.

```
chmod -RE /ifs/ingest < /tmp/ingest_acls.txt
```

\(^8\) To change ownership on an existing folder, use the “-R” flag to recursively set the ownership on every file and subfolder as shown in the example below.
SIMPLIFIED ENVIRONMENT (OPTIONAL)

In an environment where the AD schema is not extended to include RFC2307 UID and GID mapping, or a directory service is not installed, open permissions are utilized. The open permissions configuration outlined below provides the equivalent of 777 POSIX permissions and full control for NTFS permissions without granting users the rights to change the permissions policy.

4. In the Isilon web administration interface, the NFS credential mapping for the export is set to map all users and group membership to the user "nobody."

5. Remove the default ACLs for the intended directories using 777 permissions.
   chmod -b 777 /ifs/workspaces

6. Apply an inheritable ACL with open permissions is applied to the shared folder.
   chmod +a group everyone allow generic_all,object_inherit,container_inherit /ifs/workspaces

7. Again, the global ACL policy must be set to “balanced” in the Isilon web administration interface under file sharing, advanced, ACL policies.

8. Print the current global ACL value using the sysctl command below.
   sysctl efs.bam.acl_policies

9. Replace <value> in the Perl command below with the current global ACL value returned from step 5.
   Perl -e "printf "%d
\n", <value> & ~0xc27 | 0x800 | 0x40000000 | 0x2;"

10. Replace <combined value> in the isi_sysctl_cluster command below with the com value returned from step 6.
    isi_sysctl_cluster efs.bam.acl_policies=<combined value>

11. IMPORTANT: Steps 5, 6, and 7 must be repeated if the ACL policy is modified.

12. As before, the do not change existing permissions for directory ACLs option is selected when creating the SMB share via the Isilon web administration interface.

13. In the advanced settings section of the Isilon web interface for the SMB share, the security parameter for impersonate user is set to nobody.

For more information about this workflow and macOS integration tips, see Isilon KB article 3124 on the Isilon Global Customer Support Center website.

KNOWN ISSUES

While NFS v3 offers the best network file sharing performance available for macOS, the protocol presents operational issues in some workflows. Changes on an NFS mount are visible via the command line interface of macOS clients, but the Mac OS Finder interface may fail to display the changes unless the volume is re-mounted.

Adobe Premiere Pro CC running on macOS writes new files over NFS and SMB without an external resource fork metadata file ("AppleDouble" file), however, manual file copies or growing media files on an NFS volume generate an AppleDouble file for every valid file. For example, during the processing of a file a macOS user to copy the 100 gigabyte file media.mxf from a P2 card to an NFS volume, a temporary file called _media.mxf is created. The _media.mxf AppleDouble file is invisible to the macOS Finder application. Windows versions of Adobe Premiere will detect a duplicate file with a matching media file extension and attempt to index it. For this reason, it is important to make sure that AppleDouble files are hidden from Windows clients. In the advanced settings for an SMB share on OneFS 7.2, the option entitled Hide Dot Files hides all UNIX files beginning with a period from SMB clients. In versions of macOS prior to macOS, files created using the SMB protocol are hidden from Windows clients. In advanced settings for an SMB share on OneFS 7.2, the option entitled Hide Dot Files hides all UNIX files beginning with a period from SMB clients. In versions of macOS prior to macOS, files created using the SMB protocol will also create AppleDouble files unless Alternate Data Streams (ADS) is enabled. In environments with macOS clients prior to macOS, connect to the OneFS via an SSH session and run the following command while in the root of any directory shared using the SMB protocol.

```
touch .com.apple.smb.streams.on
```

The .com.apple.smb.streams.on file enables ADS on the macOS SMB session, preventing the creation of AppleDouble files. The macOS dot_clean command removes any AppleDouble files created over NFS or SMB by macOS clients lacking ADS support.

NFS and SMB do not share a common byte-range locking mechanism. Project files are saved to shared storage for collaboration and archival purposes, but saved to local storage when users are editing and actively modifying the project files. The Adobe Premiere Pro project consists of small, simple metadata files referencing media stored on Isilon OneFS. In this nonlinear editing workflow, the media.

```
chown -R nobody:DOMAIN\ingest /ifs/ingest
```
files are not modified by the editing software. The ingested media content remains in a read-only state and changes to the ingest content are stored in separate render files housed on the workspaces volume.

Issues with synchronization between the macOS Finder and the macOS NFSv3 virtual file system have been reported in some versions of macOS. In the event the status of the Finder view (file renaming, new files, etc.) of a NFS mount does not match the status of the mount as shown via the ls command in the macOS command line, please unmount and remount the NFS export on the client.

Issues with buffer overruns when exporting media formats using the QuickTime Tool Kit in Adobe Media Encoder have been reported in cases where the source file storage read performance greatly exceeds the target file write performance. For more information, please see the following Adobe Knowledgebase Article: https://helpx.adobe.com/media-encoder/kb/ame-hangs-export-quicktime.html
APPENDIX A. CLIENT CONFIGURATIONS

Mac #1
Mac Pro (2013)
Mac OS 10.10.3
32 GB RAM
ATI FirePro D500
ATTO Technology ThunderLink 2102 10GbE network adapter

Mac #2
Mac Pro Late 2010
Mac OS 10.10.3
32 GB RAM
Myricom 10G-PCIE-8B-S 10 GbE network adapter in slot 2

Mac #3
Mac Mini Late 2010
Mac OS 10.10.3
16 GB RAM
ATTO Technology ThunderLink 2102 10GbE network adapter

Mac #4
Mac Mini Late 2010
Mac OS 10.10.3
16 GB RAM
Myricom 10G-PCIE-8B-S 10 GbE network adapter in Thunderbolt Expansion

Mac #5
Mac Mini Late 2010
Mac OS 10.10.3
16 GB RAM
ATTO Technology ThunderLink 2102 10GbE network adapter

Mac #6
Mac Mini Late 2010
Mac OS 10.10.3
16 GB RAM
ATTO Technology ThunderLink 2102 10GbE network adapter

Win #1
Lenovo D30
Windows 8.1 x64
32 GB RAM
Nvidia Quadro K5000 driver V353.30
ATTO Technology NS112 10GbE network adapter
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