SeaChange®

CHANGING FOR GOOD

PART TWO
> white paper

DEFINING THE SCOPE OF A NEW GENERATION CMS

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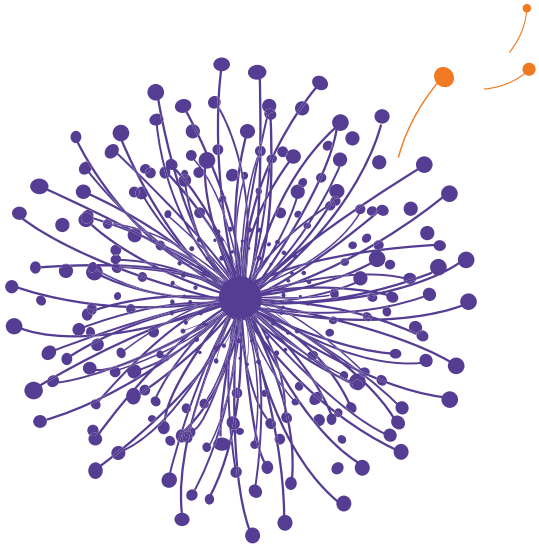


Introduction

The pay TV industry is transforming. Media companies, broadcasters and network service operators alike are looking for ways to maximize content value by leveraging the full potential of their digitized and globally interoperable operations environments.

Everyone from the smallest to the largest players recognize the opportunity to drive new revenue by delivering content that's compelling enough to capture the attention of consumers wherever they are. The challenge is to find a workflow framework in the form of a content management system (CMS) that allows them to engage whatever points of functionality they have under their control, from the camera to the end user, in the process of achieving new business goals.

This requires a new way of looking at what can be accomplished by a next-generation CMS from the media company, broadcaster and MVPD (multichannel video programming distributor) perspective—whether they are distributing content to channel distributors or to subscribers themselves.

On all sides, the challenges of finding a CMS that works across all points of connectivity requires setting benchmarks for an optimal CMS. These conditions must address both the underlying workflow architecture and the types of functionalities that should be accessible through the CMS. The new CMS must be fully attuned to enable distributors of every description to reduce CAPEX and OPEX without sacrificing the quality and management controls they're accustomed to with traditional infrastructures. At the same time, it's paramount to identify a CMS that's fully compliant with industry standards, as well as architected, so that it can be integrated with the proprietary interfaces that give it access to functionalities supported by those legacy elements.

All the trends in consumer behavior and developments surrounding broadcasters' and MVPDs' efforts to be responsive to those trends provide the foundation for defining the requirements of a new generation CMS. Essentially, the foundational workflow for asset management must allow all contributors to maintain direct control over every function that goes into making that service available to end users.

Some Context...

Before delving into the CMS specifics, there's some additional context worthy of discussion. Beyond the content and consumption trends are some parallel happenings that underscore the effectiveness of a CMS solution.

Virtualized Infrastructure

In the legacy TV environment, adjustments to support new devices and applications can take many months or even years. Operating from software and cloud-based virtualized infrastructure, it's possible to radically reduce time to market; and by creating a DevOps environment where development teams can directly tune into operational results and make whatever adjustments are necessary, it is possible to minimize disruption to services.

For example, with virtualization of middleware running on cloud infrastructure, changes in UIs, service lineups and features, such as recommendations or the introduction of enhanced information and viewing options with sporting events, can be implemented almost instantaneously. Moreover, functionalities such as pause and rewind, place-shifting from one device to another, or cloud-based DVR are software-based enhancements that can be readily accommodated on the underlying COTS processing and storage infrastructure.

The DevOps advantage will only become more vital to competitive success with the growing complexities associated with multiplying devices, new applications and new services. By one estimate, combining content sources, device types, transport and other elements into a single complexity metric, network service providers' DevOps complexity is on course to increase 400 fold over the 20 years from 2000 to 2020.[1] Another major benefit the cloud-optimized CMS will bring to the industry is the flexibility to interchangeably utilize private and public cloud resources. While some providers have chosen to anchor their entire operations in public cloud environments, most prefer to work from an in-house framework. But there are many benefits that are open to the in-house systems that can be exploited with utilization of the public cloud option in what has become known as a "hybrid" cloud model.

With a fully cloud-optimized CMS, providers will be able to tap the public cloud to accommodate the scaling requirements of an existing application, or to introduce a new type of operation that might otherwise require investment in new in-house data center capacity. An "elastic cloud" (dynamically scales up and down depending on the resources required at a certain moment in time) provides an efficient means of accommodating temporary spikes in demand for data center capacity, as often occurs, for example, with momentary surges in audiences for live events streamed over the Internet. Rather than building extra capacity to handle such instances in-house, broadcasters and service providers can utilize hybrid architectures to acquire temporary capacity from the public cloud with no disruption in operations.

[1]ScreenPlays, DevOp Mandate Sets High Bar for Automating QA in Pay TV, April 2014

Playing Well with Legacy

Along with maximizing the benefits of the virtualized cloud, the CMS also must allow users to leverage the new CMS workflow to bring legacy components into the emerging operations environment. Fortunately, the industry has established the right conditions for implementing a new generation CMS that can bridge the gap between a virtualized data center infrastructure where vital functions are implemented as software modules running on commodity hardware, and legacy environments where workflows are already in place, to orchestrate various appliance clusters in fulfillment of specific tasks.

One key element to this migration-friendly pooling of resources is the SMPTE (Society of Motion Picture and Television Engineers) 2022.6 standard that enables seamless integration between the IP and SDI (Serial Digital Interface) domains. Implementations of the standard in a new generation of vendor controllers designed to run on commodity hardware is enabling broadcasters to package and send SDI signals over IP networks, ensuring that legacy SDI-based workflows can be brought into the IP-optimized CMS workflow.

Similarly, in the contribution and distribution domains, MVPDs and broadcasters are able to utilize a new generation of high-density transport stream gateways that convert ASI (Asynchronous Serial Interface)-based transport streams for delivery over IP links. This facilitates cross-platform management of content for a wide range of applications such as broadcast contributions, studio-to-studio media exchanges, in-house signal distribution and routing, post-production and live event coverage.

New Consensus on Interoperability

More generally, the broadcast industry has undertaken a wide range of interoperability standards to ensure that one of the key benefits of working in the virtualized IP content management environment, namely, avoidance of vendor lock-in, is realized. Most recently, protocols developed by SMPTE, the Video Services Forum (VSF), the European Broadcast Union (EBU) and the Advanced Media Workflow Association (AMWA) have been pulled together under the auspices of the Alliance for IP Media Solutions (AIMS) with broad industry support to achieve interoperability across all functions touched by the IP transition.

Significantly, AIMS has aligned with the International Association of Broadcast Manufacturers (IABM) to support that organization's Industry Collaborative Groups initiative, which is meant to give a seal of approval to ad hoc and formal groups that are supportive of IABM-endorsed standards. All of these activities have made it possible to develop a comprehensive CMS that will remain viable as new products are introduced into the content management workflow.

Challenges

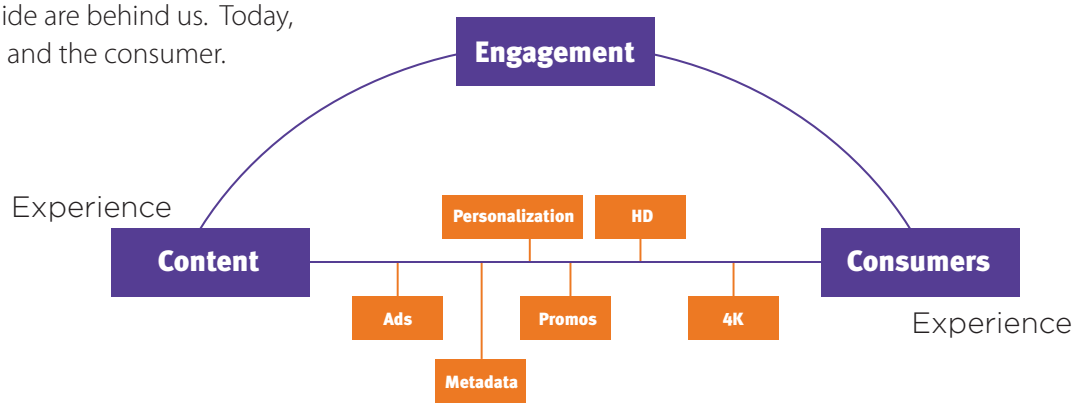
Traditional MVPDs are faced with challenges in bringing together what were disparate aspects of their operations under a unified CMS workflow. Until now, the transition to IP-based software technology for video processing in new data center headends was running on a track separate from the transition to cloud-based approaches to managing subscriber experience. Now, headend-based video processing and the management of the subscriber experience are becoming intertwined in a virtualized multi-layered private cloud environment that, with the right CMS, will allow operators to fully engage in a video entertainment marketplace that runs on Internet time.

Also significant from the standpoint of long-range implications for the CMS workflow, some networks' direct-to-consumer strategies, rather than replicating their pay TV channel offerings, involve use of their content assets to develop new brands designed to appeal to online viewing tastes. Some of these efforts are targeted to niche interests; others are for mass audiences but with a flair that is quite distinct from traditional TV content.

These strategies require a master workflow that supports an end-to-end, highly automated operations environment starting with original production and extending through all aspects of post-production, content and metadata management and support for all the functionalities tied to playout to distributors and direct streaming to consumers. With this workflow in place, directors, producers, editors, engineers and operations managers of every description can have dashboard access to all the functionalities pertinent to their responsibilities.

Content & Consumer Driven—Setting CMS Parameters

The days of the TV guide are behind us. Today, it's about the content and the consumer.



Everything that happens between the content and the consumer is what makes it a great (or sometimes not so great) experience. And great experiences keep consumers engaged.

A new generation cloud-optimized CMS can give providers the ability to respond at unprecedented speed to the needs of a dynamic, ever-shifting marketplace. Decision makers must quickly find CMS solutions suited to meeting immediate needs revolving around the integration of production and post-production infrastructures. At the same time, they must ensure the workflows they choose have the versatility and scalability essential to exploiting future business opportunities.

Changing Consumption Trends

It's no secret that consumers are watching increasing amounts of video content, and they are doing it when, where and how they want. There are many factors at play feeding these new models, including increased access to bandwidth, availability of, and interest in, long-form video on all devices and a growing role for live TV in OTT video.

No longer is it about what's on at 8pm on Thursday night—content needs to be available where and when consumers want it. They are driving consumption and, in order for providers to stay relevant, it's important that a CMS addresses these new models as well as those that will emerge in the future.

Platform Requirements:

Time-shift modes – The CMS must support all time-shift modes and be able to activate in response to user commands all the mechanisms the provider has established for time-shifting content, including trick-play, start-over, catch-up and network DVR.

Blended service navigation – Depending on the content distribution model, it may be extremely important that the CMS support aggregation of content options from third-parties for user access on the provider's user interface. A one-stop shop for content is going to make any service more valuable to the consumer.

Seamless shifting of user sessions across devices – The platform must be able to support persistent access to content as the user moves from one device to another. This means the system must track the user's place in the video experience continuously throughout the session, including what apps or actions are in process, with the ability to synchronize all functionalities with the transition to another device.

Content

Content is the key to consumer experience. The sheer amount of content available today is astounding. Being able to manage and keep track of that content will continue to prove a massive challenge and as number and variety of devices and consumption models grow, it will become increasingly important to be able to ensure availability of content, without violating content rights or unnecessarily minimizing the availability of the content.

Further, being able to enrich the content with metadata from multiple sources will not only support new search paradigms but will make each piece of content more valuable.

Platform Requirements:

Rights management and content protection – The workflow platform must keep an inventory of all the rights associated with all the assets and make sure those policies are accurately embodied in whatever protection mechanism, including DRM, forensic watermarking and fingerprinting or conditional access, is assigned to each content stream.

Blended service navigation – The CMS must support aggregation of content options from third-parties for user access on the provider's user interface.

Content lifecycle management – As rights management and content protections are important for in-app viewing, content lifecycle management for allowing and managing electronic-sell-through (EST) /download-to-own (DTO) content is equally important.

Content provider content restrictions – The CMS must be able to support and adhere to content provider contract restrictions like minimum sales prices for content as well as network and device restrictions.

Enriched metadata – The enhanced metadata not only supports content-driven user experiences, but also provides the backbone to support the most effective search and recommendations capabilities.

Personalization/Quality of Viewing

And, the content should be personal and look great, regardless of the environment. Seamless, consistent, quality experiences are expected, and nothing less.

Platform Requirements:

User authentication – The platform must be able to draw from provisioning, authorization and policy management systems to associate each individual with authorized service subscriptions and usage policies in order to enable a single point of initial registration and ongoing sign-in for all apps and services within each user's account. And it must be able to continually update the information to manage the user's profile, subscription associations, usage patterns and policies in order to manage each user's experience through the life of the subscription.

Support for personalization – The CMS must be able to leverage existing BSS/OSS and other sources of user information to enable fulfillment of personalization policies set for each type of usage environment on a per-session basis while at the same time stitching together all the content and applications elements that comprise the personalized user experience, including the ability to personalize catalogs based on viewing behavior.

Content Curation

Content catalogs need to be dynamic in order to convey freshness, relevance and personalization. Given the volume of content, number of devices and rights management across those devices, this is no small undertaking.

Platform Requirements:

Dynamic catalog creation and management – Dynamic catalogs, which are populated with content upon user request, are critical. In this way, you deliver personalized catalogs taking

into account the viewing and purchasing behavior of the subscriber. Next to this, the CMS needs to facilitate automatic filling of catalogs at content ingest and distribute these catalogs to other systems.

Support for flexible use of internally archived content – With threads connecting all storage locations and modes, the CMS must support discovery mechanisms tied to cataloged descriptors that will allow managers to spin up new aggregations of content for specific niche or more general interests, pull clips into non-linear editing systems for inclusion in new programs and create real-time complements to live broadcasts, such as a video of a sports star whose record has just been broken in a live game.

Transactions/Monetization

It's not enough to just be able to deliver the content in a compelling way; it's imperative to also accelerate revenue. No matter the model, integrating support for dynamic advertising and promotions will extend the content experience if done in a personal and compelling manner.

Platform Requirements:

Support for dynamic advertising – Utilizing the individual user data amassed for the personalized service, including data describing user characteristics, tastes and type of device employed with any given session, the CMS must be able to communicate with ABR manifest packagers and legacy service ad placement systems to implement addressable and interactive advertising on a per-user basis. And it must have an embedded quality-assurance capability that validates that the ad is formatted and placed as required by the ad management system.

Monetization through promotions – The CMS must provide the resources necessary to appropriately market content and present compelling offers to increase content sales and help drive subscriber engagement and satisfaction.

Flexible, Scalable, Interoperable Solution

Looking beyond the consumer and content requirements—the "experience"—there are a host of other must-haves to make this all work. The solution itself has to be able to adapt and accommodate all the other requirements, either alone or in conjunction with third-party solutions.

Platform Requirements:

Virtualization-compatible architecture – The CMS must be architected to work in a federated cloud environment where workloads can be migrated from one processing environment to another across private and public domains in rapid response to changing needs. To enable content management across the virtualized architecture, the CMS must be able to make software abstractions of all the functionalities—signaling, insertion, metadata, transcodes and

GREAT EXPERIENCES KEEP CONSUMERS ENGAGED

other manipulations—and stitch them together for each service scenario.

A multi-user management console – All personnel involved in any function tied to the CMS must have access to control of those functions through the CMS management console based on specific usage authorization policies.

CDN management – With multiple CDN options at distributors' disposal, the CMS must be able to tap into mechanisms tracking CDN performance in real-time to ensure that each content stream is directed to the best performing CDN among the CDN options available to the provider in each user's location.

Support for fast deployment of new applications from internal and outside developers – The platform must be able to leverage standard interface protocols to integrate new promotions, third-party consumer product offerings, social features and any other type of application while enabling them to leverage the platform's data and functionalities to support specific personalization features.

Addition of new devices to the workflow – The CMS must be able to automatically engage all functionalities essential to incorporating new device form factors, OSs, DRM requirements and other parameters into the workflow.

Support for B-to-B transactions – The workflow system must serve as the processing center for collection and transfer of the usage data that back office systems use to confirm policy enforcement and payments of royalties, licensing fees and other costs incurred in relationships with other businesses.

Dynamic, Automated Workflow

And finally, although certainly not last nor least, there has to be a process for getting from content to consumption. Media companies, broadcasters, and network service operators all need to be able to manage and control the content workflow in order to accomplish their goals—while automation is key, rules, workflows and quality assurance all play a major part as well.

Platform Requirements:

Automated ingestion of content and metadata – With content flowing in from myriad sources, it's essential that the CMS support automated ingestion of that content and related metadata in accordance with system mezzanine storage and cataloging policies, and with application of quality assurance measures ensuring content conforms to all stipulations set by the receiving party.

Automation of all processes across all application workflows – Managers must be able to develop new and connect existing application-specific workflows against a frame of reference that brings them into conformance with the CMS. New sub-workflows can be built by assigning specific elements from a catalog of functions incorporated into the CMS while existing workflows can be defined in terms of existing or newly-created, cataloged functions.

In all cases, once incorporated into the CMS, sub-workflows can be activated by simple commands on data center servers through the CMS portal with assignment of specific policies for how they are to be applied. Managers are thus able to configure automated activation of processes based on chosen parameters, such as whether content is live or ingested for storage, whether it is interlaced or progressive, how many channels of audio have to be managed, the aspect ratios and adaptive rate formats employed with receiving devices, whether or not loudness correction is required on ad spots in the program stream, whether there are language tracks to be kept in sync with the source, whether metadata should be overlaid or embedded in the content stream, just to name a few of the many details requiring attention.

Built-in monitoring and troubleshooting – The CMS must support automated monitoring of every element on the primary and ancillary workflows in real-time with the ability to identify any point where malfunctions or bottlenecks are affecting operations and to automatically perform load balancing on transcoders, splicers and other elements as needed. The system must also be able to provide readouts on system performance over time with the ability to identify how any particular asset is passing through the system with analysis of all variances such as how much time is consumed in processing.

Video processing for playout – The CMS must support guaranteed and secured distribution over any type of video infrastructure, with delivery of each program in conformance with the encoding stipulations of affiliates.

Video processing for distribution – The workflow management system must support transcoding on individual audio and video tracks to fit all device parameters, as well as nuanced processes such as conformance of content to 4K UHD, HDR and VR formats supported by user devices, application of text overlays, closed captioning, language translation mechanisms and audio normalization to prevent volume fluctuations between ads.

Conclusion

From content through to consumption, a CMS is vital to ensuring providers can get the right content, in the right format, in front of consumers when and where they expect it, and truly deliver the experience that will continue to engage.

Baseline requirements for a CMS that can address the content and consumption trends include:

- Support for automated ingestion of content from any source with automated aggregation and cataloging of all relevant metadata, both at the time of ingestion and as new data is added over time, for ready access by search and recommendation engines and other mechanisms that enable personalized feature enrichment. The system must be able to apply quality control and policy enforcement processes to ensure assets are fully compliant with system and content provider parameters and restrictions, while automatically accessing mechanisms that can be applied to make needed corrections.

- Steering content through all the processing in accordance with business rules encompassing the multiple ways that content can be configured and grouped to support service models. This includes managing all encoding and transcoding operations across live and file-based content and engaging mechanisms that support time-shift modes from instant trick-play functions to catch-up and cloud DVR.

- The workflow must encompass and, to the greatest extent possible, automate all the steps involved in providing various forms of content protection, from conditional access to digital rights management (DRM) and watermarking.

- Through interconnectivity with all back office, metadata, advertising policy and other relevant sources of user data and rules governing placement of ads and content features, the CMS must be able to drive the stream packaging and manifest manipulation mechanisms required to enable delivery of content to every device with personalized features and support for dynamic ad insertion as needed.

By setting expectations to answer these essential capabilities, users will be able to ensure that the CMS workflow they implement today will serve their needs for a long time to come, no matter what new approaches to utilizing their assets they may want to implement in the years ahead.

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12.15_2016