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## Considerations When Evaluating a Playout System Implementation

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Choices for a playout solution have usually fallen between implementing a traditional automation system that links together a complex collection of many devices from different providers, or a basic single-channel box consisting of a standard PC with cards. There is now a viable alternative that brings a file-based, networked, and scalable approach to the task of well managed, consolidated delivery of on-air content that includes video, audio, secondary media, and graphics.

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# Introduction

As in many cases with new approaches, it can take time for the right combination of technologies to mature and be properly integrated before a real solution is available. While it is important to assess what is possible in a particular device, the complete proposition has to encompass what it takes to create a playout channel and sustain it over time on-air.

It takes a careful evaluation of the correct combination of software and hardware to put together the right combination for real-time delivery. Many broadcasters also have to consider what is involved with making the transition to a different approach, while also needing to incorporate new capabilities such as HD, web, and mobile services, along with more complex branding with graphics.

# Traditional Playout Systems

Traditional playout systems combine disparate single-function devices such as servers, character generators, logo inserters, and presentation mixers under automation control. While operators can run multiple channels, it can be labor intensive, tiring to run, prone to error, and produce an inconsistent on-air look.

This type of system can be complex to install and maintain, and it can be a constant struggle with software upgrades on such a diverse range of equipment. This makes total cost of ownership expensive—especially as it inherits a lot of complexity and a large license fee to match.

# Channel-in-a-Box Devices

Channel-in-a-box devices are single devices which play out the content for a single channel, inserting some graphics as appropriate. These devices are usually PC-based, with third party I/O cards. To be low priced, there are essentially a kit of various parts. Technology components such as servers and graphics are often not the core expertise of these suppliers, so they typically can only offer basic capabilities in all areas. There is nothing that exceeds or excels. Particularly in graphics, their capabilities have not been comparable to discrete devices

There are many applications for which this could be a good approach. These might include creating regional services with unmanned playout locations at headends, secondary and incremental channels using the same content as premium channels, start-ups and specialist thematic services, and +1 channels. It could also be a potential disaster recovery solution to back up a main playout. However, a crucial element for many installations is file-based distribution utilizing a central database system. Most channel-in-a-box implementations cannot support this requirement.

Original channel-in-a-box suppliers have typically been driven by the cost efficiency of their systems, while trying to balance that with reliability—especially in Windows-based systems. They focus on delivering conventional playout, with simple, straightforward functionality, as cheaply as possible. While this gives their customers savings on CAPEX, the level of reliability and functionality in these systems is more limited in order to keep the price down. This low price can also have an adverse effect when its time for support and service—a company selling low-cost/low-margin equipment may not be able to provide the support necessary for a 24/7/365 broadcast operation.

Traditional standalone channel-in-a-box TV systems are capable of working well in simple deployments, with more basic workflows, but their limited workflow integration has meant they've often been found wanting when deployed in larger multi-channel operations and/or highly branded channels. The complex and dynamic playout of highly branded channels will consistently see 5-10 elements coming together for every event, including content, multi-language audio, promotions, subtitles, and secondary events. All the various multi-stream content, graphics, editing, audio elements must also be ready at the right time and in the right order. Historically, this has been a big failure and criticism of channel-in-a-box solutions and the biggest cause of user dissatisfaction. Add to that the lack of integration in an existing infrastructure and workflow, a cheap channel-in-a-box device quickly becomes a disappointment.

Given that multi-channel, highly branded channels are often the most dynamic, the most keen to embrace innovation as a means to differentiate themselves, and the ones most likely to entertain moving from conventional into playout models, this failure has proven an unfortunate stumbling block for many suppliers. So while a channel-in-a-box device can be good enough to get some operations started, it can fail to deliver the necessary

# Channel-in-a-Box Devices (cont.)

performance when a facility needs further integration or to add more channels.

Put simply, channel-in-a-box works for a single channel, but fails when an organization grows to multiple channels or wishes to incorporate out-of-box integration.

The term "channel in a box" no longer does justice to the automation, functionality, and integration that some modern systems can incorporate in order to help broadcasters tackle their complex playout challenges. The industry is now splitting into two very different paths—the more traditional single-box solution, and the superior, integrated playout systems approach. To compete with high-end conventional playout implementations, new solutions had to become cleverer and more powerful to deliver the required performance—and this is where the integrated playout systems approach has emerged as a new contender. At the same time, this integrated approach has had to offer a similar price-performance ratio for a complete solution as that found in a number of low-cost all-in-one devices. By using newer and better integrated technologies, an integrated playout system can offer more capability, but at a comparable price point to channel-in-a-box products.

# Integrated Playout Systems

An alternative view to the traditional automation and channel-in-a-box models is to consider playout nodes as just one of the type of devices that can be networked together in the file-based playout center, allowing the operator to deliver precisely the right solution for each channel, rather than delivering the solution that a fixed architecture dictates. The crucial thing to remember is that file distribution is at the heart of the integrated playout system solution.

# Complete Playout Solution

Integrated playout systems can offer a truly end-to-end solution for television playout.

Every aspect: server, graphics, asset management, and playout control should be purpose-built to create a tightly integrated and cohesive system that matches the demanding broadcast environment. All components should be designed to seamlessly work together to deliver the benefits of streamlined and efficient operations. This keeps a station on air and on budget—as the broadcast need grows, so does the system, keeping pace with business requirements while fully integrating with traffic and other front office systems.

Playout nodes should be designed to provide high-density functionality for not only video and audio, but also secondary media and metadata. With the proliferation of formats, there must be multi-codec support with a flexible SDI I/O. Video output should be routed through a GPU to enable high-performance graphics and effects processing. The playout node should be able to natively host and integrate a playlist management application so it is not continuously dependent on a separate PC or network connection.

The playout node does not exist on its own: it receives the content to be broadcast, receives instructions from planning and traffic, and delivers an as-run log. Therefore it should reside on a network to accomplish a complete file-based playout solution.

A full-featured playout management application must be part of any integrated playout system. This application should support such capabilities as schedule import, linking of events with graphic templates by rules, as well as adding, deleting, and replacing graphic templates. It should provide visibility of all secondary events, and the timing of all secondary events. The application should provide the ability to populate references to database fields and import fields. The application should also manage changing references and timing, simultaneous operation of multiple channels, and automatic sync of main and backup channels. Playout management should be able to import instructions from other systems such as traffic management and build playlists that are implemented in the playout node. Such playlists must be dynamic, allowing them to be changed prior to transmission.

A focused asset management application must be part of any integrated playout system. This should be a tuned implementation to track where content is and which playout nodes need it, optimized to the needs of an integrated playout environment. This application should support such capabilities as file/video ingest, trimming, soft part segmentation, and quality control. It should be able to manage secondary essences, closed-caption/subtitle integration, and customizable metadata. There should be a system monitoring dashboard, an FTP interface to storage solutions, and failover redundancy.

As content may be found on a local server, or on other external storage (such as an archive), the application must be able to pull the required content and metadata and transfer them as files, over the network to the playout nodes it is managing. These processes fundamentally enable a totally file-based playback environment.

An integrated playout system must include advanced graphics management and delivery. This should be truly equivalent with much higher end dedicated solutions, but fully integrated with the asset management and playout management applications. The system should include a composition application that can import from industry-standard graphics applications 2D/3D static and animated graphic elements. A complete channel look with branding design should be able to be constructed off-line, permitting creative artists to implement their ideas in their design software of choice rather than being dependent on technical considerations. Such an application obviates the need for traditional legacy graphics devices and operators.

The importance of this approach is that these simple but effective playout nodes can be built into a stand-alone transmission system, operating remotely at an unmanned location or disaster recovery center—or they can be part of a larger center. The information that these channels require can come from the same planning and traffic systems that typically drive a full-scale automation system. It is a flexible solution designed to free the system designer from traditional limitations.

With a complete solution, a number of efficiencies can be realized. Staff are able to accomplish more tasks while delivering superior results as there are simply fewer operations that have to be performed. Tasks such as transcoding and conversions are reduced or eliminated. Running simultaneous channels that require different localized content and branding becomes achievable with minimal effort.

An effective supplier of an integrated playout system should be able to demonstrate strong focus and experience with the entire playout ecosystem. They should possess solid domain expertise gained from a number of deployments over time. This background means close attention to combining all of the processes inherent in playout operations, such as sub-titling, traffic lists, media asset management, and branding. This knowledge can assist channel operators to embrace increasingly specialized capabilities leading to greater output sophistication while enjoying ease of use and lower costs.

A supplier of an integrated playout system should provide consultation, installation, and support agreements for a worry-free deployment and low total cost of ownership. Look for a supplier with worldwide solutions and delivery expertise with the competence for the most complex projects.

# Optimized IT Architecture and Infrastructure

The desired result in a playout facility is a high-availability channel playout system which is flexible and adaptable, with sophisticated, high-quality graphics and effects automatically generated from templates, and which can be left to run unattended or be responsive to last minute changes. The goal is a system designed for redundancy, reliability, and robustness.

To accomplish this, a system should be constructed to take the best proven IT technologies available today, but optimized for the unique demands of television. A specialized hardware and software layer has to be developed around the integrated playout system to deliver the performance standards broadcast professionals expect.

Running a television channel from a standard computer is still a problematic task. It requires detailed broadcast knowledge to deliver the performance and reliability required. For demanding media environments, playout nodes need to be purpose-built, with a high-availability architecture for mission-critical 24/7 use. These nodes should feature multi-processing and an integrated GPU for optimum performance. These purpose-built platforms must run very sophisticated, multi-threaded software. They should be implemented with an embedded operating system. This gives the developer 100% control of software performance, as well as support for real-time operations in a modular and flexible programming environment. It may all sound simple, but it takes a huge amount of broadcast experience and specialized knowledge to achieve it.

A dedicated and embedded operating system has to be created and refined to deliver intelligent resource allocation, management of assignable tasks, incorporation of multi-core processing/multi-threading, and precise control of the target platform for continuous predictability. Only by constructing the operating environment and wrapping a software layer around the system can a supplier of an integrated playout solution guarantee the performance, reliability, and capabilities that will really satisfy the diverse needs of media playout facilities.

With more and more content being managed as files, a playout system needs to incorporate standard networking for ingest and transfer, while efficiently managing media files as well as secondary media such as subtitles, voiceovers, and graphics.

Playout needs are different for different facilities. Integrated playout systems should incorporate a modular scalability that can match the needs of a basic single channel to multi-channel high-resiliency playout centers.

In an integrated playout system, one channel does not have to equal one device. Many playout implementations require substantial resilience. Playout operations cannot tolerate any loss of content for any amount of time. The playout nodes should have support for both n+1 and 1+1 redundancy.

The key to integrated playout systems is the software implementation. In the past, dedicated broadcast platforms were a requirement. Now, optimized IT technology is perfectly capable of delivering the necessary performance. The overall hardware element of a playout system is becoming less critical, and is now more of an enabler.

Development of software and algorithms is now where innovative television suppliers' real intellectual property lies and what is the pre-eminent value add that is being delivered in such solutions as an integrated playout system. Because of this, the cost of adding extra processing power and memory to a system, to meet higher performance requirements, becomes largely insignificant in terms of the overall cost of the system.

Integrated playout system software-based architecture also means that it is easy to support, manage, and update a mixed playout of various standard and proprietary files, formats and conversions. All that is required is some limited development work.

The fact that the integrated playout system primary intellectual property is in software also helps facilitate a "pay for what you need" model. Using the same standard optimized IT hardware components, the desired software functionality can be specified and users do not have to pay for features they never use.

Supplementing optimized IT components and software development is the utilization of open standards. Integrated playout systems should use standard APIs like OpenGL for graphics processing such as rendering. Content must be transferred to the playout nodes using standard FTP. Metadata definition and exchange should use XML. With integrated playout systems using open standards and common data exchange with XML, it is very easy to expand the functionality, add new connections, and scale the scope of the system.

# Advanced Graphics Integration

Television graphics devices grew up in the days when it was a huge challenge to put an electronic image into a video signal. Today, a standard PC graphics card has far more power than is required for playout channels, even in HD.

Because of the extensive need for graphics in publishing and the Internet, powerful, but widely recognized, software packages such as Adobe Creative Suite or 3ds Max have evolved to create sophisticated graphic elements. Any graphics designer will instantly recognize these packages.

Creative artists should be focused on building the best channel look rather than being limited to what technicians can provide, using software with which the designer will be comfortable and familiar, so it will be a swift and intuitive process.

An integrated playout system must include a composition application to enable real-time graphics that can be used off-line on any Mac or PC. It should import 2D/3D static and animated graphic elements from industry-standard graphics authoring applications. The application should provide unlimited layering and timeline editing.

To create the channel's on-air look, the application should enable arranging graphic elements into templates for playout channels. The application should permit creation and saving of repeatable templates. The templates with all the associated data will be populated at the moment of going to air. Again, open standards means that these templates can collect the data from multiple sources, so at run-time they can be constantly updated. As the playlist changes, the associated XML metadata maintains the correct associations so the proper content will be updated and delivered on-screen.

Thanks to standard APIs such as OpenGL, and powerful GPUs, there should be native integration with the playout nodes to process and render graphics for real-time delivery on playout channels.

Using this methodology, there is no need for traditional legacy graphics devices and operators. Rather than being a separate operation, there should be total integration for graphics with media asset management and playout management.

Of addition importance is a managed graphics workflow. Today, graphics can be easily changed and created. The desire to make use of this functionality will only grow over time and therefore the volume of graphics interactions for each channel will grow. In a multichannel environment, this can be a real challenge. Having a graphics workflow solution as part of your playout solution dramatically reduces the risk of errors and means less staff to run the channel.

# Testing and Validation

For an integrated playout system to provide all these capabilities and integration, an extensive amount of research and development has to occur long before any solution is delivered. While careful software development and hardware design at the engineering level are expected, there are some other critical technical processes that need to be incorporated as well.

With the goal of having tight integration of a variety of standard IT components and sub-systems, rigorous validation has to be performed.

Some of the technology evaluation criteria that should be included as part of validation include:

- Does a certain technology deliver on the promise of its features and specifications?
- Can the technology be effectively utilized for its intended application?
- Can the technology function well as a building block for the overall system?
- Will the development cycle to integrate the technology be predictable?
- Will the technology scale as expected and operate under various loads?
- What will be the operational behavior in error conditions?

Some of the evaluation criteria for storage validation should include:

- Benchmarking performance over multiple days during rebuilds, and while running various server input output configurations:
  - — Price versus performance versus latency
  - — Bounded latency with augmented storage sub-systems that respond within a certain time limit
  - — Hot-swapping storage controllers under a full load, live firmware updates under a full load

Some of the evaluation for the file system validation should include:

- How is access managed and controlled for concurrent access of real-time and non real-time applications?
- Is there automatic management of the file system profile so defragmentation is not required, even under 24/7 operation?

Some of the evaluation for network data movement validation should include:

- Management of the network data stacks and fabric so that transfers are effectively lossless
- Characterization, configuration, and management of device initiators and targets, network interface cards, and network switches so they operate as one clean lossless connection from end-to-end

Once a design has been completed and software created, a multi-stage component/system validation and testing process must be completed. This process should be implemented on a long-term basis and be highly scalable. For ongoing support and new releases, the functionality and behavior of each technology piece, and the overall system, must have extensive regression testing.

As technology advances, there will be subsequent generations of components. As they are incorporated, the system must be retested with new versions of storage drives, RAID controllers, file systems, data servers, network interface cards, host bus adapters, and switches to ensure the system behaves as specified.

To put the necessary effort into perspective, here are some examples of what has to be evaluated to guarantee the performance of the system as technology advances:

- As new generations of multi-core processors emerge, the operating system has to be optimized to take advantage of multi-processing and multi-threading advances
- With new drive models, they must have performance analysis and validation, failure analysis, and special mode page handling for media usage
- Media networking needs performance benchmarking and failures analysis
- For real-time graphics delivery, a GPU has to undergo performance analysis and validation with OpenGL rendering and processing

# Services and Support

After an integrated playout system has been selected, the interaction with the supplier needs to enter a new phase. Now the supplier must deploy service expertise to effectively design and implement a system that meets business needs, and support that system efficiently over its useful life. Evaluating the supplier's capabilities in these areas is critical for realizing the benefits of the new technology, minimizing risk, and controlling total cost of ownership.

Effective system design is essential if you are to realize all of the benefits of an integrated playout system. In this step, the supplier's system architects must engage in a discovery process to gather detailed technical requirements, and then translate those requirements into a system design. An experienced system architect will ask basic questions about your requirements, such as preferred compression and bit rates, projected amounts of storage, and numbers of ingest and playout channels. A true consultative approach from best-in-class suppliers should also explore potential future expansion of the system, interface points with other systems in the enterprise, long-term data continuity planning, and total system fault tolerance. These considerations should influence the design process as much as the simple bits, bytes, and channels, which often take precedence outside of a consultative engagement.

If an effective system design is the vision, then the reality is built during on-site system implementation. Here, the integrated playout system supplier's team of project managers, field service engineers, and trainers combine to commission new systems in real-world environments. The system must be configured and tested for optimum performance, and then the users must be trained on operation and maintenance procedures.

To implement an integrated playout system, on-site support should be included from a team of product specialists who work with operations staff to ensure a successful launch. There should be initial system checkout and engineering training. On-site training for operators along with consulting with graphics/production staff to define how the on-air look is implemented—including help with initial preparation of templates and media formats—is another aspect that should be provided. Assistance for the setup of the database and operational rules in accordance with individual business needs is yet another support aspect.

Finally, customizing the traffic interface for downloading and translating schedules and for the return of as-run logs necessary for reconciliation is something that should be provided.

Every integrated playout system supplier should have these basic capabilities. For systems of greater complexity and size, such basic implementation capabilities must be orchestrated by a detailed project management methodology to control project cost, timing, and risk. In any supplier evaluation process, each supplier should be asked to explain their project management methodology, including the statement of work, project scheduling, supplier/vendor communication, system documentation, and issue tracking.

A properly designed and implemented integrated playout system can provide years of operation as the heart of a playout delivery infrastructure. However, all systems inevitably require technical support to troubleshoot failures, keep the system current with supported software releases, replace defective hardware components, and generally maintain system uptime. Potential suppliers must demonstrate their capabilities and investment in these core areas to ensure that capital investments are protected. Beyond core technical support capabilities, integrated playout system suppliers with advanced customer support infrastructure should be capable of providing high-availability services such as:

- 24/7 technical phone support
- Remote system diagnosis
- Access to continuing software releases and associated installation services
- Advance exchange hardware replacement with next business day delivery
- Field service engineering

Integrated playout system suppliers who can offer such high-availability services are able to dramatically minimize any system downtime while ensuring the profitable flow of media assets to the overall enterprise, on-air playout, and online operations. In addition, best-in-class customer support organizations are able to offer high-touch services such as dedicated technical account management, 24/7 remote system monitoring, and even outsourced engineering support.

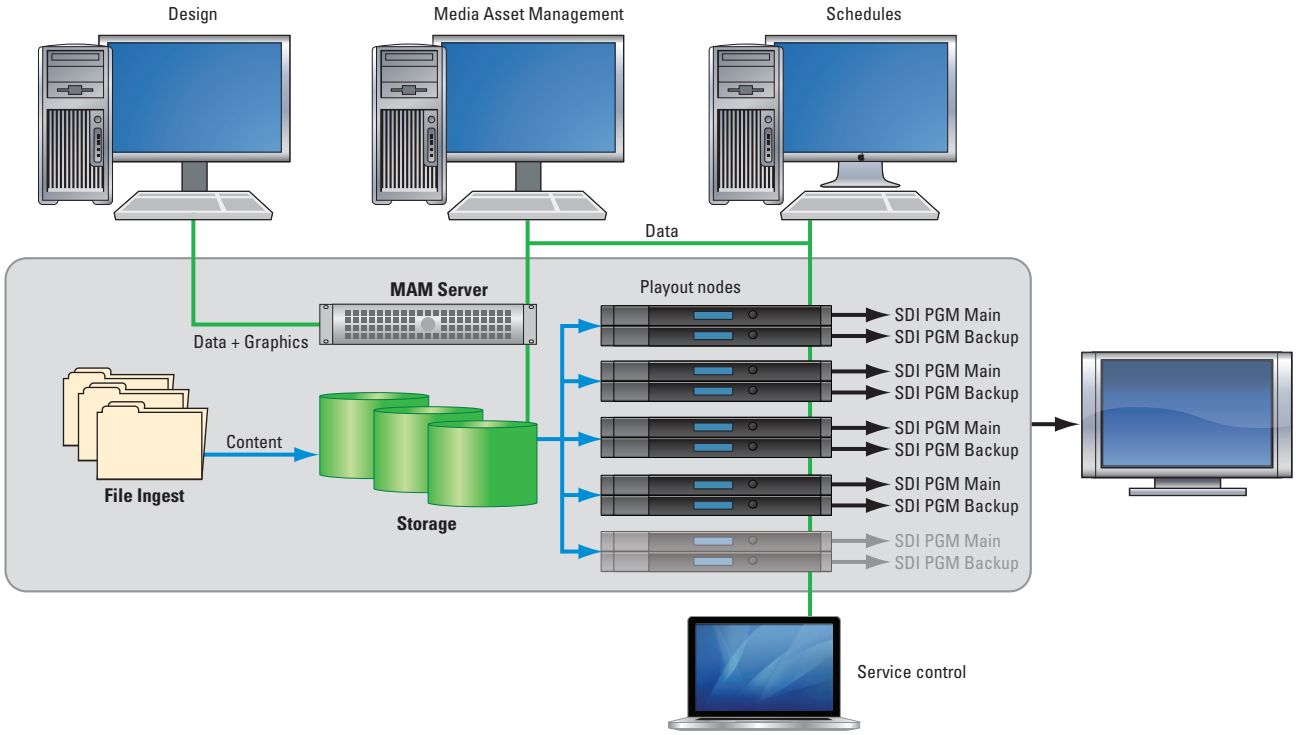
Often, these services are offered in the context of a system support agreement with prescribed response time parameters. Not only do support agreements obligate the system supplier to a specific level of performance, they also definitively control cost of ownership. A full evaluation of potential integrated playout system suppliers should include a review of their customer support capabilities, high-availability services, and system support agreements.

# Summary

Integrated playout systems offer broadcasters, especially thematic and multi-channel ones, a better way to brand and deliver television, as they represent a more reliable, scalable, and conceptually superior infrastructure for delivering broadcast workflows.

Conventional playout approaches, where programming is assembled close to playout, create unnecessary complexity and the inability to solve time-critical problems. By decreasing the use of disparate systems and streamlining workflows, broadcasters can move their entire playout process forward by days and run a much leaner playout operation.

The integrated playout system approach has as its goal the integration of asset management, playout management, graphics management, and associated broadcast functionality into a small number of IT-optimized components. It is executed in a way that is easier and more efficient for broadcasters to use, compared to a conventional playout approach. Cost efficiency is an outcome rather than a goal. By abandoning the conventional approach of delivering and branding television in multiple disparate steps, integrated playout systems hold the key to radically simplifying and improving content preparation and playout workflows in both SD and HD channels.

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