

Live Event Playback

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APPLICATION NOTE



The Advantages of Professional Solutions Versus General-Purpose Computers and Software for Live Event Playback in Various Professional Environments

Introduction

In live event environments such as houses of worship and convention centers, there is a growing need to integrate multimedia into live productions. When selecting a solution for live event playback in this context, there is a debate over which is the better approach: commodity consumer desktop clients and software or professional playback equipment.

Commodity-based Playback Approach

In small-to-medium sized facilities, the commodity-based approach is often popular. It consists of standard software presentation packages running on commodity desktop computers, and is capable of outputting animated graphics, slide presentations and clip playback — all from a common user interface.

On an initial review, this choice seems to make sense. The desktop user interface is fairly straightforward, well developed and most anyone with Apple Mac or Microsoft Windows experience can easily operate the systems with little training. This is an advantage when the technical areas are largely staffed by volunteers on an as-needed or rotating basis.

Second, clip playback can be embedded into a playlist containing slides and other types of graphics, and the clips can be played at any time during a graphic element event by clicking on the clip from the bin window.

Third, any video playback can have a graphic superimposed over it. One practical application of this capability may be found in facilities with child care centers. If a child requires parental attention, a child-care worker can quickly type in the name of the child and alert the parent to leave the event so that they can attend to their child.

Fourth, with an Internet-connected host personal computer, the presentation software has access to codecs required for clip formats not supported by on-board codecs.

Finally, for a relatively low cost (approximately \$400+ for software and \$1,750-\$3,500 for a desktop computer host system) small to medium facilities can acquire a single-device presentation solution connected directly to the main projection system.

It would seem simply flawless — but is it? As effective as this consumer-grade solution is, there are significant tradeoffs involved.

Shortcomings Exposed

As many small/medium-size facilities such as churches and school auditoriums quickly discover, the tradeoffs involved in using commodity-based playback systems result in an inferior user experience, which often leads to frustration.

To begin with, should the desktop computer need to be rebooted, or the program restarted during an event, the projector will display the computer restart sequence. Nor is there an ability to switch to an alternate source without using the projector controls, which can often show pop-ups and glitches during source changes. Larger facilities can mitigate this side effect through the acquisition and use of a switching device to connect one or two computers and two to four video sources, all synchronized and cleanly fed to the projection system.

Operationally, while the programs may be easy to use, once user expectations have been refined over time, operational characteristics start getting in the way. For example, on quick-turn events from graphics to video, modes are frequently used which require the operator to click a tiny “clear-all” button to get to “black” so they can roll a clip without the graphics being layered over the video. Testing has shown that this process is only effective 66 percent of the time, leading to inconsistencies and video glitches one out of three times.

Additionally, video clips must be trimmed properly for the playback event, as there are no “mark-in, mark-out” capabilities in the software. This makes it especially challenging when the relatively frequent last-minute off-the-web or outside-party video clip on a USB stick is brought in with instructions to “be sure to start the playback when you see the cut from...and be sure to stop it right after the presenter says...” This kind of on-the-fly playback control is practically impossible to achieve, and often results in an unpredictable user and audience experience. Another option could be to edit the clip before use, but that may not always be possible given that the system may be in use during the entire event and therefore cannot be used for launching editing or conversion software.

The end user experience is further compromised by another undesirable effect—playback stutter. Why? General-purpose computers are simply not built to guarantee high-priority handling of media files, especially video clips. Therefore, when the system is busy — running another background task or currently playing a clip at a very high data rate — the video playback will stutter. This effect can only be remedied by restarting the system.

Fortunately, live event environments have other options available that can deliver a flawless playback experience to their audiences, without breaking the budget.

Trading Up: Purpose-built Playback Solutions

Surprisingly, purpose-built media devices found at the lowest prices are not intended for playback applications. These non-linear editor friendly, solid-state or hard disk recorders enjoy nearly ubiquitous market coverage for recording of live events, but they are also often aggressively marketed as dedicated playback machines.

Not only are they inadequate as playback systems, lacking most, if not all, of the features to address the live playback environment, they are also very sensitive to how media must be inserted and ejected from the device, especially when using FireWire (IEEE 1394) drives. For an untrained operator, a misstep during the removal/mounting of the media will often result in corrupting the file system and loss of all the clips on the media. This is not the type of equipment one should ever expect the rotational or as-needed volunteer to master.

The next tier of purpose-built devices actually intended for live event playback have most or all of the “5 Foundational Features for Live Event Playback” missing on media recorders. Additionally, they may also provide more audio channels, which can permit the use of enhanced acoustic environment tracks and/or language translation channels.

These features, combined with smooth playback, flexible cueing and trimming tools, countdown and real-time responsiveness deliver reliable live event playback, frequently with a volunteer-friendly user interface.

Navigating the Codec Jungle

A practical limitation of this class of playback devices is that they can typically playback only one or two mainstream codecs natively. Only media formatted using those codecs will be processed in real time, guaranteeing an adequate playback experience. As long as the facility technical manager limits the media at the source to conform to these specific codecs, these devices are very good at what they are designed to do. However, it is very common for speakers and event managers to rely on video content produced by third parties. Given the broad range of mainstream codecs used to record video material, this inevitably results in clips being brought in that are encoded in formats not supported by the specific player model being used in the facility. As a result, viewers are presented with rough video transitions during the live event, as the technical crew struggles to play and transition between clips cleanly.

As the event audience grows more perceptive of these issues on the big screen, the presenters are faced with a dilemma—they have very relevant video clips, but how to integrate it into live events without distractions or rough transitions and what impact do these visual “mistakes” have on the perceived quality of the subject matter being presented?

The answer is a transition to professional playback equipment.

5 Foundational Features for Live Event Playback

- Simple cueing mechanisms like Shuttle/Jog
- Clip in/out marks and trim functions
- Countdown to end of clip (or countdown to mark)
- Cue to timecode or “counter” position
- Playlists

Solutions

Grass Valley, a Belden Brand, offers a complete range of professional-class playback solutions.

The T2 iDDR

The T2 iDDR (intelligent Digital Disk Recorder) is a 2-channel media playback device (plus 1-channel for recording) designed for the live events market. Available in RAID-10 or SSD configurations, it has enough media protection for most mid- to high-end playback requirements. Additionally it supports native playback of a wide variety of codecs.

Codecs supported natively on Grass Valley T2 iDDR:

- AVCHD (H.264/AVC)
- AVI (Grass Valley HQ, DV, DVCPRO 25, DVCPRO 50, DVCPRO HD)
- GF (DV, DVCPRO25, DVCPRO50, MPEG-2)
- MXF (Grass Valley HQ, AVC-Intra 50, AVC-Intra 100, D10, DV, DVC-PRO25, DVCPRO50, DVCPRO HD, MPEG-2)
- P2 (DV, DVCPRO25, DVCPRO50, DVCPRO HD, AVC-Intra 50, AVC-Intra 100)
- XDCAM (DV, IMX, HD422 [50 Mb/s], HD [3 5Mb/s, 25 Mb/s, 18 Mb/s])
- XDCAM EX (HD [35Mb/s, 25Mb/s])

While this is a large list for any purpose-built playback device, there are frequently other last-minute clips that are delivered for playback that would still need transcoding. The T2 iDDR supports additional codecs via on-board transcoding to its native Grass Valley HQ AVI format to provide for transcoding before playback.

Codecs supported on T2 iDDR (via on-board transcoding):

- AVI (Grass Valley HQX, uncompressed)
- MPEG-2
- QuickTime (Grass Valley HQ/HQX DV, DVCPRO HD, H.264/Canon EOS 5D, ProRes 422, ProRes 4444, JPEG 2000, animation, MPEG-4, Photo JPEG, PNG, uncompressed)
- Windows Media (Windows Media Video)
- Sequential image files (TGA, BMP, JPG, TIFF, PNG and GIF)

T2 maintains much of the familiarity of a VTR user interface while providing access to clips in a bin display on an integrated front panel touchscreen. Additionally, the display provides confidence monitoring for all channels. The recorder and two players operate independently and simultaneously, and can even be set up to create a 1-in, 1-out time-shift device while keeping a playout channel available for other uses. Playout channels can also be ganged for dual-screen use.

Complete product details can be found at:

www.grassvalley.com/products/t2



K2 Solo 3G

K2 Solo 3G media servers are simply 2-channel storage devices where either channel is capable of recording or playback: 1-in/1-out, 2-in/0-out or 0-in/2-out as required on demand.

K2 Solo 3G depends solely on a GUI which has many familiar-looking components, mainly the channel control panel (with transport controls and pertinent data about the clip(s) being recorded or played) and a bin window where the list of clips is maintained.

As a high-performance device capable of supporting 1080p and AVC-Intra, there are fewer codec choices for direct playback and record.

Codecs Supported on K2 Solo 3G:

- DVCPRO HD
- MPEG-2@HL 4:2:0, I-Frame & Long GOP, 12-80 Mb/s
- MPEG-2@HL 4:2:2, I-Frame & Long GOP, 20-100 Mb/s
- XDCAM HD (25, 35, 50 Mb/s)
- XDCAM EX
- DNxHD 115, 121, 145, 175, 184, 220 Mb/s
- AVC-Intra 50/100
- H.264 playout
- DVCPRO HD
- MPEG-2@HL 4:2:0, I-Frame & Long GOP, 12-80 Mb/s
- MPEG-2@HL 4:2:2, I-Frame & Long GOP, 20-100 Mb/s
- XDCAM HD (25, 35, 50 Mb/s)
- XDCAM EX
- DNxHD 115, 121, 145, 175, 184, 220 Mb/s*
- AVC-Intra 50/100*
- H.264 playout

*Additional software licenses required



The user interface makes it easy to “crash record” and gives the user the ability to name the clip during recording and give it a record duration. In fact, on a channel-by-channel basis, the channels can be set up to record into a specific bin as desired.

Furthermore, a beneficial feature in live event productions that involve coordinating with satellite locations is the ability to push or pull clips as files or streams. The streaming can happen simultaneously as the clip is recording, and on the playout side K2 Solo 3G can read and write to and from storage so that the clip can start playing back seconds after it has started streaming — provided, of course, that the network bandwidth is sufficient to allow streaming at high enough data rates.

Playback features include all of the 5 Foundational Features for Live Event Playback mentioned earlier, but also include the ability to gang channels together for slaved iMag/Center Screen playout (or Vid-eo+Key).

K2 Solo 3G can also be upgraded via a software license (AppCenter Elite) to enable the ChannelFlex feature where each channel can be set up as a 2-video-track recorder, or 2-video-track player. With one set of controls, a single channel can play out dual-screen material (even while recording the dual-stream on the first channel) and it never gets out of sync, ever.

If the source material for 2-track playout (dual-screen, 3D, or Vid+Key) originated as two separate tracks, each one on separate clips, the AppCenter Elite software permits the user to select a clip and attach a second clip to it, making it a 2-track clip forever locked together, which will play out on a single ChannelFlex-enabled playout channel.

Additional clip transcoding is not supported on-board K2 Solo 3G. While it does directly support a variety of codecs, you may encounter others — especially in the rush to get something unusual on the screen. Those cases usually roll as described earlier, without the benefit of having been trimmed, timed, or even vetted for extraneous content. This is where the Grass Valley EDIUS nonlinear editing system comes in, with its support of virtually every known codec. A clip can be brought into EDIUS and then marked and trimmed for playback, before exporting it into any one of the supported K2 Solo 3G formats. EDIUS, Apple Final Cut and Avid Media Composer edit systems can transfer files across a network, or copy to a USB drive to be used by K2 Solo 3G.

K2 Solo 3G has an intuitive GUI, networking features with other K2 family products, access to import or export to common storage systems such as NAS, USB 3.0 ports for exporting to external drives and a high-performance architecture which reliably and easily gets the right clip to playout at the right time, and without any stutter.

K2 Summit 3G

K2 Summit 3G is literally two K2 Solo 3Gs. With the same user interface, software and codec hardware, it is like having a pair of K2 Solo 3Gs in the same chassis, both with access to the same media.

The big differentiator from K2 Solo 3G is that K2 Summit 3G has dual power supplies each with their own line cord and powered by two separate circuits, giving K2 Summit 3G true power redundancy. Additionally, its on-board storage has much larger capacities and is typically configured as RAID-10, creating two stripe groups that are mirrored for protection.

While this one RAID-protected system with redundant power supplies would not typically be used solely for playback in most facilities, it provides a lot of production power and management housed in a single device. With the K2 Summit 3G and AppCenter Elite, it is possible to:

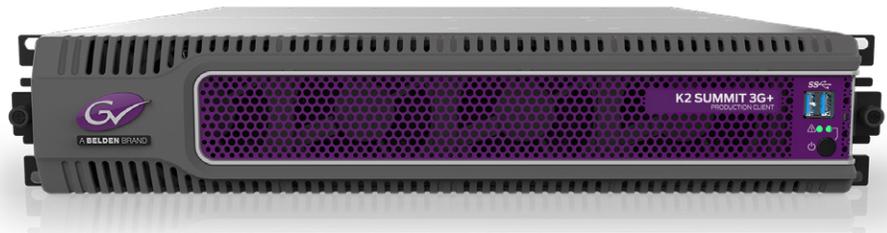
- Use a channel setup to record the Center+iMAG feed for delayed playout
- Have another channel set up and cued to playout the Center+ iMAG feed
- Configure a third channel to record the main program feed and:
 - Stream it to another K2 Summit 3G or K2 Solo 3G for use elsewhere
 - Use Hot bin export to a network location for easy editing
- Preserve the fourth channel for playout of any clips for the live event

Another applicable configuration would be:

- Use Ch1&Ch2 in Iso-Cam mode to record 4 cameras on SEPARATE CLIPS
 - It could be PGM plus 3 camera feeds
 - They can be exported to NAS storage for use in post production
- Use Ch3 in 3D/Vid+Key to record Center+iMAG feed for delayed playout
- Use Ch4 in 3D/Vid+Key Play mode to play out any clips (on main output) for the live service, and then later the same channel could play out the Center+iMAG clip for delayed playout.

Complete product details for K2 Solo 3G and K2 Summit 3G can be found at:

www.grassvalley.com/products/k2



Conclusion

The Grass Valley T2 and K2 product lines are professional-class playback solutions designed to address the needs of the expanding live event market. This can include houses of worship, educational institutions, medical facilities, corporate centers and community convention centers. In contrast with commodity desktop-based systems which typically do not meet the **5 Foundational Features for Live Event Playback**, the Grass Valley professional playback platforms go well beyond those foundational features and include:

- Improved video playback and record performance
- Delivering the desired degree of reliability
- Enabling playback of media formatted in a variety of codecs
- Providing dramatic improvements in user and audience experiences

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