

White Paper

# Dell EMC: Enabling the Digital Era in Media and Entertainment

Transforming Media and Entertainment with End-to-end Infrastructure

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## Executive Summary

For many industries, digital transformation presents a future opportunity, an aspirational model for how a firm wishes to conduct business and interact with its customers. For the media and entertainment industry, however, digital transformation has become an everyday reality. In the past several years, technological innovations have not only fundamentally altered the business but have also democratized content creation and delivery. New content-creation firms continue to emerge, disrupting the competitive landscape. As just only one of multiple recent examples, Apple announced this year that the company has allocated \$1 billion dollars to procure and produce original media content.<sup>1</sup>

It is not just the creation of content that has changed; the consumption model for media also has been fundamentally altered. The days of audiences sitting on the couch watching a predictable schedule of broadcast television are quickly eroding. The mobile device, once called a phone, is quickly growing as the display of choice. According to Nielsen's Comparable Metrics Report on the average audience composition by platform for ages 18-34, the score for smartphones (28%) was nearly identical to that of television (30%). In other words, this highly desirable demographic is already nearly just as likely to be viewing content on a mobile device as they are on a television.<sup>2</sup> The most dramatic industry change, however, may be the evolution of audience expectation. Media is becoming less appointment viewing, and more viewing whenever and wherever the audience desires. The expectation is on demand.



All three of these transformational elements—the democratization of the market, the rise of the mobile device, and the expectation for on demand—have arisen thanks to the transition away from film to digital media. While the transition away from film to digital media offered early efficiency gains, those benefits have already become established parts of the competitive landscape—no longer opportunities, but rather expectations. In the digital era of media and entertainment, firms must look toward technology

not as a new opportunity, but as a necessary engine of the media industry where success is often decided by how efficiently that engine can be leveraged.

A core tenet of a digital industry is that IT capability transitions from a necessary, but altogether ancillary, expense to a chief enabler of revenue generation. As a result, firms that wish to thrive in this new digital media entertainment industry need to develop new skills sets, and one IT innovation leader helping media firms understand this new landscape is Dell EMC.

## ESG Research into the Priorities in Media and Entertainment

To achieve a deeper understanding of the role that IT investment plays across multiple industries including media and entertainment, ESG recently conducted an in-depth research study on IT spending priorities.<sup>3</sup> The study covered 641 IT professionals representing midmarket (100 to 999 employees) and enterprise-class (1,000 employees or more) organizations in North America and Western Europe. All respondents were personally responsible for or familiar with their organizations' IT spending and their 2017 IT budgets. As part of this study, ESG asked IT decision makers to identify the top three considerations that those IT decision makers believe are most important when justifying IT investments to their

<sup>1</sup> Source: The Wall Street Journal, [Apple Readies \\$1 Billion War Chest for Hollywood Programming](#), August 2017.

<sup>2</sup> Source: Nielsen, [THE NIELSEN COMPARABLE METRICS REPORT: Q4 2016](#), May 2017.

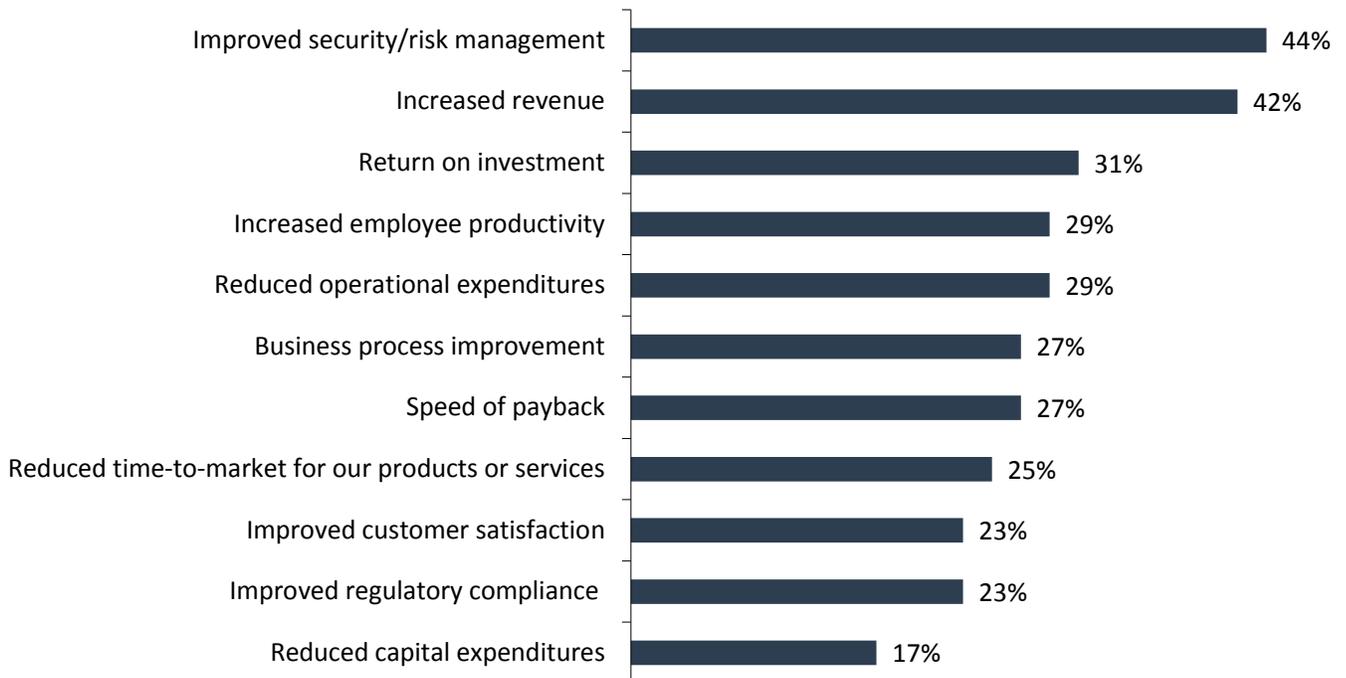
<sup>3</sup> Source: ESG Research Report, [2017 IT Spending Intentions Survey](#), March 2017. All ESG research references and charts in this white paper have been taken from this report.

business management team. The results presented in Figure 1 are for those IT decision makers who also identified their business as residing in the communications and media industry.

The top two most commonly identified responses were improved security and risk management (44%) and increased revenue (42%). Improved security/risk management being the most often cited is no surprise; it was also the most commonly identified response when results included all the industries in the study. Additionally, with the prevalence of malicious attacks over recent years, the desire for improved security and risk management is a logical industry response. The second most commonly identified answer for communications and media firms, increased revenue, however, presents a departure from the combined results with the other industries included in the study. The justification of improved revenue was the fifth most commonly identified response when all industries were included, with only 27% of IT decision makers identifying it as a top three IT investment justification. One plausible rationale for this disconnect is that firms in the communications and the media industry see a more direct correlation between increased IT investment and improved revenue opportunity.

**Figure 1. Most Important Considerations in Justifying IT Investment in the Communications and Media Industry**

**Which of the following considerations do you believe will be most important in justifying IT investments to your organization’s business management team over the next 12 months? (Percent of communications and media respondents, N=48, three responses accepted)**

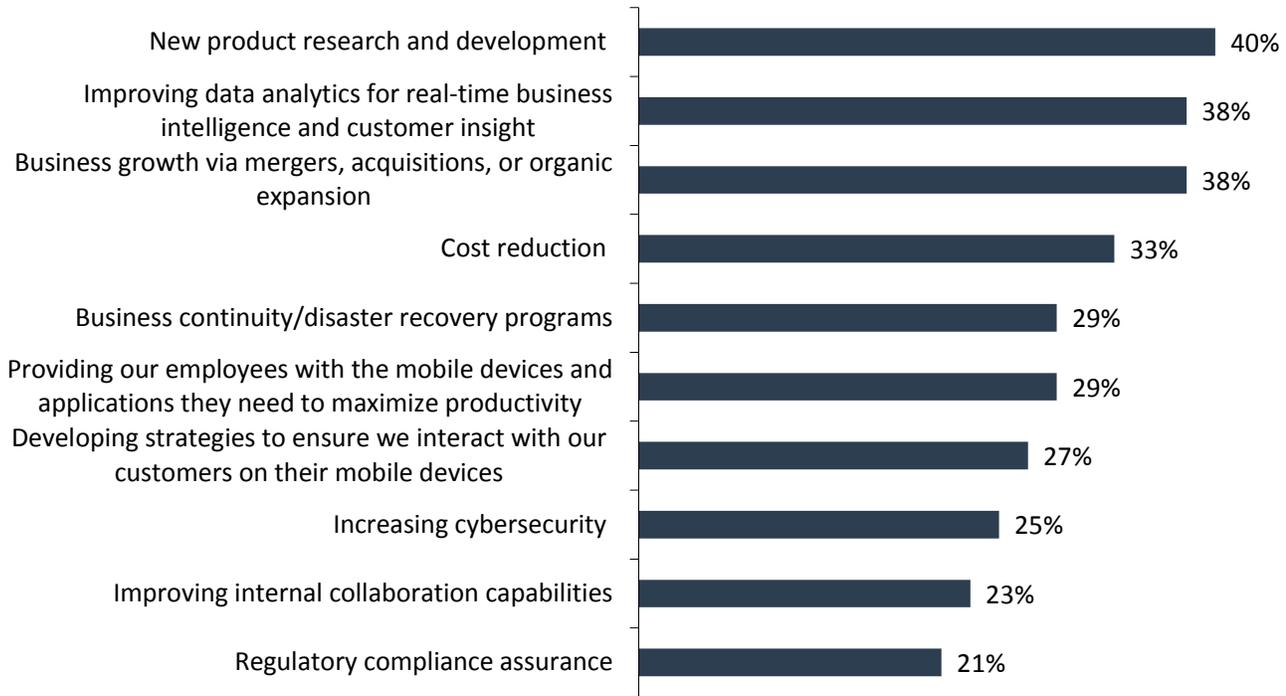


Source: Enterprise Strategy Group, 2017

Also as part of this study, ESG asked IT decision makers to identify the top five business initiatives driving technology spending in 2017. The results in Figure 2 are for those IT decision makers who also identified their business as being in the communications and media industry. These results also support the direct correlation between IT investment and revenue opportunities, as the most commonly identified initiative for communication and media respondents was new product research and development (40%). As a comparison, when the results are expanded to include all the industries that participated in the study, the new product research and development response drops from 40% to 27%.

**Figure 2. Business Initiatives Driving Technology Spending in the Communications and Media Industry**

**Which of the following business initiatives do you believe will drive the most technology spending in your organization over the next 12 months? (Percent of communications and media respondents, N=48, five responses accepted)**



Source: Enterprise Strategy Group, 2017

Also potentially revealing some industry-specific insight, the third most commonly identified response for IT decision makers who also identified their business as being in the communications and media industry was business growth via mergers, acquisitions, or organic expansion (38%). This response was the eighth most commonly identified response when the results included all participating industries, with only 22% of IT decision makers including it in the top five responses. This result suggests that in relation to other industries, organic and inorganic growth opportunities in the media industry are driving needs to invest in and possibly rethink IT infrastructure.

When combined and compared with the larger sample size, these results suggest a deep connection in the media industry between IT investment and revenue opportunities. As this connection fuels further IT investment, the importance of optimizing the IT architecture design becomes ever more important. Inefficiencies that were once small—such as an extra few copies of content, multiple disparate systems, or performance issues that delay production efforts—become substantial burdens. In response, media and entertainment firms need to rethink not only the role of technology but also its place in the overall cost structure of business.

### The Resulting Economic Truths of the Digital Media Transformation

With the transformation to digital, the media and entertainment industry has become a technology industry built upon digital products, digital workflows, and digital-based economics. Understanding how to build a framework for success in this digital era requires internalizing three core concepts: data has mass, data is more costly to move than to store, and advances in IT innovation have shifted the cost paradigm.

## Data Has Mass

As the media industry strives for greater realism, with higher resolutions, greater depth, richer colors, and more computer-generated elements, the amount of digital content created increases, which results in higher capacities and higher costs. To help educate the industry, multiple tools have emerged to help calculate how changes in resolution, frame rate, color depth, and compression ratios translate into capacity increases. For example, 2K video shot at 24 frames per second can generate 120 GB per hour, even with 5:1 compression. When increased to 4K at 24 frames per second with the same compression, the camera generates about 470 GB per hour.<sup>4</sup> What matters is not the 470 GB per hour; it is the fact that the shift in resolution generated a four-fold increase in data. Assuming everything else in your IT infrastructure remains constant, the cost of storing, protecting, and securing all this content just increased to four times the original number. And while higher resolution content is definitely desirable and necessary competitively, audiences are not going to pay four times the money to view it. Producing tomorrow's content with yesterday's resolution, however, is a losing strategy.

What media firms can do is optimize the IT infrastructure that stores and protects that data. Inefficient IT architectures leverage incremental copies to ensure the necessary level of data access. The four-fold increase in data capacity to support the next-level resolution is a competitive necessity. Multiplying that capacity, however, with extraneous copies is a waste of money and resources. If you want to know how efficiently your IT infrastructure stores content, count how many data copies are held at any given time.

## As Costly as Data Is to Store, It Is More Costly to Move

While the size of digital content is its own concern, the cost of media content is further exacerbated when that data has to move. Media and entertainment has become a multi-site global industry driven through mergers and acquisitions with outsourcing, or through tax incentives. For example, one Dell EMC Customer, *Animal Logic*, created and rendered a series of VFX feature projects in Vancouver, Canada and Sydney, Australia, with studio reviews taking place in Los Angeles. To take advantage of exchange rates and tax credits, facilities now must have a globally distributed presence, but this distribution adds cost.

For example, sending 100 hours of 4K video can take days or even weeks based on the connectivity. The fastest way to send digital content at that point may be to physically ship the data with the infrastructure packaged as well. While the extreme cases where data has to move across geographies delivers obvious cost increases, data movement within sites can often be overlooked. For example, if content has to move to one infrastructure type for the artists to access and then to another to be finalized, each of these movements can add hours or days to precious development time.

## The Cost Paradigm Shift: People Are Expensive

While the first two digital media cost drivers, capacity and data movement, are real and must be comprehended by any digital media business, the IT industry continues to deliver innovations to help mitigate the cost of IT infrastructure. While the capital cost of equipment is still a significant line item, IT infrastructure, if architected and deployed incorrectly, can dramatically increase the cost of possibly the largest budgetary item, the personnel.

High-quality visual effects have become an expectation of late, and artists' time costs money. Similar to the costs of digital capacity, some amount of time and cost is expected and unavoidable when it comes to personnel; however, if the IT infrastructure design delays providing the necessary content to artists or editors, these inefficiencies result in substantial unnecessary expenditures. How much budget and time is lost while highly paid talent is paid to wait for files to copy?

Ultimately, there are three basic rules to optimizing digital media and entertainment operations in regard to the IT infrastructure:

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<sup>4</sup> Source: [www.red.com](http://www.red.com), *Recording Time*.

1. Optimize the amount of copies of data stored.
2. Minimize the number of times data moves from one location (or system) to another.
3. Measure and reduce the amount of time that talent waits for access to content.

These three rules do not measure everything, obviously, but they provide a high-level guide to understanding how to eliminate waste and drive cost efficiency within the business. Addressing these three rules can be done with the right IT infrastructure design—one that takes a holistic approach to address the needs of the entire business versus one that has emerged piece-meal in disparate deployments over time. To better understand these costs and how to identify and then mitigate them, it is important to focus on each of the three major facts of digital media, content creation, content management, and content delivery.

## The Impact of Digital Transformation on Creation

When articulating the impact that digital technology has had on the media content creation, do not look any further than the camera. The use of digital flash recording media inside the camera is the new norm. Directors can have instant verification of the shot without waiting for the film to be developed, and digital media, unlike film, can be reused.

Recording in the highest resolution, such as 4K or 8K, not only captures content in the clearest and highest resolution available, but also allows post-production editing of the content to be done without impacting the quality of the image. Manipulation work such as cropping, resizing, or stabilizing can all be improved. These transformations, however, alter the interaction or IT resources and the content creation process in a couple of noticeable ways.

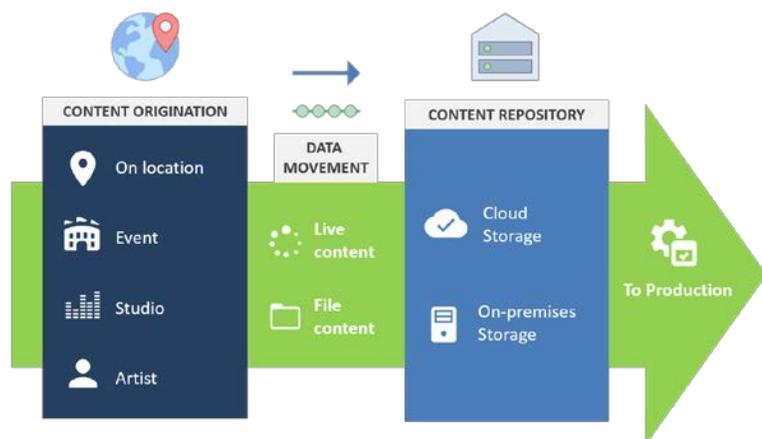
- **Digital media can be reused, so why not use it?** The benefits of instant gratification whether in the studio or on location as well as the ability to reuse media has increased

the amount of content generated at capture to ensure editors and artists are provided maximum flexibility in the addition of visual effects or editing in the post-production. The increased amount of content adds to the cost of the infrastructure that must be housed on location and increases the time it takes to move that content across sites for manipulation.

- **Location. Location. Location.** Content creation in a studio is one consideration, but shooting on location or at an event presents another challenge entirely. The right amount of infrastructure must be available on-set to deliver the necessary capacity and compute resources for everything that needs to take place on-set, but then all that content typically needs to be sent to where the post-production work is completed. Based on content and location, the ideal solution may involve anything from physically shipping the assets to leveraging public cloud infrastructure. Even when capture is done in studio, the artist resources can often reside elsewhere.

Solving these challenges requires IT infrastructure that can closely integrate the edge (the work done on-set) and the infrastructure that supports post-production and digital assets management. Solutions that can ease the movement of data, span multiple locations, and ensure that data loaded on-set is automatically propagated to a centrally accessible

### CONTENT CREATION



repository speed up the production process and reduce the time to revenue for these newly captured digital assets. Optimizing the data storage and movement is critical because at higher resolutions that increase data sizes by a factor of four, each extraneous movement or duplication can be four times more costly and possibly take four times as long.

## The Impact of Digital Transformation on Management

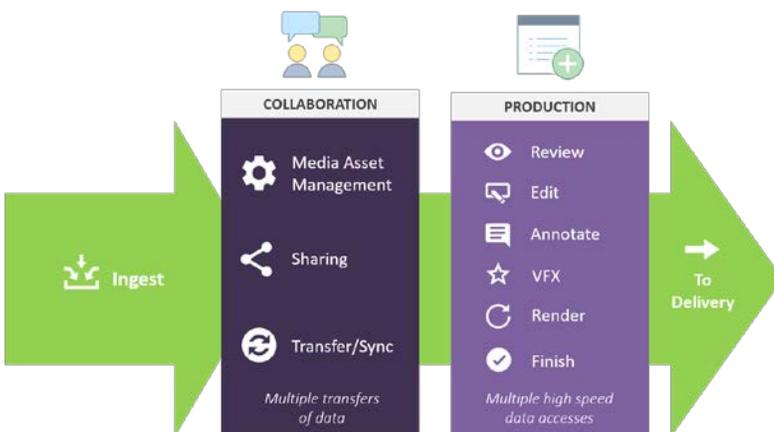
The days of vaults filled with reels collecting dust are quickly vanishing. Archives are no longer physical. They are virtual, with digital assets stored electronically. The goal in this transformation is two-fold: to better protect these valuable assets while improving the speed/ease at which those assets can be leveraged to generate revenue.

Two high-level issues:

1. The different applications involved with the content development and management processes have different requirements and access data in different ways.
2. Historically, digital storage infrastructure had to be optimized to one specific workflow.

At a high level, when content flows into a media asset management (MAM) infrastructure, it is a sequential flow of large files of raw data. When dozens of artists then work on those assets to add in visual effects, the workload changes dramatically. Instead of one single massive data movement, dozens or possibly hundreds of individual workstations are all accessing, editing, and modifying the same set of content. After the work is completed, the access changes again back to a sequential movement of large content. And when the data wasn't being manipulated or moved, it is placed in an archive, typically leveraging tape media.

### CONTENT MANAGEMENT



Why do all these changes matter? Each of the changes in requirements, access type, protocol, and performance can result in a separate infrastructure deployment. Each of these disparate infrastructure silos adds cost. Each movement across these silos adds cost and takes time. If we were to design the optimal infrastructure for this era of digital media production, it would not include the disparate silos; it would deliver the following characteristics:

- **Optimization for time rather than capacity alone:** Price declines and capacity increases in both solid-state (aka flash) and hard drive disk storage have altered the data storage equation. The price of tape capacity and hard disk capacity are near equivalent. So the infrastructure savings of tape are nowhere near as beneficial as they once were. With a digital transformation of the media industry, the new primary cost driver is time. The time it takes to locate and identify, then write tape, and then move the data onto active infrastructure has costs. Additionally, no digital storage media type is infallible; in order to ensure that data remains uncorrupted on tape or on disk, periodic validation checks are necessary. With tape media, it can be easy to neglect this necessary but manual and resource-intensive step; with modern disk infrastructure, this validation and any necessary repair is automatic.
- **Speed and flexibility in serving/processing the data:** Different activities access data in different ways. When an artist builds the 3D geometry or adds digital light to a scene, the data accesses are small and random. Finalizing the

content, however, requires a very different access type and has performance requirements. Specialized infrastructure that serves only one specific need, but lacks the flexibility to adapt to the demands of the entire project, creates too much expense as data must be stored on multiple systems or be moved back and forth. Modern architectures that leverage flash storage can deliver substantial improvements to high-performance parallel workflows, while simultaneously supporting sequential access. In other words, data access no longer slows down the work. This demand for flexibility is true for performance and for accessibility. Does the application require NFS, S3, or a custom API? The answer isn't to select multiple systems for each specific demand; the answer is to select an infrastructure that makes the question moot by supporting them all.

- Consolidated infrastructure:** To keep IT infrastructure costs under control, the media industry has traditionally leveraged large capacities of low-cost storage media, such as tape, only to perform a time-consuming migration process to higher performing infrastructure when the data was needed. Modern IT infrastructure can deliver each of multiple storage cost and performance points in the same flexible infrastructure. Resources do not need to wait for data to move from one location to another to start the next process in the workflow. Each minute, or hour, of delay that it takes for content to be ingested, moved into the asset management infrastructure, or transferred to the content delivery network adds cost and delays revenue.

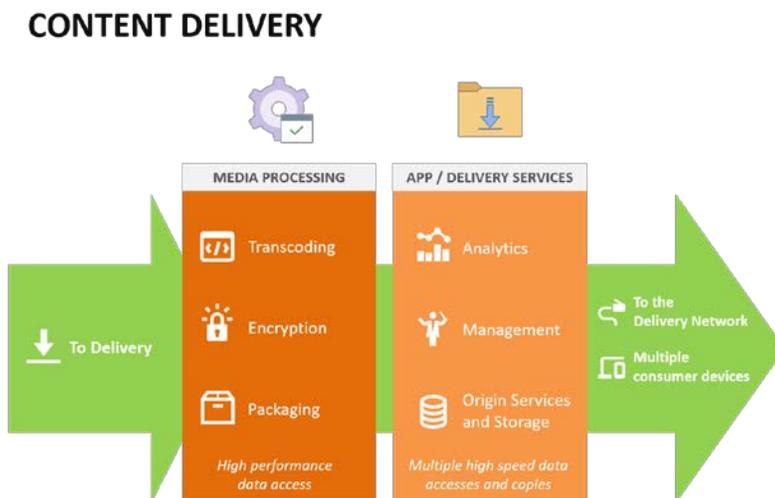
With an ever-evolving landscape of media formats and desired delivery models, the efficiency at which the business can quickly identify and access the right content, edit it, layer in the necessary effects, and transcode it to the right format and then deliver it to the right content delivery service, whether traditional or over the top (OTT), directly influences profitability.

### The Impact of Digital Transformation on Delivery

The dominance of the predictable broadcast schedule is quickly giving way to a new rising crop of on-demand services. At a high level, this change offers a wonderful opportunity. With more content accessible, there is more revenue to be generated. Similar to content creation and content management, capturing this opportunity demands changes in the infrastructure design.

The introduction and adoption of on-demand content introduces two key challenges:

- Unpredictable access:** The sheer increase in volume of content available via on-demand services creates an obvious strain on infrastructure, but the unpredictability adds an increased degree of difficulty when packaging and managing content to be delivered.
- Unpredictable delivery:** The shift is not only the dramatic rise in media available for consumption, but also the variety of modifications and optimizations needed to deliver media content to every screen type. Mobile devices are quickly becoming a format of choice, but they are only a handful of the formats being used to consume content.



The central theme of these challenges, of course, is unpredictability. Unpredictability in access demands more capacity to store and make available larger catalogs of content. The unpredictability in delivery results in greater and more powerful compute resources needed for high-parallel transcoding services, as video conversion is typically computationally intensive

and multiple simultaneous transcoding jobs are the norm. One additional means to help address the unpredictability, other than throwing more resources at it, is analytics.

## The Necessity of Analytics

The application of analytics offers a necessary tool for understanding content data access patterns and format demands. These insights can help ensure that necessary resources are applied to the right workloads, reducing the overall cost of infrastructure. Enabling timely insights, however, demands an infrastructure that can deliver the following:

- **Multi-workload (multi-protocol) accessibility:** Demands can vary, and in some cases, it is not desirable to run analytics on active content. An infrastructure, however, that delivers multi-application accessibility with support for a large variety of protocols and APIs simplifies and reduces the costs of deploying analytics workloads.
- **Performance headroom to apply analytics:** Adding analytics necessitates additional compute cycles. When these cycles are not contemplated as part of the design, they can add to infrastructure costs. The more performance-optimized the infrastructure, the more efficiently insights can be obtained without costly capital deployments.

Optimizing the infrastructure in response to the rise in unpredictability can require scaling up data storage capacity and compute performance. Unfortunately, simply throwing more hardware at this challenge is a losing battle. Any inefficiency in infrastructure design simply increases as the infrastructure scales. Solutions that can address these complexities enable capacity to scale seamlessly as demands grow without adding new disparate frames of infrastructure, while simultaneously adding the performance necessary to overlay analytics.

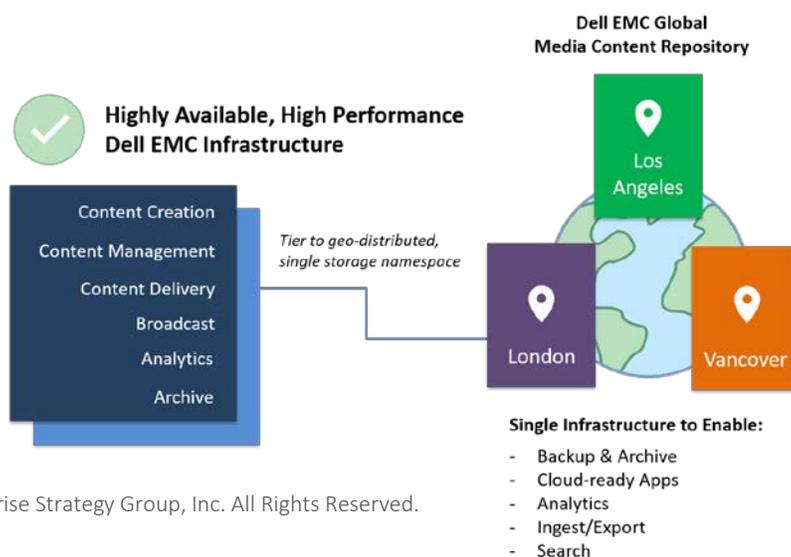
## The Dell EMC Difference

Two overarching models of infrastructure design are common in the media and entertainment industry. The first model is an emergent one. In this scenario, each IT infrastructure decision is made in isolation often focused on a specific application. This model can be efficient early on, but as projects grow, the sheer volume of equipment to budget for, manage, and maintain becomes unsustainable. With this model, there is little overlap of infrastructure capabilities. Every time content is required to switch workloads, the data must be physically moved. These complexities are further increased when a firm undergoes multiple acquisitions, serving to increase the hodgepodge of infrastructure design. Ultimately, the emergent model is unsustainable.

The second infrastructure design option offers an ultimately more efficient answer. By leveraging a leader in IT technology with a broad portfolio of optimized hardware, software, solutions, and services designed for media and entertainment, such as Dell EMC, firms can consolidate deployments when possible to eliminate unnecessary data copies and dramatically simplify infrastructure management and maintenance.

These solutions automate necessary data transfers and eliminate unnecessary ones. Dell EMC offers a variety of capabilities specifically optimized for the media and entertainment industry, including:

- **Established industry expertise:** After the acquisition, both Dell and EMC continue to build on their strong histories and expertise in



deploying infrastructure for media and entertainment. For example, Dell EMC's Isilon Storage portfolio has been a leader in data storage infrastructure for media and entertainment environments ever since the technology got its start serving visual effects workloads over 15 years ago. Now, the combined Dell EMC offers a much broader portfolio and still continues with the same mindset in services, support, and close relationships with application vendors and partners that helped build its Isilon business.

- **An end-to-end IT infrastructure portfolio:** The combined Dell EMC delivers a wide array of IT technology options, including servers, storage systems, networking, workstations, and even 4K displays. For enterprise data storage, Dell EMC offers multiple product lines, each designed to support massive scale media and entertainment content environments, such as Isilon and Elastic Cloud Storage (ECS). Both technologies are designed to work together and offer multi-protocol support to enable the consolidation of multiple applications on one platform while presenting a massive scalable pool of content storage that can span multiple tiers of performance as well as multiple geographies.
- **A rich portfolio of services and application partners:** Dell EMC's close partnership with VMware enables the IT leader to deliver a wide array of virtualization solutions as well as converged and hyperconverged infrastructure options. With Pivotal, Dell EMC can help any media and entertainment firm build out its cloud-ready application development capabilities, whether for better analytics, more cloud-centric capabilities, or other custom application needs. Dell EMC also offers other services specifically suitable for media and entertainment, such as high-speed media ingest and export capabilities and metadata search. For example, one of Dell EMC's solution offerings delivers a "unified permissions model," which is a way of managing user permissions in heterogeneous (Mac/Windows/Linux) environments without needing to maintain two separate databases of user IDs such as Active Directory (Windows) and LDAP (Mac/Linux). This capability is critical when artists access content via Mac or Windows workstations, while the applications that perform the necessary high-performance rendering often run on Linux. Unified permissions is one example of a service designed to eliminate the costs of multiple infrastructure silos and data migrations.

All of these capabilities position Dell EMC as a critical partner to help address the workflow demands of content creation, management, and delivery that have transformed in response to the rise of digital media. Detractors to this approach may argue that the infrastructure has become commodity, and all that matters is the application, and, therefore, the application should be the focus of the design rather than the alternative. This argument, however, is not supported by economic data. There are multiple ways to deliver the accessibility, performance, and capacity demands of an application. Addressing each need in isolation adds too much overhead and cost. This approach may have made sense when only one or two parts of the end-to-end media workflow were digital. Now, however, the entire process is digital. Optimizing one piece at a time is not going to be as efficient as architecting a solution that encompasses the demands of content creation, management, and delivery.

## The Bigger Truth

As more technology companies (e.g., Apple and Amazon) become media companies, media firms need to accept that the competitive landscape, including the winners and losers, will be determined by digital capabilities. In order to compete with firms that have a heritage in technology, media companies must build their own valuable expertise. This begins with taking a hard look at the data. Where is it created? Where and when does it move? How often? And, how many copies are stored? The next step is then to leverage a partner, like Dell EMC, that can take this information and architect a global end-to-end IT infrastructure that can optimize each element across content creation, management, and delivery.

The key determinant for a successful partner is scope, one that can offer the widest breadth of the solutions. A partner with experience across all the phases of the digital media content lifecycle can ensure that unforeseen bottlenecks do not arise when data moves from workflow to workflow. If issues do arise when content moves, leveraging different partners delays finding the resolution. Ultimately, competing in a digitally dominated industry, like media and entertainment,

demands heavy investment in building the necessary digital capabilities, such as analytics or application development. As the demands on the infrastructure technology surge, a regular symptom of digital industries, older or proprietary infrastructure siphons budget away from revenue opportunities. Dell EMC, with its technology portfolio, combined with its extensive set of services and partners can deliver the infrastructure to dramatically reduce the day-to-day costs of doing business, while providing the knowledgebase through partners like Pivotal to help transform your organization to best succeed in this ever-evolving digital industry.

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