



EDIUS Integration with K2 Systems

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With EDIUS Elite from Grass Valley, a Belden Brand, EDIUS users can directly edit files stored on a Grass Valley K2 Summit standalone media server or SAN, without the need for file conversion.

When used with K2 storage area networks, EDIUS multiformat nonlinear editing systems permit editors to access material with the same level of performance as if everything was stored locally, and multiple EDIUS users can access files even while they are being recorded.

Introduction

An important part of media production is the editing of content into new and creative forms. In many productions, there are a number of editors involved in the process, and there is a strong need for them to work collaboratively and expeditiously.

The native file system of Grass Valley K2 systems uses a container file format (CMF) to encapsulate elementary streams of video, audio, timecode and ancillary data to provide direct access for operations like editing. Formerly, extra components, processes and conversions were necessary for EDIUS to get direct access to the K2 file system. Files could be transferred via FTP, and that is still possible.

Now, with EDIUS Elite, there is no longer any need for file conversion, thus permitting EDIUS users to access K2's internal files directly to facilitate editing in place.

EDIUS Elite is a systems version of the EDIUS Pro application. The current version requires K2 system software v9.1+. If also used with GV STRATUS® nonlinear product tools, this requires software v3.0 for

GV STRATUS.

Fortunately, the need for more collaborative editing is being matched by the ongoing increase in performance of shared storage systems along with a corresponding decrease in costs. Consequently, more users of facilities of all sizes require reliable, high-performance solutions for shared editing.

The combination of Grass Valley K2 media server/storage with Grass Valley EDIUS editing systems is emerging as a powerful solution that can outperform other product offerings for applications such as studio or news production.

This application note provides a brief description of the K2 media server platform — focusing on the K2 SAN followed by a description of EDIUS. After the descriptions, there is detail on how a K2 SAN and EDIUS can be integrated together, along with information on how various production workflows can be realized.

The K2 Production SAN

SAN technology, along with virtually every other aspect of IT technology, has evolved dramatically in just the past few years. File systems, drives, servers, networking and connectivity have all improved in performance and capabilities.

Grass Valley has extensive experience with SAN technology and can provide a single unified infrastructure to do ingest, playout, replay, editing and file transfers.

K2 SAN components are few in number and small in size. With so few pieces needed, the investment in a SAN can be very reasonable. A K2 SAN incorporates components and connectivity that is similar to other IT-based systems. Total cost of ownership is efficient as well. K2 SANs have a number of tools for setting up, upgrading and maintaining a system.

The K2 platform leverages the core of the general IT industry, and then optimizes and enhances technologies specifically for the real-time, high-availability requirements of television broadcast and video production. K2 uses standard file systems, storage and networking. Grass Valley adds value by optimizing and tuning IT technologies for media applications in ways IT vendors can't or won't. The implementation of the latest technologies produces more cost-effective solutions.

The K2 SAN incorporates a variety of the latest technologies. These include 8 Gb Fibre Channel backbone with 15/7.2K SAS drives in a RAID-5 or RAID-6 topology. As storage components alone will not

provide a satisfactory solution, these parts are integrated with a complete infrastructure. The K2 server acts as a data bridge and to manage dynamic and deterministic bandwidth requirements. For optimum throughput, a 64-bit operating system and file system are included. K2 provides scalability and cost-effectiveness by adapting the iSCSI protocol over 10 Gb/1 Gb Ethernet to provide real-time and deterministic performance for media movement.

Technologies and infrastructure are combined within the K2 platform to manage bandwidth. Bandwidth is the primary factor in determining how reliably a system will perform and what capabilities it can provide. K2 is engineered to manage the multiple levels of bandwidth that may be needed for deterministic operations. This is provided by a shared file system that includes quality of service mechanisms.

Three levels of managed bandwidth are provided.

- The first level with the highest priority is for real-time media where clients are constructed to never exceed stated bandwidths. This real-time performance is a service level not needed by most regular IT systems
- The second, intermediate, level consists of reserved bandwidth level for time critical production activities such as editing where each individual client gets allocated bandwidth it cannot exceed
- The third level is managed, shared bandwidth for non real-time operations such as file transfers

The K2 Production SAN (Cont.)

All three levels are available simultaneously. On many systems there is only one level of bandwidth management and it cannot be relied on to perform all tasks reliably and consistently. The K2 SAN has built in redundancy, buffering and multiple levels of processors for guaranteed throughput. Grass Valley characterizes the storage performance for various production uses, and measures bandwidth performance by individual disk groups, servers and controllers.

Another important aspect of the K2 SAN is file management. Unlike files found in most regular IT server systems, media server files are large...very large. The system including storage controllers and file system must be specially tuned for such files.

In a standard IT server system, there are a large number of small, simple files with rapid reads/writes to and from storage. It is not necessary to read during the write process — delays and latencies can be tolerated.

In media, delays and latencies are not acceptable as they translate to black frames and audio dropouts. In media, working with large files means storage has many simultaneous reads during the write process. For proper media file management, the K2 SAN provides specialized buffering and prefetching, enhanced on-the-fly error correction, packaging of multitrack essence inside media file containers, and optimization of the application layer to read/write efficiently and deterministically.

The technology of a K2 SAN offers some very useful user features for media production. Movement and modification of content with storage, removable media and editors can be done in parallel rather than sequentially to make productions more efficient. Files are stored on disk as elementary streams for editing and metadata operations. There is separate and managed system bandwidth for media handling and edit client operations as well as simultaneous file transactions. Metadata can be created, saved and exchanged with other systems for easy content management. Open standards-based file and metadata structures enable useful re-purposing of content.

A superb use for the K2 SAN is for shared editing in place. EDIUS editors can access material with the same level of performance as if everything was stored locally. New content can be added to a bin for editing when needed. Multiple EDIUS users can access files even while they are being recorded. Metadata can be preserved and searched on through the production process. Content can be browsed from EDIUS and if the compression type of the essence is the same, no transcoding is necessary. The K2 SAN allocates bandwidth for each EDIUS system. No one edit user can use more than their share of bandwidth, and so bandwidth for recording and playing video is always guaranteed by the K2 SAN.

The EDIUS Multiformat Nonlinear Editing Application

EDIUS is optimized for file-based production and offers diverse features such as real-time, multitrack, mixed-format editing, plus compositing, chromakeying, titling and timeline output capabilities.

As users increasingly need to re-use and re-purpose content, metadata management is vital to production processes. EDIUS includes tools to make metadata integration easy and efficient. In EDIUS, clip metadata is displayed in bin windows. Clips can be searched for by using metadata tag information. EDIUS includes a Source Browser, which automatically displays file-based assets and also shows the file metadata.

EDIUS also supports a wide range of file-based media formats. In fact, EDIUS boasts exceptional mixed-format editing. One of the aspects that sets EDIUS apart from other editing applications is unrivaled real-time video transcoding technology. EDIUS converts between HD and SD resolutions, aspect ratios and frame rates — all in real time. While editing in HD, users can place 4:3 SD video, or mix NTSC and PAL sources, or combine them all into projects in other resolutions and frame rates without wasting a single moment on conversion or rendering. EDIUS supports resolutions as high as 4K/2K to as low

as 24x24. EDIUS supports frame rates such as 60p/50p, 60i/50i and 24p. This flexibility extends to support for proxy mode where proxy and high-resolution clips can be combined on the timeline.

Of course EDIUS supports all the common formats such as DV, MPEG-2, DNxHD and AVC-Intra, but also includes P2, Ikegami GF, and Canon XF and EOS movie formats. Format support does not stop even there. AVCHD and ProRes can be imported and there is export in H.264/AVCHD (MP4) format to a media card. There is timeline export direct to Blu-ray Disc and DVD, as well as iPod and PSP exporters.

A key element of EDIUS is its fast, flexible user interface, which includes unlimited video, audio, title and graphics tracks. There are also other outstanding features such as GPU-accelerated 3D transitions, along with real-time effects, keyers, transitions and titles. Another feature that separates EDIUS from other offerings is its multicamera editing. EDIUS can edit up to 16 different sources simultaneously. Source and selected camera can both be displayed in full-screen mode. Aside from the sheer number of sources, the interface tools make it extremely quick to cut a show from the matched sources.

Putting the Pieces Together

What ties K2 and EDIUS together is software and networking optimized specifically for the requirements of high-bandwidth, shared media editing. EDIUS Elite is a special version of EDIUS that supports specific integration with K2. Functions previously provided with K2 EDIUS Connect are now included in the EDIUS Elite package, enabling EDIUS editing clients to have direct access to the K2 server's file system and storage.

With EDIUS Elite, there is no need for file conversions, thus permitting EDIUS users to access K2's internal files directly to facilitate editing in place. The native file system of K2 supports the elementary streams of video, audio, timecode and ancillary data to provide direct access for operations like editing. There are no third-party components and no hardware gateways needed as in some other systems. There are also no file transfers having to occur as all the content is available on the same shared storage.

This connectivity provides improved efficiency in a network editing environment.

Because users can directly access K2 clips from the EDIUS client, there is a substantial saving of time. To the editor, performance is just as good as if they were editing from local storage in a standalone environment. Much of the time taken up in the editing process is simply locating the desired material for a project. K2 clips can be searched directly from EDIUS clients, with associated metadata displayed in EDIUS's Source Browser. There are other time savers as well. EDIUS

is able to edit growing files being ingested by the K2's record channels. K2 clips and K2 programs can be sent directly from the timeline.

EDIUS Elite also supports use of a wide variety of K2 formats and file types. K2 ChannelFlex clips for super slow-motion can also be edited. If a user wants to capture clips via EDIUS, the content will be stored on the shared K2 storage where not only can K2 channels play them, but other EDIUS edit clients can have access as well.

In addition to editing of K2 clips directly within EDIUS, editing can also be performed with K2 program files, which consist of pointers to multiple K2 clips. The K2 program file is similar to reading an EDL file. A K2 program only holds the reference data of the original K2 clip, thus file sizes are small and send time is minimized when an edit sequence is made to be a K2 program.

For editors, material is ingested via the K2 or EDIUS clients, the content is browsed from the EDIUS client, programs are edited in the EDIUS application, and finished pieces are exported as a K2 clip or a K2 program.

During capture, markers and marker text can be added on-the-fly to content. For browsing, the K2 folder tree is integrated in the EDIUS Source Browser. Metadata can be searched on and displayed. K2 program and K2 playlist files can be brought into the timeline as a sequence and edited. The finished timeline can be sent as a K2 program or a K2 clip.

EDIUS Elite – Key Features

- Editing of K2 clips directly within EDIUS. This includes K2 program files, which consist of pointers to multiple K2 clips
- Support for segment encoding
- K2 clips can be searched directly from EDIUS clients, with associated metadata displayed in EDIUS's Source Browser
- Edit growing files being ingested into K2
- Export K2 clips and K2 programs from the timeline
- Supports K2 ChannelFlex clips (super slow-motion, key-fill, 3D)
- Capture clips (MPEG-2, AVC-Intra, DNxHD, DVCPRO, DV) to K2 via EDIUS, and store these clips on K2 storage

EDIUS ELITE – Key Benefits

Improved efficiency in a network editing environment

Users can directly access K2 clips from the EDIUS client, saving time.

Users can perform editing just as they would in a standalone environment, but over a networked connection to shared storage.

Supports reading and export of K2 programs

A K2 program is a format used in the K2, similar to an EDL file. A K2 program only holds the reference data of the original K2 clip, thus file sizes are small and export time is minimized. EDIUS ELITE not only reads the K2 program, but also supports export from EDIUS, allowing for a major reduction in the time it takes to export and transfer files.

The Value of a Combined EDIUS & K2 System

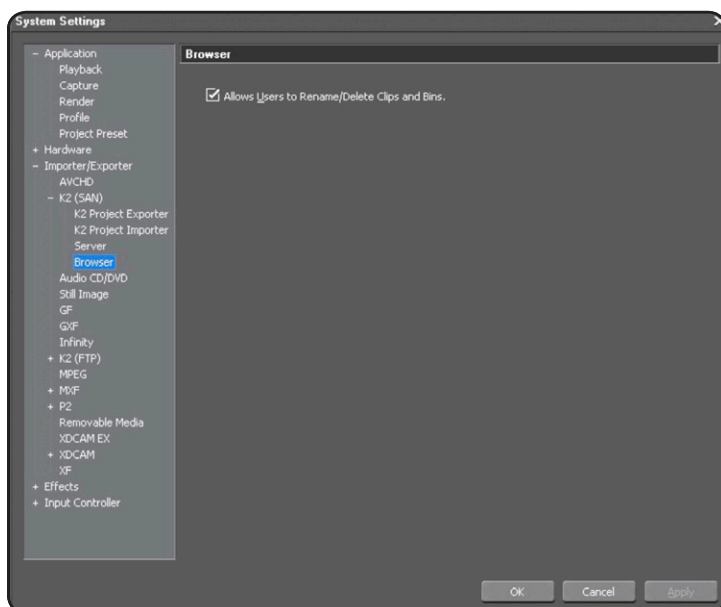
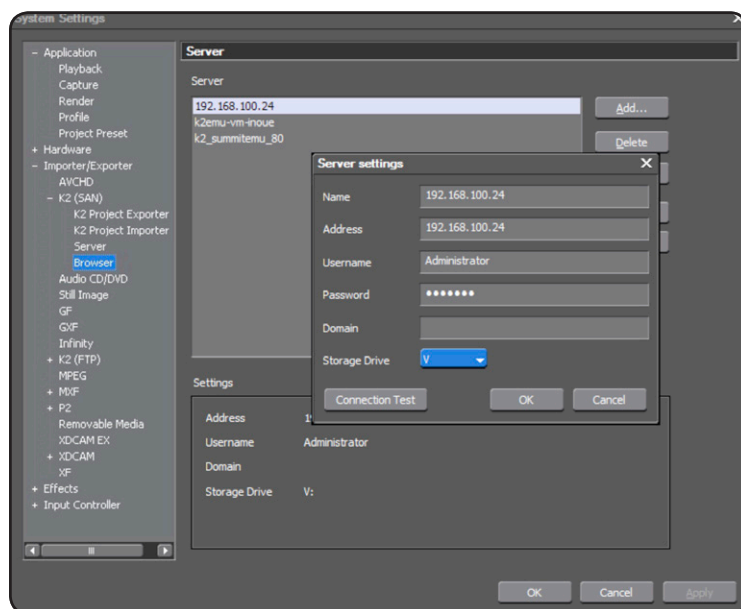
By integrating an advance editing application like EDIUS with a server/storage platform like K2, there are a number of valuable user benefits:

- Because EDIUS is able to get direct access to the K2 file system, there are no conversion and transfers. The speed of the end-to-end editing process is unsurpassed by any other system
- Each EDIUS client gets guaranteed performance from managed bandwidth provided by the K2 system
- Users save time with capabilities such as editing on growing files, and direct conversion of sequences to playlists
- Metadata can be created, searched on and shared to make it easy to find and re-purpose content
- Installing, maintaining and upgrading the production system is simple. The EDIUS clients use just a software license and standard networking to connect to K2 storage

EDIUS Elite Settings

EDIUS System Setting: Server Settings

The server can be either shared storage (K2 SAN) or a standalone K2 Summit client



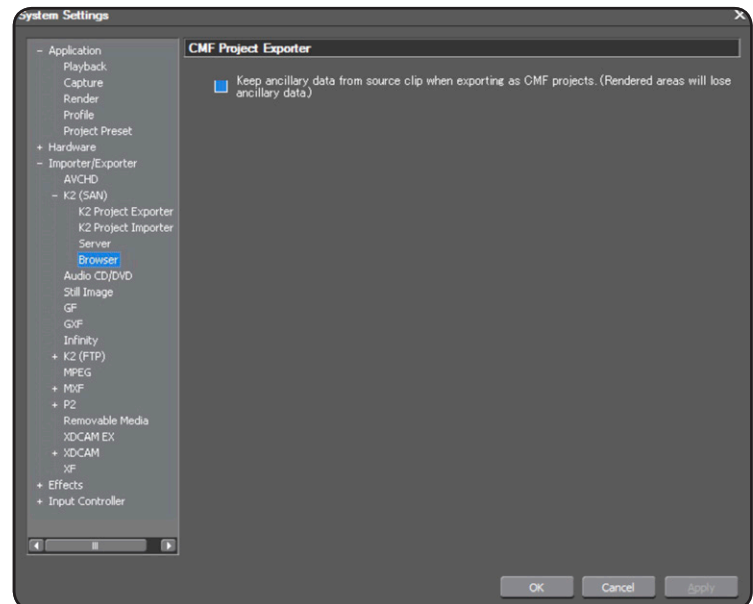
EDIUS System Setting: Browser Settings

The EDIUS System Administrator can permit users to rename or delete K2 clips in the EDIUS Source Browser.

EDIUS Elite Settings (Cont.)

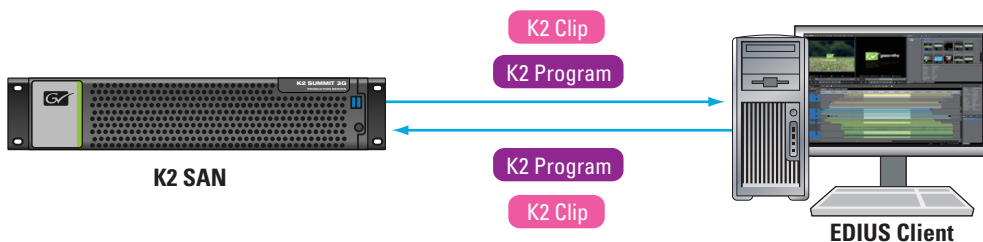
EDIUS System Setting: Project Exporter Settings

When exporting as a K2 program, the ancillary data (closed caption data) can be kept in the original source K2 clip if the project is cuts-only. Areas that are rendered to different resolutions or frame rates will lose ancillary data. When rendered to the same format for titles or effects, filters will not lose ancillary data.



EDIUS Elite Workflow

Users can directly access files (K2 clips, K2 program, K2 playlist) on the K2 storage from EDIUS clients and can search, edit, and export as K2 clips or K2 programs.



- Real-time Native Editing (DVC, MPEG-2, DNxHD, AVC-Intra)
 - No Transcode
 - Segment Encode

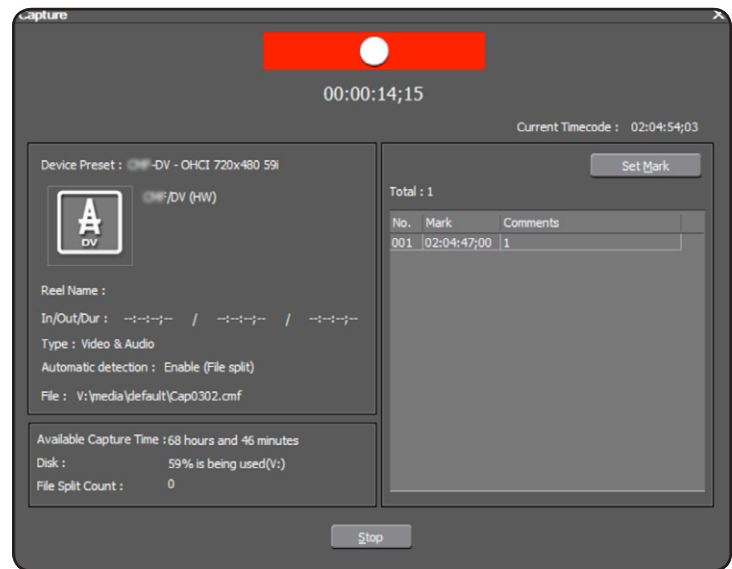
The EDIUS Elite workflow is as follows:

- 1) Ingest via K2 Summit or EDIUS client
- 2) Browse from EDIUS client
- 3) Edit in EDIUS client
- 4) Export as K2 clip or K2 program

EDIUS Elite Workflow (Cont.)

1. Ingest

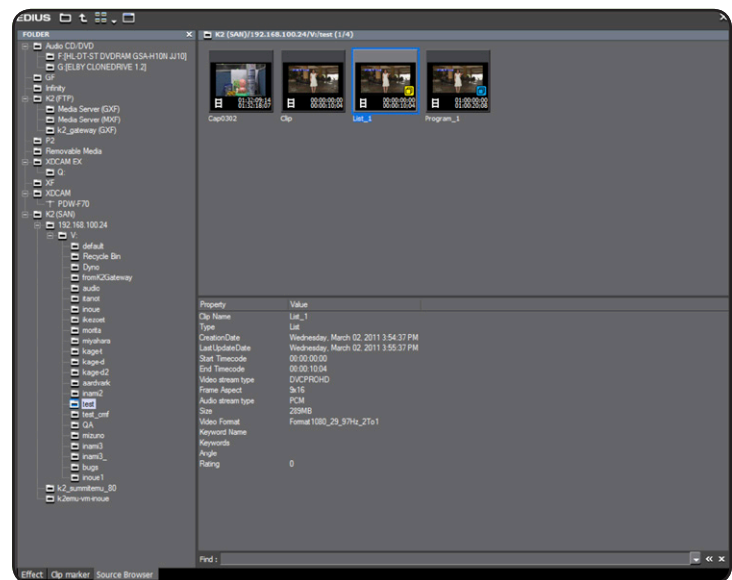
- Ingest to K2 Summit in any of the following formats: AVC-Intra, MPEG-2, DVCPRO and DV.
- On the K2 storage (local or shared storage), clips will be stored as native K2 clips.
- EDIUS clients can also capture in K2 format to K2 shared storage.
 - Capture K2 clip from any input
 - Capture directly to K2 storage
 - DV, DVCPRO, MPEG-2, AVC-Intra supported
 - During capture, markers and marker text can be added on the fly



2. Browse

EDIUS client can browse data on K2 storage:

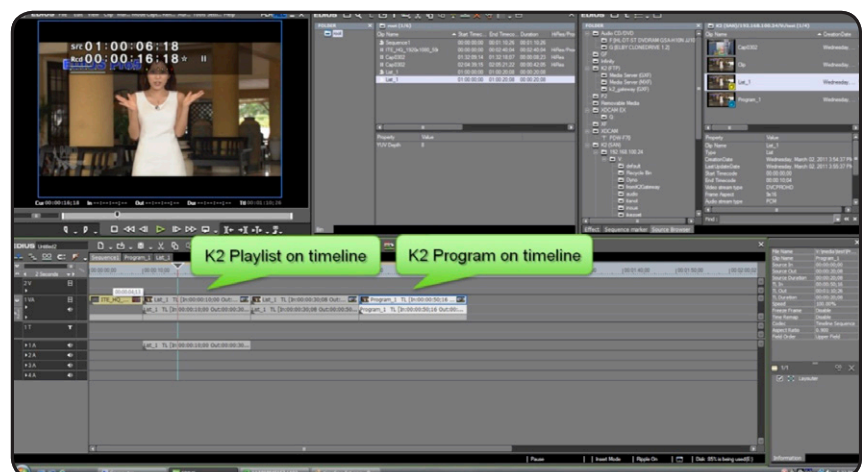
- K2 folder tree integrated in Source Browser
- Direct SAN access to multiple K2 servers
- K2 clip, program and playlist support
- Growing K2 clip files support
- ChannelFlex clip support
- Search and display metadata



3. Editing

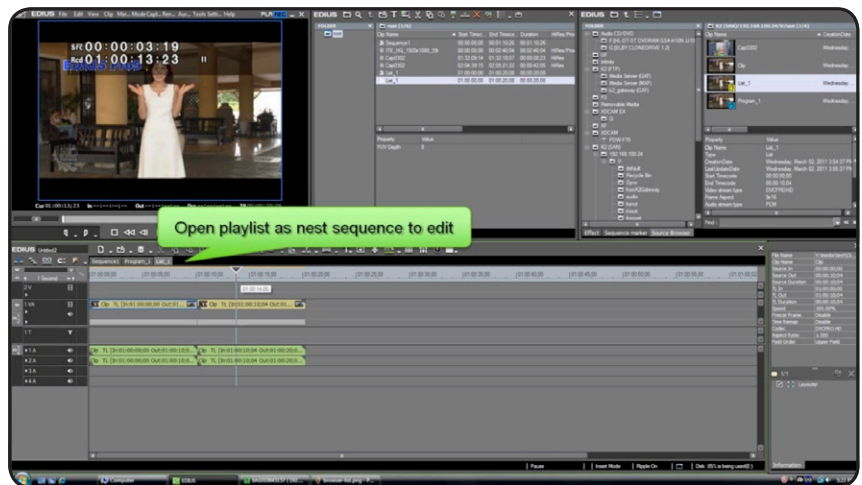
EDIUS clients can edit clips directly on K2 storage.

- Import as sequence (K2 program and K2 playlist)



K2 programs and K2 playlists are imported as sequences into EDIUS.

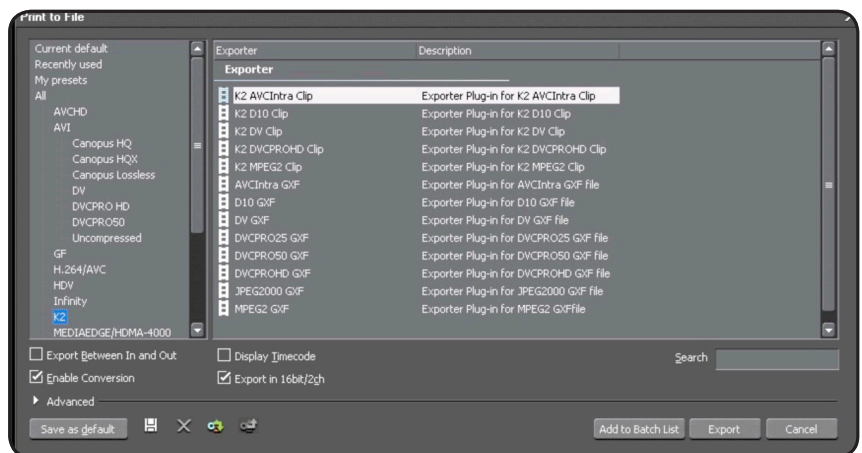
EDIUS Elite Workflow (Cont.)



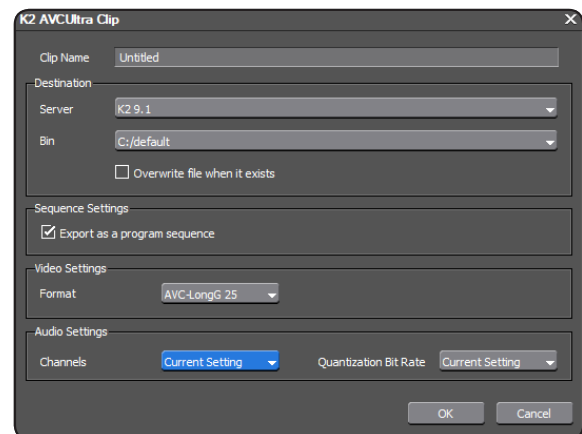
The sequence can be shown as one clip, or if double-clicked on, the sequence can be opened and the K2 clips seen.

4. Export

- Export the timeline as a K2 program
- Export the timeline as one file (K2 clip)



To export as a new K2 clip, go to [Print to File] and select [K2 Clip Exporter]



K2 clip export is accessed from the EDIUS file export list. Selection can be made to export as a program sequence with smart render (segment encoding) or as a fully flattened single clip file. This functionality includes support for batch export of K2 playlist programs.

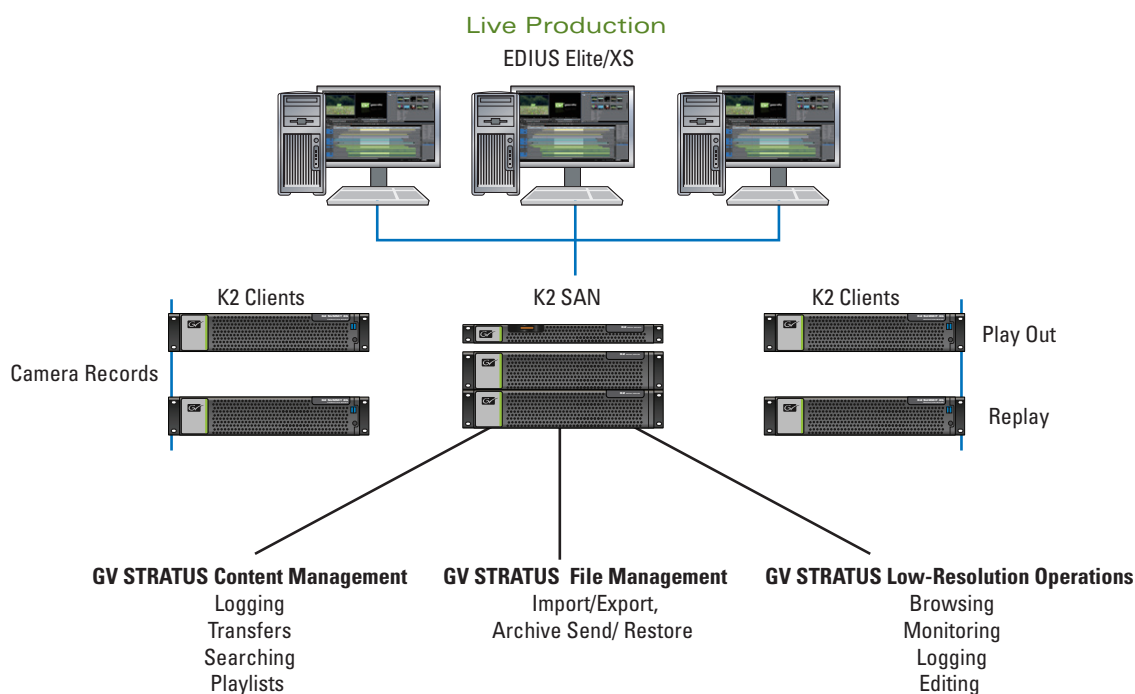
Systems for Live Production

A K2 SAN in a live production environment can provide channel control for recording and playing out, replay, file transfers, content management and editing. EDIUS is a great system component to create edit packages during breaks and at the end of a program. With fast edit in place and editing of growing files, EDIUS can create new content even during a production.

EDIUS can be used to monitor incoming recordings, mark scenes of interest and have a cut-down, shortened version of an event ready within minutes of the end of an event. EDIUS can generate K2 playlists for immediate playout without waiting for conforming or rendering. Of course EDIUS can also perform more complex long-form editing tasks after live productions as well.

A natural editing process with EDIUS in live productions is its superb multicam editing capability. Multiple cameras can be routed into the K2's record channels. All EDIUS clients mounted on the SAN can have access to these recordings — during or after the event. EDIUS can nimbly edit from camera to camera to create a complete edited program. The finished piece can be played from the SAN, or transferred to another system.

EDIUS can also integrate content management with the K2 SAN. Grass Valley's GV STRATUS Media Workflow Application Framework tools can provide production oriented asset management functionality. Metadata can be logged in GV STRATUS clients and used by the EDIUS Source Browser as search and navigation references. Other tools can be used to find external content to be used in an EDIUS project, or to move a finished project to other storage, such as an archive.



Systems for Newsrooms

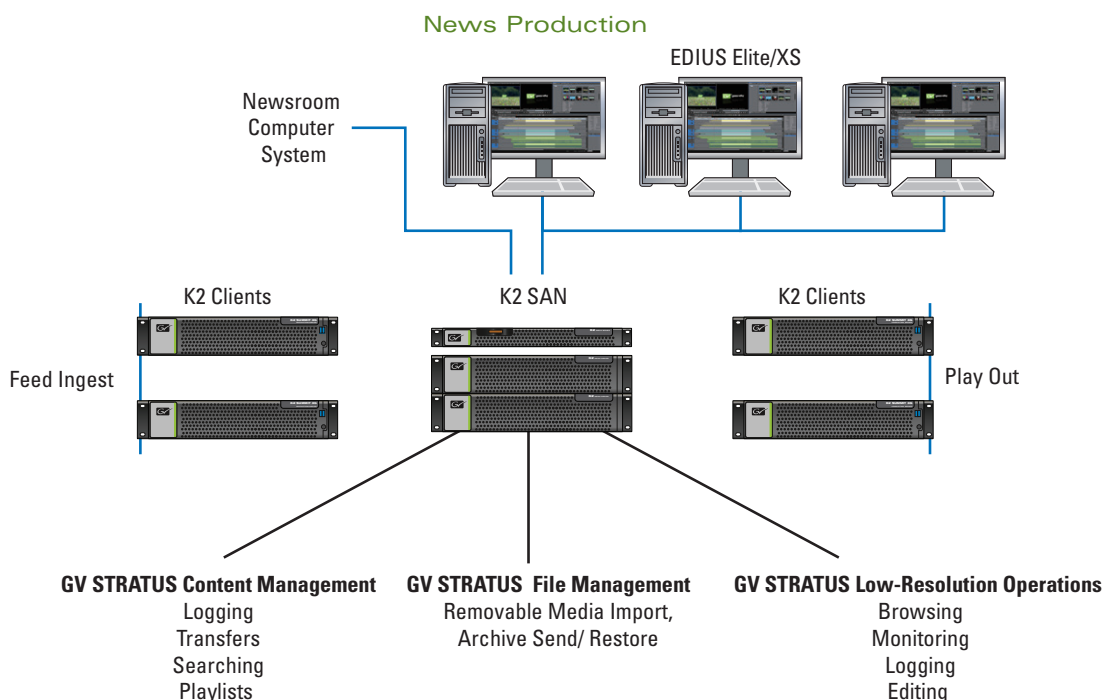
A K2 SAN in a newsroom environment can provide ingest feed control, removable media ingest, file transfer, content management and both high- and low-resolution editing. EDIUS can perform the function of a news editor. EDIUS can provide integration with the Newsroom Computer System. It has a script-viewer that permits viewing the script generated by the NRCS as an aide to editing the new story. EDIUS also supports an Assignment List Plug-in. This allows the editor to match a finished news story to a placeholder for the story created in the NRCS that becomes part of the MOS news rundown.

Because both K2 and EDIUS support proxy-based operations, EDIUS projects can contain both high-resolution content and low-resolution proxy content on the same timeline. This capability can be very useful for news organization needing multisite capability. A news organization may have multiple facilities, or more likely have a newsgathering crew located remotely to cover a particular event. The editor can work on a news story with certain elements being proxy material before the high-resolution content is transferred into the K2 system. EDIUS

can also directly read EDLs created from low-resolution GV STRATUS proxy editors.

In addition, there is a special GV STRATUS license for a version of EDIUS called EDIUS XS. This version works only as a low resolution proxy editor. It includes almost all the features of EDIUS Elite but works with low resolution media. For scalability, GV STRATUS systems can combine any number of ELITE and XS versions of EDIUS. A conform engine capability permits projects finished in EDIUS XS to be compiled and rendered for use on K2 playout channels. GV STRATUS nonlinear production tools can provide news-oriented asset management functionality. Metadata can be imported with various media, and additional metadata can be added. The metadata can be used by the EDIUS Source Browser as search and navigation references.

Other tools can be used to find external content to be used in an EDIUS project, or to move a finished project to other storage such as archive.



EDIUS System Compatibility

EDIUS Elite 7.2

K2 Summit v9.1

GV STRATUS 3.0



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