Harris® NEXIO Farad™

High-Performance Online Storage and Playout Application

OVERVIEW AND EXECUTIVE SUMMARY

Storage and playout facilities face significant business challenges in the ever-changing and highly competitive broadcast television market. Among these challenges is the need for:

- Easy, flexible and cost-effective scalability in storage capacity and playout bandwidth,

- Flexibility to handle an ever-expanding range of codecs and file formats,

- Extremely high reliability and fail safety throughout the ingest-storage-playout cycle,

- Across-the-board cost management that supports efficient and profitable operations.

Harris® NEXIO Farad™ is a high-performance online storage solution for storage and playout facilities that effectively addresses these business challenges.

The NEXIO Farad solution's storage and bandwidth can be scaled independently, in increments as small at 8 TB and 2000 Mb/s, respectively. This allows for expansion tailored to current client needs.

The combined NEXIO® portfolio is highly flexible in terms of codecs and file formats that can be ingested and played out.

NEXIO Farad reliability is implemented with RAID-601 utilizing Harris-patented Intrinsic Mirroring™ technology.

Cost management is achieved by the NEXIO Farad solution's single repository architecture and ease-of-use design that reduce energy, operating, and maintenance costs.

THE EXPANDING, CRITICAL ROLE OF THE STORAGE AND PLAYOUT PROVIDER

Many networks and larger production studios are finding it advantageous, from both a technological and business standpoint, to out-source finished video content to storage and playout service providers. These providers ingest and store their clients' video content securely within their server architecture — often in a wide range of codecs and file formats— and then playout content files as required. Such enterprises succeed when they provide extremely high levels of service and reliability and can scale cost-effectively to meet burgeoning industry demands for storage space and playout bandwidth.

Ingest glitches, disc drive crashes, and playout failures that result in that worst-case scenario, the dreaded "dead air," are just some of the potential technical challenges that storage and playout facilities face in running their business and competing successfully.

From a business standpoint, these facilities are challenged with finding a cost-effective growth strategy that matches their clients' immediate needs while positioning themselves for a future that's often hard to predict. And while the growth of demand for storage and bandwidth seems exponential, operating and capital outlay costs must be constantly managed to stay competitive and keep the facility profitable.

BUSINESS CHALLENGES

Expand Easily and Cost-Effectively

Viewers' appetite for video programming, especially niche programming targeted at specific interests like sports, fashion, cooking, travel, music, etc., seems insatiable. This growth in content, along with the expansion of satellite-based channels and the rapid migration to HD, has fueled an enormous growth in demand for storage capacity and playout bandwidth. To keep pace, a storage and playout facility must have a cost-effective expansion strategy that not only scales to their clients' current needs, but also stands ready to meet future needs.

Buying large blocks of additional storage and bandwidth hardware before it can be leased ties up capital, and the needs for storage expansion versus bandwidth expansion can differ widely. Complicating any plan for expansion is the process of transferring content to backup servers, taking the primary system off-line, installing the new hardware, and then transferring all the content back to the primary system. The hours of downtime involved in this process can be hugely expensive to both client and playout facility.

Avoid Downtime and Safeguard Client Assets

Content is any network's or studio's most valuable asset, and that asset must be safeguarded at every point throughout the ingest, storage, and playout cycle. Storage and playout facilities therefore have a special obligation to incorporate robust and redundant reliability into their plant and procedures.

Ingest reliability implies that program feeds will be successfully written to disc regardless of their file, codec, or source, be that the Internet, fiber line, physical media, or satellite downlink. *Storage reliability* means that content is safeguarded against loss due to drive/chassis failures or an inability to locate files. *Playout reliability* means that content files play out flawlessly and on time, even in the event of system anomalies that take down the primary playout channel. As the custodians and publishers of their clients' valuable content, storage and playout facilities must rigorously pursue end-to-end high reliability across their infrastructure.

Stay Flexible to Meet Current and Future Demands

Flexibility in today's broadcast market means working with and managing an ever-expanding spectrum of technical and logistical requirements. With the rapid advent of new codecs and file formats, storage and playout providers must be ready for the unknown.

"What new codecs and file formats will our clients be using now?"

"How much bandwidth will these clients now need for playout?"

"How much online storage capacity will we need in the foreseeable future?"

"How can we anticipate growth, cost-effectively?"

These are just some of the questions storage and playout facilities face as they adapt to changing industry conditions.

"Flexibility" also implies that a facility can adapt to their clients' changing demands. Because a hardware or software bias toward reading or writing impacts flexibility, there should be no performance trade-off for writing content to disc during ingest versus reading files back during playout. Content should be readily accessible to meet any requirement from editing to archiving. Since change is a given, a playout and storage facility must be flexible enough to adapt quickly to new operational needs without costly and time-consumptive retooling from the ground up.

Effectively Manage Costs

Survival in today's business environment depends upon successful and comprehensive cost management.

Storage and playout facilities seek to manage their personnel and engineering costs, the cost of 24/7 operation, the cost of powering disc drives and associated equipment, and the investment needed to buy, install, maintain, and upgrade hardware and software as needed. Cost management clearly pertains to every aspect of the storage and playout provider's operations. Ideally, one integrated hardware and software platform will provide across-the-board cost management solutions without downgrading or compromising performance, flexibility, or reliability.

THE SOLUTION: HARRIS® NEXIO FARAD™ HIGH-PERFORMANCE ONLINE STORAGE

Scalable Storage and Bandwidth Expansion

Harris NEXIO Farad is a high-performance online storage solution that effectively solves the key business challenges faced by storage and playout providers. NEXIO Farad is unique among online broadcast server storage solutions in that its architecture permits measured, seamless, expansion of storage and bandwidth.

The NEXIO Farad solution's inherent flexibility to expand in increments as small as 8 TB and 2000 Mb/s of bandwidth changes storage rollout strategies. As their client base and capacity needs grow, storage and playout providers can install additional drives and playout channels in quantities that match current business needs. NEXIO Farad can expand to over 512 TB of online storage and 32,000 Mb/s playout bandwidth with little or no workflow disruption. Storage and playout expansion is easily accomplished by the

seamless installation of additional NEXIO Farad cores and stores. These components can be added in minutes without time-consumptive and costly transfer and re-transfer of content between primary and backup servers.

The rapid migration to HD has increased the demand for additional playout bandwidth. With NEXIO Farad, a playout facility can easily scale bandwidth to match client needs. This scenario is ideal for providers whose clients need to playout simultaneous SD/HD versions of a program. Additional playout ports can be added to the NEXIO Farad system without adding additional and unnecessary storage drives.

Engineered for Reliability, Performance, and Availability

As we've noted, high reliability and comprehensive fail safety is of prime importance to storage and playout providers. In this respect, NEXIO Farad sets new industry standards. Every component of the system, from disc drives to automation, is protected through robust backups and comprehensive diagnostics.

NEXIO Farad utilizes RAID-601 with Harris-patented Intrinsic Mirroring™ technology. This read/write disc architecture protects against drive, controller, and storage chassis failures and maintains system throughput. RAID-601 combines industry-standard RAID 6 technology with proprietary Harris RAID 0-style disc striping and Intrinsic Mirroring (RAID 1-style mirroring for broadcast operations) for unparalleled reliability, availability, and performance.

The RAID 0 disc striping utilized in NEXIO Farad is unique in that it's optimally balanced between write and read operations. Typically, a disc drive is biased toward one of these operations at the expense of the other. Data writing performance is optimized while data readout performance is diminished, or vice versa, though the bias is often to data readout performance. Harris has engineered a solution that balances these operations so that data reading and writing are simultaneously performance-optimized. This balance is critically important to enterprises that depend on high performance during both ingest and playout. With NEXIO Farad, storage and playout

providers get consistent high performance in both operations in any write-to-read proportion as needed.

Harris-patented Intrinsic Mirroring is the state-of-the-art in data and bandwidth protection. Intrinsic Mirroring simultaneously creates two copies of any assets ingested or rendered to the NEXIO shared storage system, creating two real-time copies of media with seamless failover during playout. This duality of content protects the system against chassis and controller failure, effectively removing every single point of hardware failure. Intrinsic Mirroring is also the mechanism that protects system bandwidth, even during extreme situations when up to fifty percent of the storage system disc drives are unavailable.

To ensure I/O hardware *reliability* during ingest and playout cycles, NEXIO Farad works with Harris automation systems. Should anomalies occur during either ingest or playout, the automation system immediately switches to an alternate signal path avoiding service disruptions. A full-featured monitoring system provides status on storage solution components and includes industry-standard SNMP monitoring and notifications processes. With spare drive provisioning, the function of a faulty drive is automatically failed over to an identified spare that's online and identified as a global spare. Rebuilding of data from the faulty drive happens automatically and without user intervention. This combined media security and signal management protection ensures the best possible overall reliability.

NEXIO Farad also excels in measurable *performance* levels, achieving higher bandwidth and greater capacity than most competing solutions in a storage solution that corresponds to any broadcast workflow.

True content *availability* can mean only one thing: any content file within the system is quickly availability to all requestors at any given moment. NEXIO Farad uniquely accommodates the enterprise demanding truly available storage with all content rapidly accessible across the entire ingest, production, and play-to-air workflow. The NEXIO Farad solution's scalable, single-chassis architecture consolidates content within one physical structure. This design removes the complexity and cost of storing and accessing content across multiple island SANs. RAID-6 in itself is highly reliable with no single point of failure. With the addition of Harris-patented Intrinsic Mirroring to form RAID-601, NEXIO Farad becomes a parallel data storage system that effectively hides any data disruption scenario within itself or any connected SAN. NEXIO Farad thus provides true 24/7 availability that meets the demands of the most active and extended storage and playout operations.

Flexible to Any Usage Environment

When combined with other members of the NEXIO server family, NEXIO Farad handles a remarkable array of codecs and file formats. Whether in standard or high definition, NEXIO Farad supports ingest and playout in such widely used codecs as:

- DVCPRO25/50/HD,

- MPEG-2 SD/HD I-frame and Long GOP,

- XDCAM/XDCAM HD/XDCAM HD422/XDCAM EX,

- AVC-Intra Class 50 and 100,

- DNxHD.

- SD/HD H.264 playout.

The key to this flexibility lies in the NEXIO family's software-based architecture that supports the addition of new codecs, features, and upgrades without expensive hardware modifications or additions. Ingesting new codecs is easy and inexpensive, while older codecs and content are still fully supported and readily available. If a codec requires more processing power, available CPU upgrades boost the NEXIO Farad solution's I/O chassis performance. With NEXIO Farad, there's no need to replace an entire chassis to meet the next advance in compression technology. The system is essentially future-proof through software updates and CPU-based upgrade components.

This versatility solves problems arising from today's tapeless workflows utilizing different file formats and delivery modes. Content is typically sent to storage and playout providers via some mix of the Internet, satellite feeds, FTP, and/or fiber lines, and a

good deal of up-conversion and down-conversion between HD and SD may be performed to accommodate dual HD/SD playout. As future file types will likely be in formats that are currently uncommon, or don't even exist today, future-proofing in this respect is highly desirable by storage and playout providers. NEXIO Farad delivers that codec-agnostic performance now.

Cost Effective, Easy to Use

Cost management encompasses operating costs, personnel costs, energy usage, and total cost of ownership. NEXIO Farad helps enterprises effectively manage their across- the-board costs through a powerful set of design and cost management features.

Because NEXIO Farad provides a single, unified repository for content ingest, storage and playout, the time and costs associated with managing content across multiple storage islands are eliminated. Facilities are no longer forced to transfer content between storage islands with all the risks and costs involved with such operations. All content is available to all channels all the time, and to any system user — from administrators to editors. Once physically installed, ingest and playout channels are software licensed from Harris on a per-channel basis, driven by customer need. Playout providers don't need to pay for channels that aren't immediately needed. As demand grows, providers simply purchase additional channel licenses and bring those channels on line with software license keys.

Intelligent system management works to minimize the NEXIO Farad solution's energy consumption. Power is used to run spare drives on an as-needed basis, as determined automatically by the system. Energy is no longer wasted to power and cool drives that aren't actively ingesting and/or playing out content. Yet if needed, these drives can be immediately brought online.

Operator and personnel costs are also reduced because many important tasks are performed "invisibly" without impacting ingest or playout. For example, in the event of drive failure during playout, the system switches to a backup parity drive or, in more extreme cases, to mirrored storage. NEXIO Farad then commences a rebuilding routine that "heals" the failed drive without user interaction. Administrators don't need to be on 24/7 call in case of drive failure because NEXIO Farad handles those operations automatically. And reduced maintenance means lower operating costs.

Ease-of-use is another area where NEXIO Farad excels, and this too helps lower cost of ownership. System control is simplified and readily accessible through Ethernet connection. The NEXIO Farad GUI is straightforward and intuitive with status-at-a-glance design. Because so many important operation and maintenance functions happen automatically, operator intervention is minimized, as is the time and expense incurred with training new operators. Ease-of-use also translates into reduced risk of operator error, which can have serious business ramifications for a storage and playout enterprise.

GROWING YOUR BUSINESS WITH HARRIS® NEXIO FARAD™

Storage and playout providers face formidable business challenges to compete and succeed in today's dynamic and fast-changing television broadcast market. Solving these challenges in scalability, flexibility, availability, performance, and cost management requires innovative engineering and new technologies geared for today's and tomorrow's broadcast industry.

With NEXIO Farad, Harris meets these challenges with a unified platform solution that maintains and grows the capabilities and profitability of a storage and playout provider, now and into the future. The NEXIO Farad solution's new choice of workflow capabilities offer speed, simplified operations, and the highest levels of media protection and reliability, without the need for multiple storage systems.

The Harris NEXIO Farad family of online storage and playback systems delivers a higher standard of performance, reliability, and availability for the most demanding storage and playout operations.