

APPLICATION NOTE

EDIUS/K2 SAN Integration

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This application note details how to integrate a Grass Valley K2 storage area network with GrassValleyEDIUSmultiformatnonlinearediting systems, so that EDIUS editors can 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. The K2 SAN allocates bandwidth for each EDIUS system so that no one edit user can use more than their share of bandwidth, and so bandwidth for recording and playing video is always guaranteed.

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.

Commensurate with this need is the ongoing increase in performance of shared storage systems with a corresponding decrease in cost. Consequently, more users of facilities of all sizes are looking for 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 starts with a brief description of the K2 media server platform—focusing on the K2 SAN followed by a description of EDIUS. After the descriptions, this application note will detail how a K2 SAN and EDIUS can be integrated together.

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 pre-fetching, enhanced on-the-fly error correction, packaging of multi-track 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, multi-track, 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 for 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, and AVC-Intra, but also includes P2, Ikegami GF, and Canon XF and EOS movie formats. And format support does not stop there. AVCHD 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 multi-camera 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: K2 EDIUS Connect

What ties K2 and EDIUS together is software and networking optimized specifically for the requirements of high-bandwidth, shared media editing. K2 EDIUS Connect is a software option that enables EDIUS editing clients to have direct access to the K2 server's file system and storage.

With the K2 EDIUS Connect option, 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.

K2 EDIUS Connect 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.

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 to 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

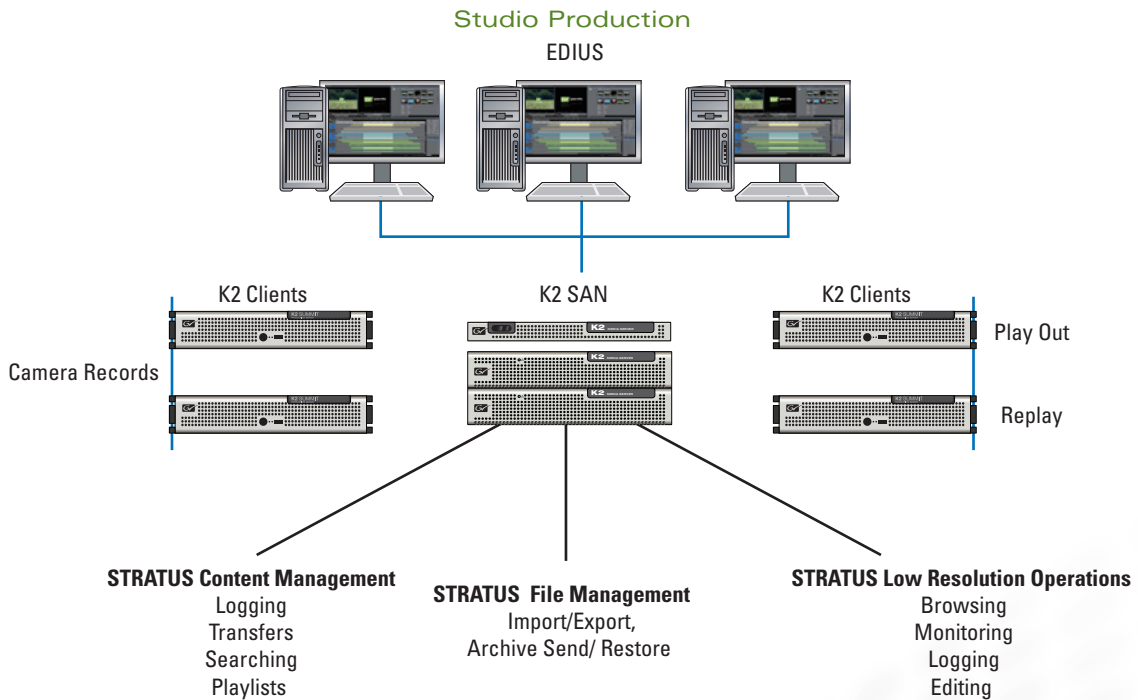
Systems for Studios

A K2 SAN in a studio 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 studios 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 STRATUS™ Media Workflow Application Framework tools can provide production oriented asset management functionality. Metadata can be logged in 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

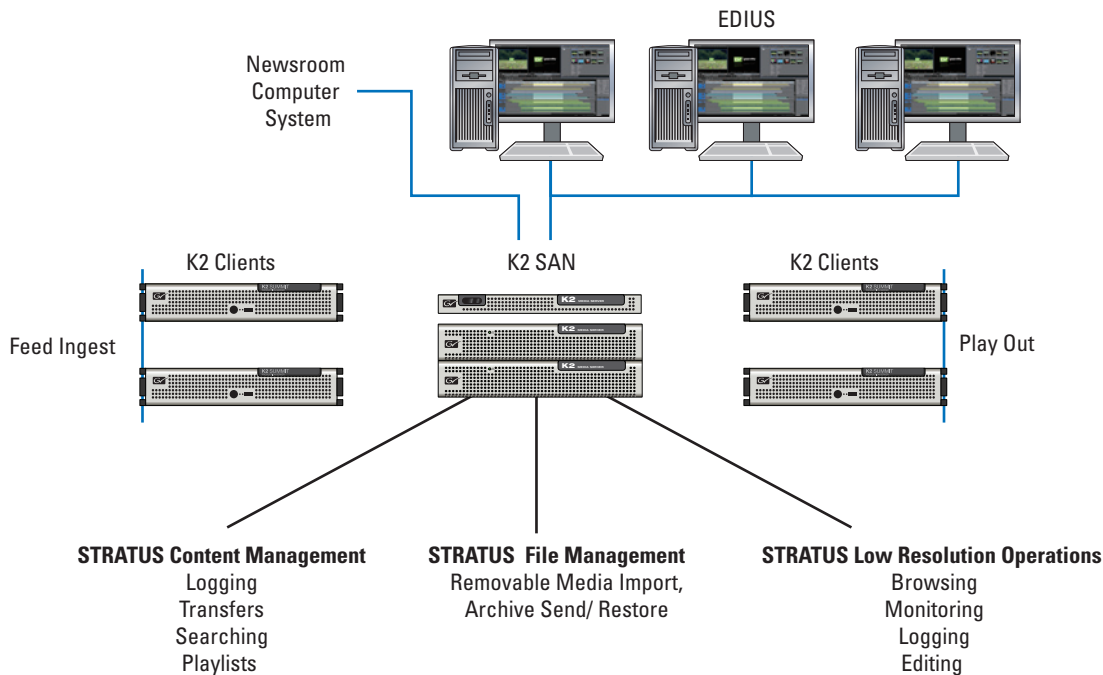
A K2 SAN in a newsroom environment can provide ingest feed control, removable media ingest, file transfer, content management, and both high- and low-resolution editing. EDIUS can perform the function of a news editor. EDIUS can provide integration with the Newsroom Computer System. It has a script-viewer 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 multi-site 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 STRATUS proxy editors.

STRATUS Media Workflow Application Framework 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

Using EDIUS v6.02 or v6.03
 K2 v7.3
 K2 v7.4
 Aurora v7.1

Using EDIUS v6.05
 K2 v8.0
 STRATUS first release

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