

Collaborative Production

Omneon Spectrum™ Media Server and Apple Final Cut Pro®

Abstract

By combining a broadcast media server with the functionality of a production server, the requirements of collaborative editing and play-to-air can be achieved in one unified platform. This paper explores a media server architecture that combines storage area network (SAN) technology with high-bandwidth network access to achieve a dual-use role, serving as a multi-channel ingest and playout server while simultaneously supporting a workgroup of collaborative editing workstations. This architecture employs an open file system with the ability to store industry-standard media files. Also key to tighter media server integration with the news edit workgroup is robust support of industry-standard file system access and file transfer protocols. Fast-paced news operations are simplified and edited content is immediately available for play-to-air.

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Synopsis

The primary role of a broadcast server is to provide realtime multi-channel record and playout capability for video and audio assets. Whereas, a collaborative production environment typically employs a production server with either Storage Area Network (SAN) or Network Attached Storage (NAS) technology to satisfy its server needs. As neither of these shared production storage environments have an inherent play-to-air capability, edited material must be transferred to a broadcast server prior to airing. In a news environment, where last-minute stories are the norm, the “transfer” step is often unacceptable due to the time constraints of the news workflow.

Omneon technology elevates media server functionality to achieve a dual-use role, serving as a multi-channel ingest and playout server while simultaneously supporting a workgroup of collaborative editing workstations. By combining a broadcast media server with the functionality of a production server, the requirements of collaborative editing and play-to-air can be achieved in one unified platform.

Automation systems and manual processes can work in tandem to ingest material to the server. Using the network file protocol, AFP (Apple File Protocol), the media server can be mounted as a drive to workstations running editing application software. These applications can “reference” files on the server, without transferring those files to the workstation. Because media can be edited while it resides “in-place” on the playout server, sequences may be played to air immediately upon completion. Omneon defines this editing approach as “edit in place” (EIP).

A well designed edit-in-place system, serving broadcast and production operations, provides successful solutions on several levels in a facility —

- For editors and program producers, it's fast, efficient and multi-access. With edit-in-place, you ingest once, write new files only when rendering is necessary, and playout using reference pointers to material residing on the server.
- For the engineering team, system architecture is less complex, with fewer data paths, fewer physical components, and fewer proprietary formats.
- For management, the system is cost effective. With fewer components, maintenance and resource costs are reduced. Edit seats are extremely affordable, and editing software has become pervasive and easy-to-learn.

Production Objectives and Approach

Broadcast news operations require efficient, economical and reliable production capabilities. Personnel and equipment operate in a deadline-driven nonstop cycle of ever-changing priorities, shifting resources, and programming adjustments. In short, the environment is constantly evolving. Time is critical in every phase of the production chain, from acquisition to editing to air.

News stories may develop at any hour from any location. News staffs research, report, update and review stories in a relentless unceasing operation. Stories may live for a brief moment or may morph across several news shows for several days. Archived footage is frequently used to augment current reporting. Large capacity storage arrays must accommodate new material while retaining previously recorded assets, as well as current edit work product.

The Omneon media server functions as a centralized ingest and playout system while providing on-demand media support to multiple workstations running nonlinear editing (NLE) applications. Automation systems and server management utilities capture news sources and services, while additional material may be ingested from microwave feeds, videotape players or disk readers. Additional server tools allow an edit workstation to begin using footage as it is being saved to the server.

Being able to retain audio and video assets on a server speeds the editing process as editors and workstations are not tied down retrieving, ingesting or transferring material. The editor can concentrate on the story content, raising production values and adding creative enhancements to each project. When and if the editor chooses to perform tasks that necessitate rendering of story elements, the server becomes the record site and the newly created content is immediately available to others.

The edit system “points to” material on the server, and the workstation maintains the reference data. The editor performs normal edit techniques, such as trimming, constructing timeline sequences and adding transitions, and the workstation maintains up-to-date reference files. Sequence and clip pointers are saved to local bins and project files. As editing progresses, information is read from central storage as needed. The fact that footage resides “centrally” rather

than “locally” is transparent to an individual editor, increasing efficiency and streamlining operations.

A media server that can also act as the production server eliminates the need to copy and distribute footage to other locations in a facility. Assets and work product remain centrally located and can be accessed to fulfill production requirements beyond news operations. Promotion departments, graphics, and other creative services may link to the server network, accessing material independently.

Solution Components: The QuickTime® Media File Format

Omneon embraces the QuickTime file format schema to establish uniform data and file handling characteristics, which are compatible with QuickTime-capable applications.

The QuickTime file format, like the various operating patterns defined in MXF (Material Exchange Format), utilizes two schemes for storing the metadata and the asset essence needed to properly ingest, store, access, transfer and playback material. In QuickTime jargon, essence is considered to be data files that contain the audio, or the video, or other component(s) of the material.

Both QuickTime schemes create a wrapper that contains the vital file-level information for telling an application where material is stored and the metadata about the material. One scheme combines the wrapper with the asset essence in a single file. The second scheme combines the wrapper with reference pointers to the essence files.

Reference Movie

The following example underscores the efficiency of using the QuickTime media file format in an editing workflow:

To add a five-second duration lower-third graphic at the beginning of a 60-second story, the section of the timeline containing the graphic would be written to a new render file on the server. When the timeline is played, the new file is referenced along with the other elements on the timeline. If the completed timeline were saved, the resulting file would be composed of instructions that say:

- Play the render file for five seconds, then
- Switch to the original clip files for the remaining 55 seconds.

A story saved in this manner is called a “reference movie”. Similar to an Edit Decision List (EDL), a reference movie is a contextual description of the timeline — a “wrapper” around the content — but without the media itself. Figure 1 illustrates a reference movie. Within the wrapper is metadata that describes other aspects of the movie, with pointers to the existing media that is stored elsewhere.

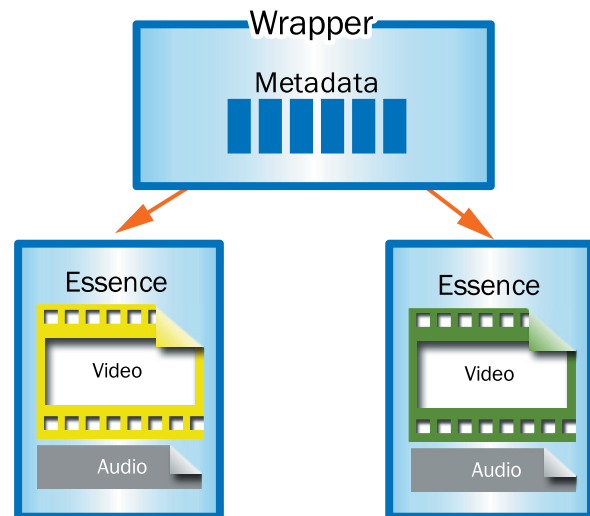


Figure 1: Reference Movie Model

A reference movie can be exported for play-to-air almost instantly, as the file representing the edit product is merely metadata with a sequence of pointers. Even when timeline elements may have necessitated rendering to accommodate special effects, for example, the exported reference movie simply points to the new files.

A reference movie is exported as a QuickTime format movie. A system that can play QuickTime movies may play the reference file, if it is able to locate the requisite content files. QuickTime is also used as an Omneon native file type, in keeping with the open standards approach of Omneon.

There are two critically important caveats when playing to air an exported reference movie. One, all rendered elements of the exported movie file must be resident on the server and not on the local workstation. And, two, the original footage pointed to by the reference movie is present on the server. Deleting, moving, or renaming the original media or the rendered files will cause the reference movie to be unplayable.

Self-contained Movie

Given the risks associated with reference movies (all the files being pointed at by the reference movie need to be resident on the server), the alternative is to export a self-contained movie file of the edit product. The file represents a monolithic clip containing all of the elements needed for play-to-air.

Figure 2 illustrates a self-contained movie. Within the wrapper file are both the metadata and the media assets. There are no pointers to media outside the wrapper.

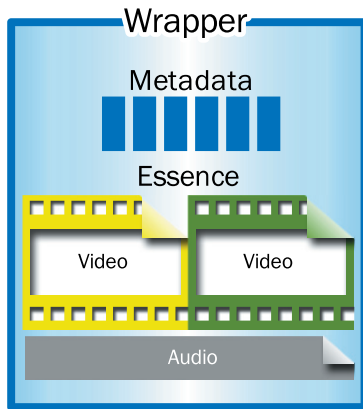


Figure 2: Self-contained Movie Model

To create a self-contained movie, the edit system must render the timeline contents to generate the standalone self-contained movie file. As in the reference movie, the timeline elements do not need to be on the local workstation in order to generate a self-contained movie. The NLE application will replicate the timeline content, integrating media files, regardless of their location.

The processor speed and the memory resources of the workstation are factors in the creation of the self-contained movie, as is any activity that may be present on the network. This method is more time-consuming to write, but it simplifies the asset management and archiving aspects of the edit workflow. Original clip files may be deleted without affecting the play-to-air of the self-contained movie file.

Solution Components: The Omneon Spectrum Media Server

The flexibility of an Omneon Spectrum media server, in combination with Apple's Final Cut Pro edit systems, raises

the production throughput of a broadcast news operation. An Omneon server networked with workstations running Final Cut Pro supports DV, DVCPRO25, and DVCPRO50 video formats.

A properly configured Omneon media server is critical when creating a viable edit-in-place environment. An Omneon server is a scalable, multi-user system that combines a multi-channel video server with network storage capability. The four primary components of an Omneon Spectrum media server are — MediaDirector, MediaPorts, MediaStore, and Network System Manager.

- **MediaDirectors:** The 2101 MediaDirector provides drive array control and file management for the system. The MediaDirector connects to the system's MediaPort I/O (input/output) devices via a high-speed serial interface (IEEE 1394), and to the system's MediaStore storage array via Fibre Channel.

The 2101's architecture is designed around dual host processors — each of which can support either realtime I/O channels or asynchronous data transfers via Gigabit Ethernet. Up to four MediaDirectors may be interconnected in one Omneon Spectrum media server using the Omneon Extended File System (EFS).

- **MediaPorts:** An Omneon MediaPort is a realtime interface adapter for encoding and decoding media. Each MediaPort is an input/output channel capable of recording, playing, and processing control commands. Several MediaPorts may be interconnected in an Omneon Spectrum media server.
- **MediaStores:** A MediaStore is a Fibre Channel disk array that connects to a MediaDirector. MediaStores house four-, seven-, and eight-drive RAID configurations and may contain one or two RAID configurations per MediaStore. Individual drive capacities can be 73, 146 or 300 gigabytes. For example, using 146-gigabyte drives, a single fully configured 16-drive array provides approximately 130 hours of DV or DVCPRO25 video storage. Up to nine MediaStores may be configured on a single Omneon Spectrum media server.
- **Network System Manager:** The Network System Manager is a network administrator application running on a professional computer platform. Connected to a MediaDirector via Ethernet, the Network System Manager provides network management and utility tools, plus configuration and monitoring services.

Omneon Data Connections

The Omneon media server integrates asynchronous (Fast Ethernet or Gigabit Ethernet) and isochronous (realtime) support in one platform. The system delivers isochronous video to the MediaPorts with guaranteed quality of service (QoS) using IEEE1394 (FireWire). Audio/video playout via this path is guaranteed with sustained reliable frame accuracy. Isochronous data handling is also utilized when ingesting material, guaranteeing that every audio and video frame is recorded to the server.

Gigabit Ethernet (GigE) and Fast Ethernet have enough bandwidth to support multiple Final Cut Pro edit stations. Within the Omneon system, the practical bandwidth limit for Ethernet connectivity per MediaDirector host processor is approximately 240 megabits per second. Ethernet, being asynchronous, delivers data in an irregular stream rather than a steady stream. All data in a file will be transmitted via Ethernet, but frame accurate sequencing is not a requirement. There is a potential for the frame sequence to be momentarily interrupted when playing footage on an edit timeline via Ethernet. This is not an indication that frames are missing from a clip, as a subsequent playing of the timeline will not be interrupted.

The Omneon MediaDirector is a multi-talented device, yet, even an advanced system will have an upper limit on performance. The challenge is how to balance the workload between multi-channel realtime playout and multi-seat collaborative production. In a typical Omneon Spectrum media server between 2 and 6 MediaDirector host processors would be used for Ethernet traffic. Because a MediaDirector uses dual host processor architecture, tasks may be allocated on a per-host basis. In a single MediaDirector, both processors can be dedicated to Ethernet traffic, or both to realtime delivery, or one to each. Because bandwidth is allocated by the file system processor, which sits between the host processor and the drive sub-system, resources are delegated accordingly. As realtime playout channels are added, Ethernet performance may fall off. In terms of priority, the MediaDirector will never starve its realtime side in favor of its Ethernet side.

With this architecture in mind, the user must properly balance isochronous versus asynchronous performance, and should not exceed those limits. When a facility's media server is initially designed and channel assignments are forecast, attention should be given to maximum realtime and collaborative loads and, wisely, attention should also be given to headroom.

Edit While Ingesting

The Network System Manager platform is used to launch Omneon MediaTool utilities that support ingesting, controlling and playing material saved directly to the server. Although operated independently of an edit-in-place scenario, these server tools may be used to augment the tasks associated with collaborative editing. Automation systems may also be used to control ingest and playout with the server.

Omneon Players & RecordTool

Players may be used to define ingest devices for the server. The recorders are set up to match the incoming audio/video format and to define the storage file/folder destination for the material. Ingest sessions may be scheduled on an automatic basis or manually controlled one-time events. As footage is being ingested, the Omneon RecordTool utility provides an option to segment the material into multiple, back-to-back clips. In an edit environment, this allows an editor to “see” the clips immediately after generation, thus allowing the edit operation to work with the clips while additional footage continues to be ingested to the server.

Solution Components: Apple Final Cut Pro Edit Station

Apple's nonlinear editing application, Final Cut Pro, allows editors to work with a fully-featured craft editing solution that includes color correction, clip manipulation, realtime transitions, compositing, import/export functionality, and project management. Since its introduction, Final Cut Pro (FCP) has increased its market share dramatically, based on its feature-rich toolset, editor-centric design philosophy, and highly-affordable price.

Using Apple File Protocol (AFP), the Omneon system mounts as a drive, or share, on a Final Cut Pro workstation via an Ethernet connection. While editing, the media files may be resident on the server or on local drives. The FCP application tracks the file usage as editing is performed. When editing is completed, the editor saves the timeline contents as a file. A file may be exported from Final Cut Pro to the server either as a self-contained movie or as a reference movie. Either approach creates a QuickTime file in the “.mov” file format.

When a file is exported as a self-contained movie, Final Cut Pro creates a self-sufficient clip using the render tools of the application.

With a reference movie, FCP generates a file that points to the various sequence assets, much like an EDL (Edit Decision List). Elements that require rendering, such as transitions or more than two audio tracks, will be rendered for use by the reference movie file. This method is faster than the self-contained movie process and files may be exported for play-to-air very quickly.

Dropped Frames

Final Cut Pro edit software determines the playback reliability of footage placed on an editing sequence timeline. A timeline playback condition, known as “dropped frames”, may occur when the application is unable to play all the frames in the timeline in realtime at the edit workstation. This condition may occur as a result of the Ethernet delivery path, or it may be due to the edit timeline conditions, or it may be due to network congestion. It is important to point out that dropped frames may occur even when only one workstation is active.

Macintosh computer speeds have a direct impact on timeline and edit-in-place dropped frame performance. Faster computers are better able to read video data without dropping frames. While Omneon does not set edit-in-place performance specifications for Macintosh workstations running Final Cut Pro, dual-CPU machines drop fewer frames during viewing than single-CPU models. Using G5 dual-CPU 2 GHz (or better) mini-towers with 1GB of memory (or more) is recommended.

A Final Cut Pro User Preference setting addresses dropped frame events. An editor may either choose to set the edit application to “flag” the dropped frame event and stop the timeline or choose to ignore the dropped frame event and continue playing the timeline. Even if dropped frames occur when the edit system plays assets from the server, the dropped frames will not impact final playout to air, because the media server ingest path, as well as the media server playout path, guarantees that all of the frames are present for the exported file.

When and if rendering is performed, one frame is rendered at a time — faster or slower than realtime depending upon the timeline complexity and the system’s overall performance. Each frame in the render file gets created — if the network delays a source frame, the rendering process waits for it. No frames will be dropped.

When an edit-in-place workflow is followed, the final product for playout is a file on the server, either a reference movie file or a

self-contained movie file. The playout occurs using the server’s guaranteed realtime pathway, and thus “dropped frames” are not an issue. What may occur on the workstation timeline is not what will occur on air.

Bandwidth Capabilities and Edit Workgroup Sizes

The bandwidth of a video format is the primary factor in determining the number of edit workstations that may be networked for a collaborative production environment. An additional factor is the type of editing that will be performed on a normal basis — cuts-only, limited dissolves, layering, effects, et cetera. The number of video streams requested over the network at any given time will impact the frequency of dropped frame events on the workstations.

DV or DVCPR025

For DV or DVCPR025 format editing, workgroup configurations of up to four Macintosh workstations, per MediaDirector host processor, may be supported when normal timeline content is a mix of cuts and dissolves. Gigabit Ethernet connections for all platforms on the network are advised.

Each video stream of DV or DVCPR025 requires approximately 28Mbps of bandwidth. Given an approximate limit of 240 Mbps for Ethernet connectivity per MediaDirector host processor, a Final Cut Pro/Omneon edit-in-place environment can support up to eight video streams at any given time. In testing, the frequency of dropped frame events was similar for cuts only and limited dissolve content when actively editing with four workstations on a single host processor. With four edit systems playing back continuous dissolves content, the dropped-frame frequency did increase somewhat.

DVCPR050

For DVCPR050 format editing, workgroup configurations of up to three Macintosh workstations, per MediaDirector host processor, may be supported when timeline content is primarily cuts-only interspersed with a very low number of dissolves. If the dissolve frequency on the edit timelines were to increase, the number of workstations in the workgroup should be reduced to two.

Each video stream of DVCPR050 uses approximately 56Mbps of bandwidth. Weighed against the single host processor approximate limit of 240Mbps, a bandwidth boundary does exist within the range of 4 to 5 video streams of DVCPR050.

Collaborative Production Workflows

Following are four examples of collaborative production workflows within a joint Omneon/Final Cut Pro editing environment. Illustrated in each workflow is a basic Omneon system consisting of one 2101 MediaDirector, one MediaStore, and two MediaPorts – one for ingest and one for playout. A single Final Cut Pro workstation is shown in each case. Peripheral equipment is not shown, such as Ethernet switches and monitors. Each workflow also assumes an automation system capable of controlling ingest and/or playout via RS-422 or Ethernet.

Workflow 1: Server Ingest > Edit-In-Place > Export Self-contained Movie > Playout

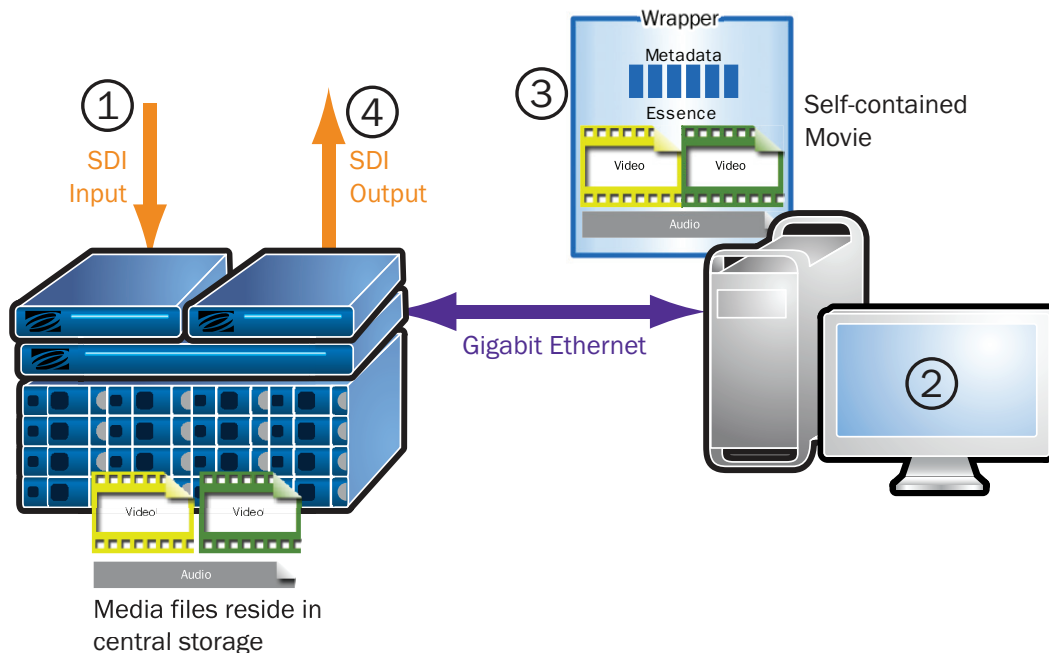


Figure 3: This workflow may typically be used for ingesting material from a satellite, network, or syndicated feed, where ingest is scheduled, fully automated and often unattended.

The workflow consists of the following four steps:

1. Server Ingest – Material is ingested via an Omneon MediaPort, either manually or under automation control. When the ingest process is completed, the files reside on the MediaStore.
2. Edit-in-place (EIP) – Using the Final Cut Pro workstation, an editor assembles the desired program or sequence. The Omneon server is mounted on the Final Cut Pro workstation as a drive or share, and all ingested files are accessible.
3. Export self-contained movie – A self-contained movie file is exported to the Omneon server.
4. Playout – Either manually or via automation control, the finished clip file is played to air from an Omneon MediaPort.

The advantage of this workflow is that the finished self-contained clip is one unified file, without pointers. Any subsequent transfers or archive procedures are guaranteed, and the reference clips can be deleted without affecting the “master.”

The disadvantage of this workflow is that the export process, even with today’s dual processor Macintoshes, roughly takes the time equivalent to the play length of the edited sequence. The entire timeline must be duplicated and written out to storage, creating a new media file.

Workflow 2: Server Ingest > Edit-In-Place > Export Reference Movie > Playout

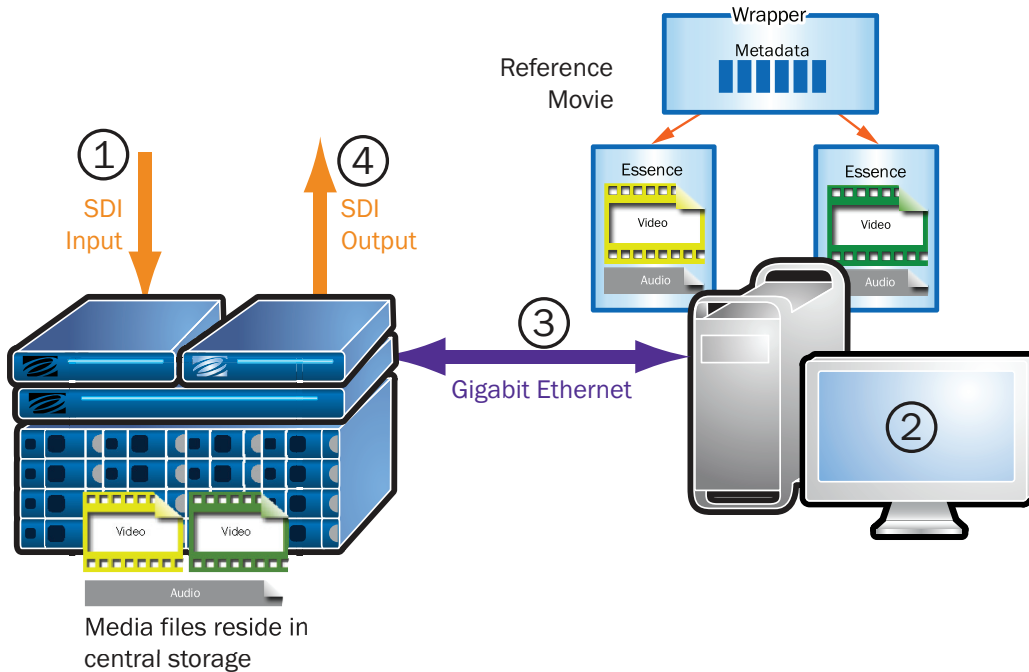


Figure 4: This workflow is also based on central ingest, storage and playout. Unlike figure 3, this example shows the use of a reference movie instead of a self-contained movie.

1. Server Ingest – Material is ingested via an Omneon MediaPort, either manually or automatically.
2. Edit-in-place (EIP) – Using the Final Cut Pro workstation, an editor assembles the desired program or sequence. All media is “referenced.”
3. Export reference movie – A reference movie file is saved to the Omneon server. This file contains “pointers” to the various clips, but no video media.
4. Playout – Either manually or via automation control, the finished clip is played to air from the Omneon MediaPort.

The advantages and disadvantages between this workflow and workflow 1 come down to a trade off between speed and security. The primary advantage is that the reference movie file is quickly exported. Once editing is completed, execute the export command and the file is almost immediately available on the server – much faster than realtime. The disadvantage is that the file is not self-contained. If any original media is moved or deleted, the reference movie file will not play.

A facility that adopts this style of workflow should implement a “conform” procedure. As time permits, each reference movie should be re-exported as a self-contained movie, for ease of backup, archiving, and re-broadcast.

Workflow 3: Local Store > Edit > Export Self-contained Movie > Playout

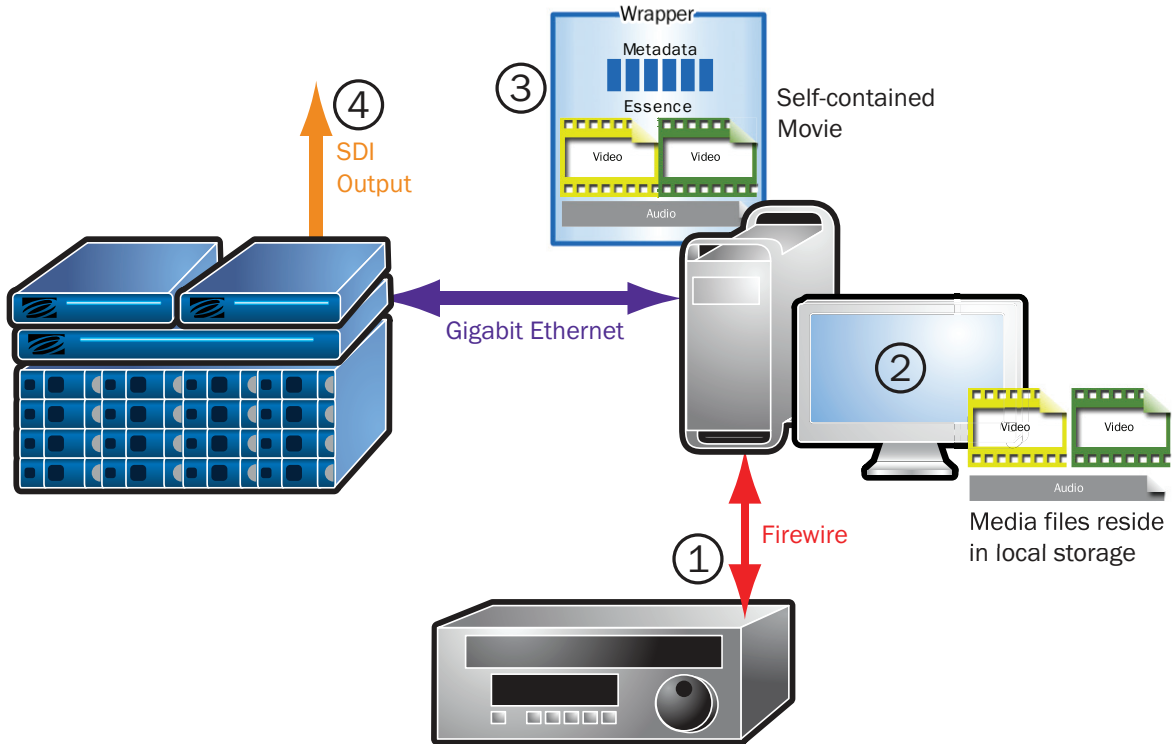


Figure 5: This workflow is a throwback to a standalone nonlinear editing workstation. Here, media files are captured to the local drives and a self-contained movie is exported to the server for storage and playout.

1. Local Store – Using Final Cut Pro’s “log and capture” tool, material is ingested to the local workstation drives.
2. Edit – Using the Final Cut Pro workstation, the editor assembles the desired program.
3. Export self-contained movie – A self-contained movie is saved on the Omneon server. Note that a self-contained export is in fact required with this workflow. If a reference movie is exported, the server has no way of locating the referenced clips that are on the local drives.
4. Playout – Either manually or via automation control, the finished clip is played to air from the Omneon MediaPort.

This workflow can be a facility’s safety valve, but it is also valid if the editor has material that does not need to be stored centrally or which cannot be stored centrally for security reasons. The Omneon/Final Cut Pro environment provides the flexibility to select where media will reside.

Workflow 4: Local Store > Edit > Playback > Archive to Server

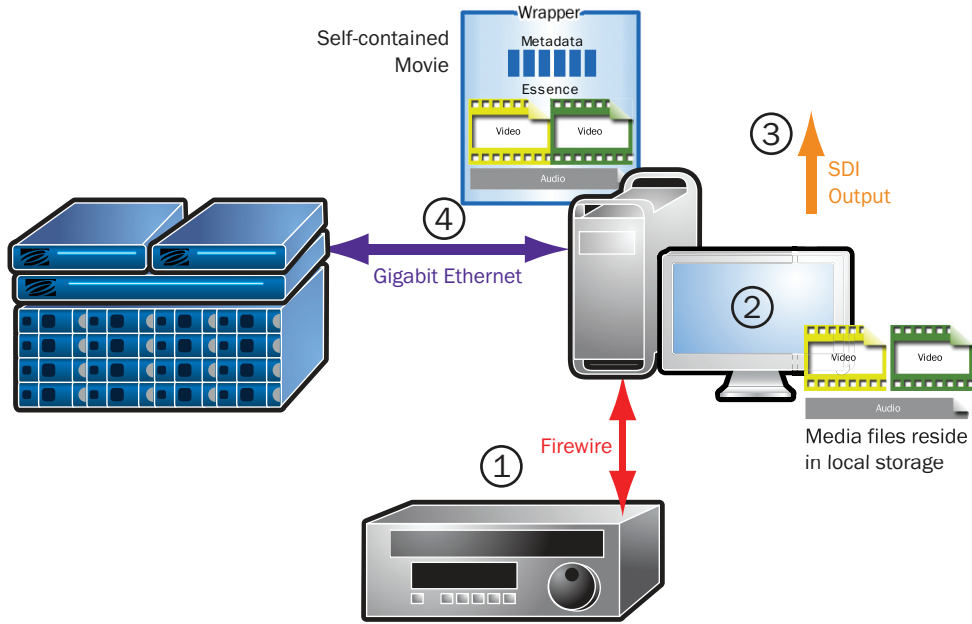


Figure 6: This scenario parallels the first steps of the workflow three, up to when editing is completed. Here, because the clip must go to air immediately, the timeline is played out live from the Final Cut Pro workstation – no waiting and no exporting. A realtime video card such as the Matrox® RTMac™ or AJA Kona is used for the live playback. Once the clip has aired, the completed file can be exported to the server for archiving or re-airing.

1. Local Store – Using Final Cut Pro’s “log and capture” tool, material is ingested and stored locally on the workstation.
2. Edit – Using the Final Cut Pro workstation, the editor assembles the program.
3. Live Playback – Using realtime hardware on the workstation, the clip is played direct to air. Note that the realtime playback may require A-D (Analog to Digital) conversion.
4. Archive to server – Following the play-to-air event, a self-contained movie is exported to the Omneon server, or the sequence can be played using the realtime hardware output and is manually ingested via a MediaPort to the server.

When planning a facility, the above workflow should be taken into consideration as edit-in-place may not be viable in an emergency situation. A variation of this workflow would be to perform a playout using the realtime hardware and begin ingesting to the server through a MediaPort. Once ingest has started, immediately begin playing out the file from the server, as the Omneon can playout while recording. This represents a fast way to get a long-form program into the server, and yet have it available for immediate playout.

Configuration Guidelines for Edit-In-Place with Final Cut Pro

Please note the following conditions when installing an FCP/Omneon EIP environment:

- Macintosh computers must be networked with an Omneon 2101 MediaDirector using Gigabit Ethernet (1000 Mbps). The best networking performance will be achieved utilizing a Gigabit Ethernet (GigE) switch, such as the Netgear GS508T.
- Connect only one Host Processor of the 2101 MediaDirector to a Gigabit Ethernet port on the switch that connects to the Macintosh workstations.
- The Omneon media server is pre-configured to have Final Cut Pro movies saved to the FCP directory as .mov files. This insures proper playback of video and audio clips. Final Cut Pro files saved in this directory (or any subdirectories under this directory) will be saved as large stripe and therefore will playback in realtime. Please see the *Omneon User's Guide* for more details on largestripe, smallstripe and nostripe files.

Limitations

- FCP files saved into directories not pre-configured to accept them will not be playable, because they will not be recorded in the proper format. They may load into Players and the first frame may appear on a MediaPort output, but the video will not play properly. See the Omneon media server user guide for a full explanation of large stripe, small stripe and no stripe files. Or refer to the Configuration Guidelines immediately above.
- FCP movies saved into the wrong directories (and thus saved in the wrong file format) cannot be made playable by moving them into the proper directory. The file type is determined at the time the file is saved to the server.
- FCP movies that are saved without the ".mov" extension will not be playable, and will not be visible to the Omneon player mechanism. Adding the .mov extension after the fact will make the file visible, but not playable because it will have been recorded in the wrong file format.
- Dropped frames may occur during a timeline playback within the FCP application. Dropped frames on playback do not indicate problems with the source file, as you may subsequently play through the dropped frame area to verify that all of the frames do exist. Dropped frames are only an issue when playing back a timeline at the workstation. An

exported FCP movie, either self-contained or reference, will not contain any dropped frames when all of the footage assets are resident on the Omneon server.

- You will be unable to delete files from the Omneon server using a Macintosh Finder if the file is in use by another process. Files currently loaded into FCP or into a QuickTime Player, for example, cannot be deleted.
- Additionally, if you have the Macintosh Finder set for column view and have the preview column enabled (with a Finder window selected, View > Show View Options... > Show preview column), you will not be able to delete a movie file. When you select a file, it appears in an embedded QuickTime player in the preview column. To delete movies, either select more than one for deletion, or turn off the preview column feature.

Omneon does NOT support the following procedures or conditions –

- FCP cannot be used to directly capture footage over Ethernet from a source device to a mounted Omneon server.
- The FCP timeline cannot be played directly to air, when assets are resident on the server.
- The Omneon server in a Final Cut Pro configuration does not support DVCPRO HD format material.
- A single host processor in an Omneon 2101 MediaDirector should not be relied upon to serve the simultaneous purposes of edit-in-place and play-to-air. The Final Cut Pro edit-in-place workgroup should be segregated from play-to-air operations on a separate MediaDirector host processor.

Supported Configurations

Omneon release 4.2 SR2 (and later) supports the following —

- Final Cut Pro version 3.0.2 (or later), running on OS X version 10.2.3 (or later) with QuickTime version 6.1 (or later).
- EIP configurations with up to four FCP workstations per Omneon MediaDirector host processor performing DV or DVCPRO25 format editing of timeline content composed of cuts and/or dissolves, with 2 audio tracks. Or, EIP configurations with up to three FCP workstations per Omneon MediaDirector host processor performing DVCPRO50 format editing of timeline content composed of cuts and very limited dissolves, with 2 audio tracks. These EIP configurations are only supported when utilizing a dedicated FCP/Omneon MediaDirector host processor port connected via Gigabit Ethernet.

Omneon recognizes that within the above noted EIP configurations, FCP dropped frame events may occur. Your perception of acceptable rates of dropped frames during editing will determine your total FCP workstation count.

- Exporting self-contained movies from FCP to the server as a QuickTime ".mov" file.
- Exporting reference movies from FCP to the server as a QuickTime ".mov" file.

Advantages

- **Open-standards based solution** — Because the Omneon system is an integrated package, combining both isochronous and asynchronous performance, its open-standards approach allows third-party QuickTime applications to work together seamlessly. From Final Cut Pro's standpoint, the Omneon server is a plug-and-play QuickTime solution that appears as a mounted drive.
- **Easy training curve** — Final Cut Pro has a large user base. The application is well documented, and the learning curve

for a multi-seat news operation is not steep, thus reducing a facility's training requirements.

- **Eliminates media replication** — Because the Omneon media server provides "shared storage" of assets for editing and playout, copies are eliminated, and media can remain in a single format. Because the play-to-air server is also the production server, the requirement for backups and spares is reduced. A facility does not need to buy different spare drives and cables for different servers.
- **Workflow flexibility** — The Omneon/Final Cut Pro combination provides facilities with an easy and flexible entry into collaborative production. With a variety of edit-in-place workflows available, including emergency "direct-to-air", a facility can design their system around its needs and particular style of production.
- **Economics** — Final Cut Pro software running on Macintosh workstations provides a low per-seat cost, and is a powerful, flexible solution when compared to proprietary news editing devices. Additionally, because the playout and editing servers are one, the facility is not being sold storage twice — once for the playout server and once for the editing server.

Conclusion

Edit-in-place has long been a "Holy Grail" of news production. Advances in network bandwidth, drive performance and video compression, along with media server support of the open-source QuickTime file format, make this possible in a multi-vendor, non-proprietary system that is practical for deployment in a newsroom environment.

Omneon offers integrated network attached storage capability within a broadcast media server, providing realtime I/O plus sufficient Ethernet bandwidth for true edit-in-place functionality. Final Cut Pro offers a high quality yet economical craft editor, with one of the highest quality codecs in the industry. The Omneon/Final Cut Pro combination is ready to work with DV, DVCPRO25, and DVCPRO50 media, and is ideal for broadcast news workflows.



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