

Internal Processing in Routers Enables Fully Integrated Solutions

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Broadcasting infrastructure has changed significantly over the past decade. The introduction of digital video and audio, the transition to high-definition and 3DTV, just to name a few have introduced new challenges and opportunities to the traditional core routing workflow.

The ultimate challenge in system design is to provide a set of integrated solutions for harmonious control and management of content routing within the complex environment of today's AV content creation and broadcast facilities. Systems integrator specialists are expert in the art of bringing together all the individual elements required to provide systems with all functions necessary to resolve a diverse set of demanding operational functions. Frame synchronization, audio track and loudness control, monitoring, management and control are examples.

Traditional systems utilize multiple devices supplied by different vendors; are highly interconnected, tricky to specify and install, and complicated to control via an array of interfaces and control panels; and have an ongoing high-maintenance overhead.

Harris product developers have simplified the systems core by integrating vital elements within the framework of the router. Internal content monitoring, control and management sub-systems are now augmented with frame synchronization, audio loudness and track shuffling, and processing. The technology utilizes the latest 3 Gb/s industry standards while retaining analog, SD and HD infrastructure. Connectivity extends from multipin copper and BNC connectors right up to fiber.

The systems integration process takes on a new meaning when the core router is an integrated system itself.

This document outlines the philosophy behind the Harris[®] Platinum™ router integrated system and why it is an ideal choice for the core of a modern-day installation. The Platinum router can utilize 16 channels of audio embedded within each video stream, has onboard synchronization systems, and enables easy control of audio levels and track changing. All audio, regardless of whether its source is embedded or discrete, is controlled with the simplicity and ease of normal audio routing operations and can exit the router discretely or be embedded in any video output. The router provides all the monitoring facilities needed without resorting to external hardware. The result is a highly flexible system comprising sophisticated state-of-the-art electronics, and offering a conventional, operational feel.

Comparing Traditional Discrete Systems with an Integrated System

Function	Traditional System	Harris Integrated System
	Figure 1	Figure 2 (simplified view)
Multiple Source Viewing	Take router sources via DAs and feed individual monitors directly or via combination processors to large-scale monitors.	Organize sources inside the router, and combine using internal processors that connect directly to large scale monitor(s).
Synchronize Wild Feeds	Incoming feeds that are non-synchronous must be routed through a frame sync before being presented to the router. Consideration for audio path timing is necessary.	Incoming non-synchronous feeds connect directly to an internal frame synchronizing input card. Efficiently utilizes I/O space and router's redundant power supply for confident, robust operation. Quick and easy control of audio delay compensation, track shuffling and video proc amp level adjustments are all available within the router control system.
Manage Track Shuffling and Audio Levels	Separate chassis for video and audio routing. External demultiplexers extract audio from video streams, and an external sound control system is utilized to change or monitor levels, and shuffle or swap audio tracks before being routed in the audio chassis. Modified audio is then externally multiplexed into video streams.	Combine the sound and vision electronics into a single chassis, enabling up to 16 audio embedded audio tracks to be extracted from each video source. Separate video and audio paths are provided in the router so as to allow internal audio track shuffling and level control. Simplified control, more efficient. Less risk of failure.

Figure 1: Traditional System

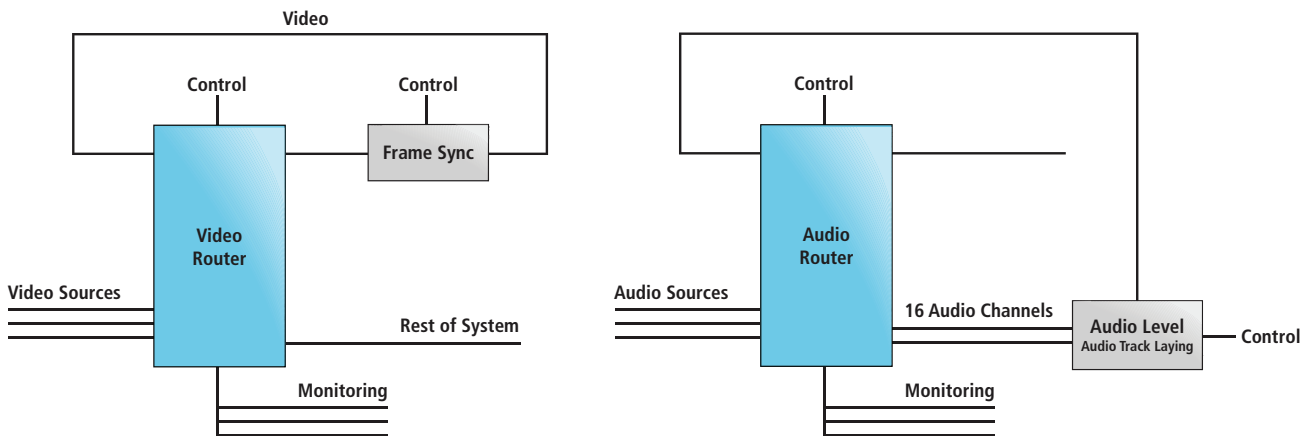
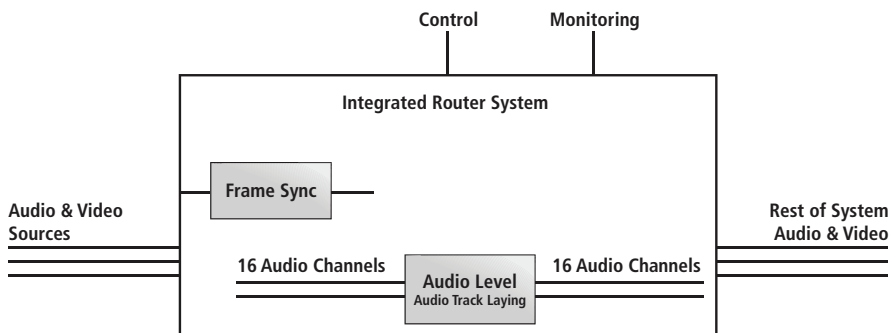


Figure 2: Integrated Router System



Efficiency of the System

By integrating more of the systems hardware into the router chassis, an array of advantages becomes apparent. Fewer input and output connections are used, and that translates quickly into both space and cash savings. Cabling is reduced. Rack space is saved. There are also savings in power consumption and a lower risk of systems failure as the complexity of the technical installation becomes consolidated into one integrated component.

The operational efficiency is also critical. The latest router innovation brought to the market by Harris places the frame synchronizer inside the router frame. The operational advantages become quite obvious when you consider that the frame sync not only re-times the video and maintains lip-sync, but also offers level, hue and other signal adjustments. Rather than having to organize a wild signal to be sent via an external frame synchronizer and manage the process in a separate control interface, access to a fully fledged frame sync facility at the input stage of the router wraps all of the control parameters into a single, neat operational package.

System Operational Fidelity

The content facility routing must be managed in a way that allows maximum flexibility while minimizing operational error by providing and limiting control options by area. It is also vital to safeguard the critical settings so that recovery from the point of failure of any sort is quick, easy and robust.

The ideal topology for router control systems is to distribute control to dedicated control panels located where the operational activity exists rather than to a single, centralized control area.

Harris achieves this in the Platinum router series by providing a range of dedicated control panels. This provides the operators with individual control of the parameters that are critically important for their particular operation. Operators no longer need to track which external devices they are controlling at any particular time because management of function control is taken care of internally by the control architecture software. All functionality is provided with dedicated control panels to provide a traditional operational feel.

From a facility engineering viewpoint, the boundaries that define workflow are pre-assigned using easy-to-follow wizards to manage the mapping and control databases.

Signal Handling and Sub-System Flexibility

The router must be capable of handling a multiple number of formats simultaneously and in a highly flexible way. Of high importance is the need for the operator to be able to manage the signals without having to be bothered about the internal working of the switching systems.

The Platinum router achieves all this with ease. The electronics for the audio and video routing are combined into one chassis. A large variety of analog and digital video and audio input and output cards allows for a wide range of signal types to be accommodated. The signal architecture is then managed so that all the

video switching is done at the highest possible level (3 Gb/s wideband). Similarly, the audio is switched on TDM (Time Division Multiplexed) crosspoints.

Within the Platinum frame, all input card slots provide a dual-path capability that feeds both the wideband crosspoints that reach up to 3 Gb/s and, in parallel the TDM crosspoints that handle audio. This means that the router architecture can be tailored to exactly suit the demands of the facility and remain flexible as the business grows and requirements change.

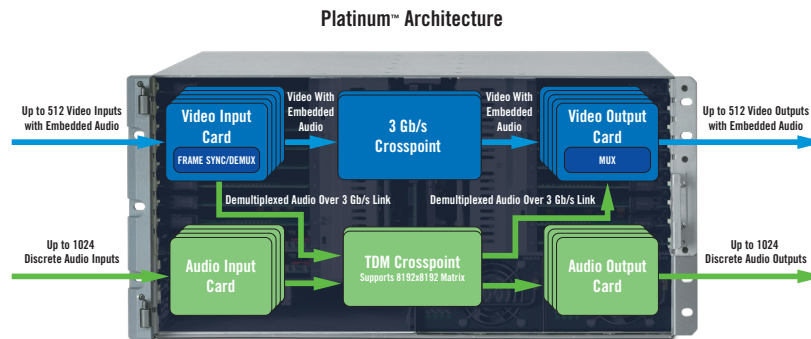
This architecture is also very cost effective since the Platinum frames can be configured as audio only, video only or hybrid mixed A/V.

There is also great flexibility at the audio sub-channel level, since within the TDM crosspoint engine, switching of the mono paths is possible — this is a significant advantage over systems that only handle signal pairs as one entity.

Operating on the “Wild Side”

Managing live events, sports channels, outside broadcasts and so on, inevitably means that many of the feeds are coming in untimed and with incorrect level settings or audio channel placement. The Platinum integrated router system now features a new and unique plug-in frame sync functionality. In fact, it offers eight frame syncs on one board, each capable of handling embedded audio and providing operators with a full set of signal controls managed by a dedicated operating control panel.

Each frame sync is fully featured, incorporating a video proc amp that enables gain adjustments, black and white clipping, audio demux and delay compensation. Compatible with SD, HD and 3 Gb/s signals, the



synchronizer brings the wild signal in time with station clock and gives the operator all the control needed to optimize the incoming signal.

This is one of the most significant recent innovations, adding into the router much more power and providing a higher level of flexibility and agility while reducing operational stress and increasing system reliability.

When working with satellite or other forms of remote signals where timing/synchronization and levels will be variable or uncertain, connection via a built-in synchronizer makes perfect sense. There is no need for wraparound through tie lines to external synchronizers; the operator sees just one occurrence of the signal, eliminating the chance of mistaking the raw source for the one post synchronizer. Moreover there is peace of mind with respect to the management of external feeds, standardizing the workflow and providing immediate means of resolving incorrect signal level issues.

Sounds Right

Correct audio levels are critical for good high-quality program transmission — indeed, legislation is dictating stricter measures that place more emphasis on accuracy and consistency. Another factor is multi-language programming, which is now common, and there are increasing requirements to change the language on different versions of the content.

The Platinum integrated router system enables sound level control and sound track changing within its internal audio processor modules.

The video I/O cards are built to handle eight video signals each and can also handle up to 16 channels of multiplexed audio from each video input. This creates a potential of 128 channels of audio from each input card. All of this audio is treated internally by the router as discrete audio sources.

Consider the following example: A 3 Gb/s video content source entering the frame on one of the eight inputs of an input card which, when demultiplexed, provides 16 channels of audio to feed the TDM crosspoints. Audio level adjustment and track changing can then take place within the TDM sub-system. The modified set of audio channels is then fed into the audio multiplexers section of an output video card so that the newly modified audio channels are multiplexed back with the video signal and sent onwards for distribution, recording or transmission.

Significantly, all this happens in the background, so the operator just handles the audio switching as if the channels are discrete. By handling the subsystems in this manner, there are no changes to the workflow that the operator is used to. This translates into an extremely shallow learning curve that is easily accepted by veteran operators.

Reliability, Redundancy Systems

Since the router is central to the operation, its reliability is paramount — this is mission-critical hardware. Failure must be minimal, and recovery must be fast and easy. All internal modules must be plug and play and hot-swappable. Redundant power supplies, control cards and both audio and video crosspoints are required for true fail-safe operation.

In addition to its redundant modules, the Platinum router has built-in failure recovery strategies incorporating management database backup services.

The Rear View

Cabling and the flexibility to handle different signal types are very important. The Platinum architecture perfectly matches a wide range of scenarios. Incoming video with embedded audio can be delivered by standard coax and BNC connectors or direct connection to SFP modular for fiber. Discrete audio can also be connected via analog or AES balanced/unbalanced as required.

Within the core of Platinum, all switching is done in the digital domain. Multiple input and output modules are available to match required signal types. Analog inputs are digitized at the input stage, and conversion to analog is also available. This flexibility allows the router to manage all analog to digital requirements.

Cost of Ownership

The router is the essential core of every system and must have a long life, since replacement ultimately requires the entire system to be re-engineered. Since the content business is forever changing, demands are put on the system to grow and change in a flexible way as businesses evolve. The router must be modular in structure, expandable in size and future-proof in terms of the signal standards — past, present and future.

Because the Platinum design is based on a modular and expandable architecture that is continually being updated, this product guarantees the best possible investment.

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