

The Art of Data Storage

- Media & Entertainment Guide

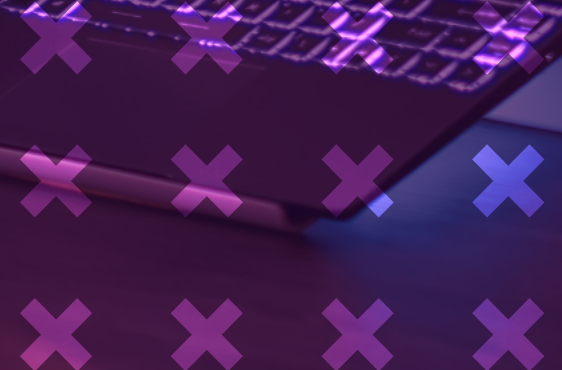
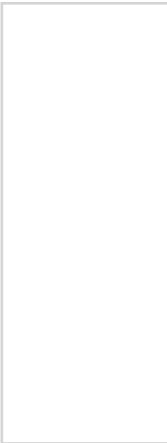
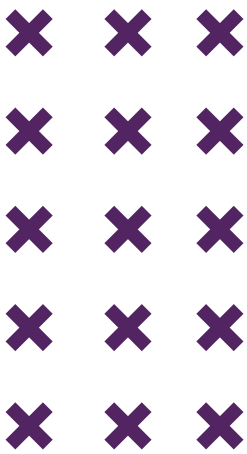


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Market Introduction in Terms of Data Storage

The media and entertainment industry is constantly transforming, driven by the need to **create, distribute, and archive high-quality content in various formats, resolutions, and standards.**

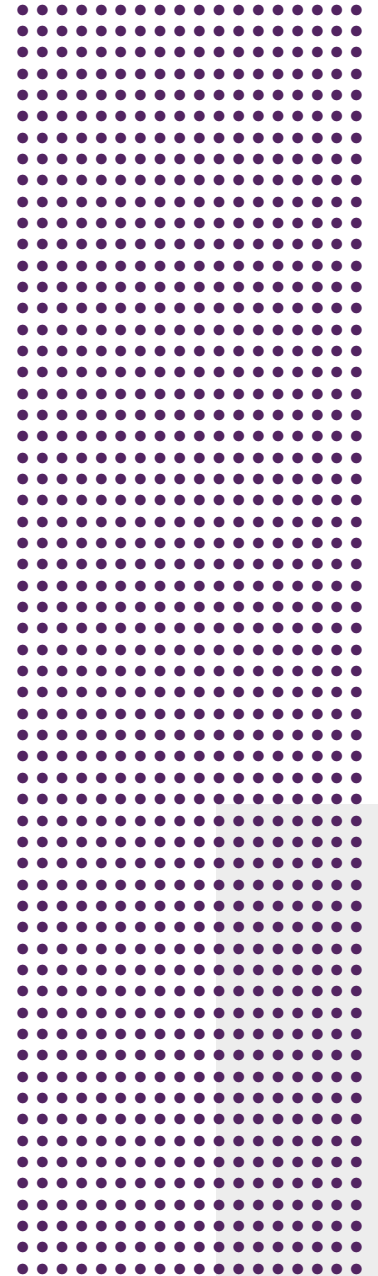
The segment refers to specific domains such as broadcast, production and post-production, media agencies, advertising, etc. **The storage needs of each vary depending on the content's type, quality, and quantity, as well as the workflow stages and the distribution channels.**

Data storage is a crucial component of the media and entertainment industry, as it supports capturing, creating, editing, archiving, and distributing digital content, ranging from feature films, TV shows, music, games, podcasts, social media, and more. The media and entertainment market is constantly evolving and growing, driven by multiple factors, such as **increasing demand for high-quality content, emerging technologies such as 4K and 8K, VR, AR, and AI, and changing consumer preferences and behaviors.**

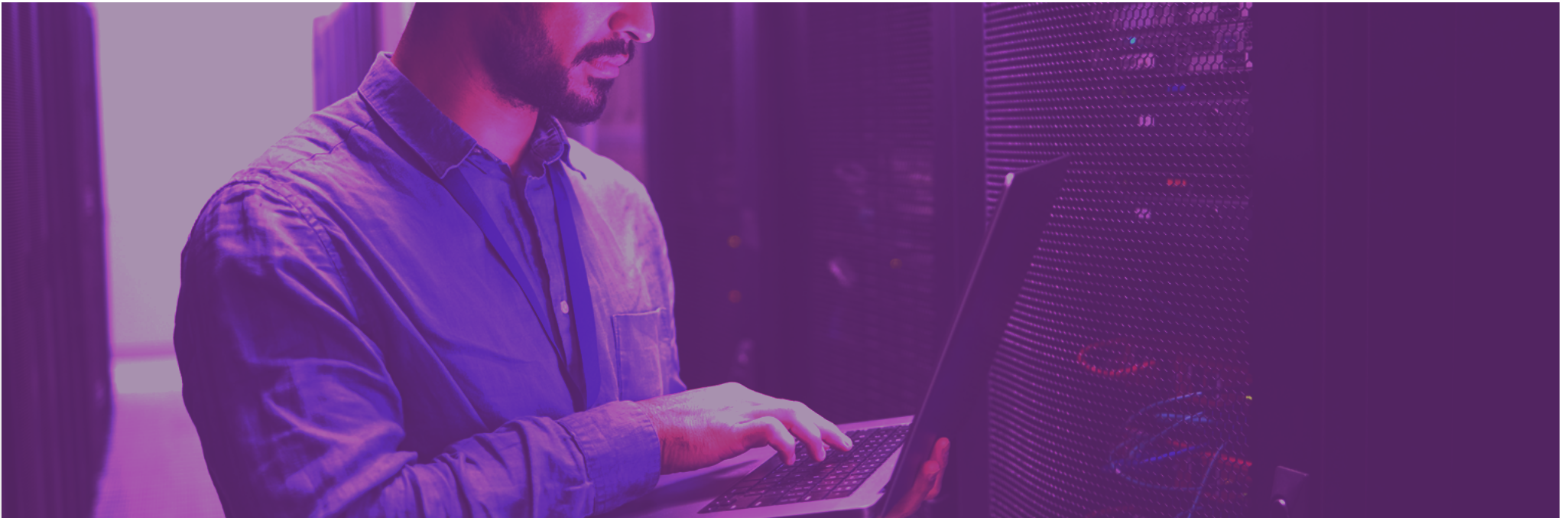
Data Storage Capabilities – The Key Aspects

The media and entertainment companies need to leverage data storage systems that can provide them with the following capabilities:

- ✓ **Compatibility:** In media workflows, storage compatibility is complex due to diverse file formats and systems. High-performance storage for large files like High-Quality videos is needed. Compatibility across systems and adapting to evolving tech standards is vital. Balancing storage capacity, speed, and interoperability in this dynamic industry is a constant task.
- ✓ **Scalability:** The storage solution should be able to scale to accommodate increasing volumes of data, especially with the rise of high-definition and 4K content.
- ✓ **Performance:** High-speed data access is crucial in the media and entertainment industry. The storage solution should provide fast data transfer rates to handle large media files efficiently.
- ✓ **Reliability:** The storage solution should be reliable and ensure data integrity. Any loss of data can lead to significant financial and reputational damage.



- ✓ **Security:** Protecting intellectual property is critical in the media and entertainment industry. The storage solution should have robust security measures in place to prevent unauthorized access and data breaches.
- ✓ **Cost-effectiveness:** Given the large volumes of data involved, the storage solution should be cost-effective. This includes considering not just the upfront costs but also the ongoing costs of managing and maintaining the storage infrastructure.
- ✓ **Support for Collaboration:** Many media and entertainment projects involve collaboration between different teams, often located in different geographical locations. The storage solution should support seamless collaboration and file sharing.
- ✓ **Data Analytics Capabilities:** Media and entertainment companies are increasingly leveraging data analytics for decision-making and to gain insights about their audience. The storage solution should support big data analytics.
- ✓ **Disaster Recovery:** The storage solution should have a disaster recovery plan in place to ensure business continuity in case of any unforeseen incidents.



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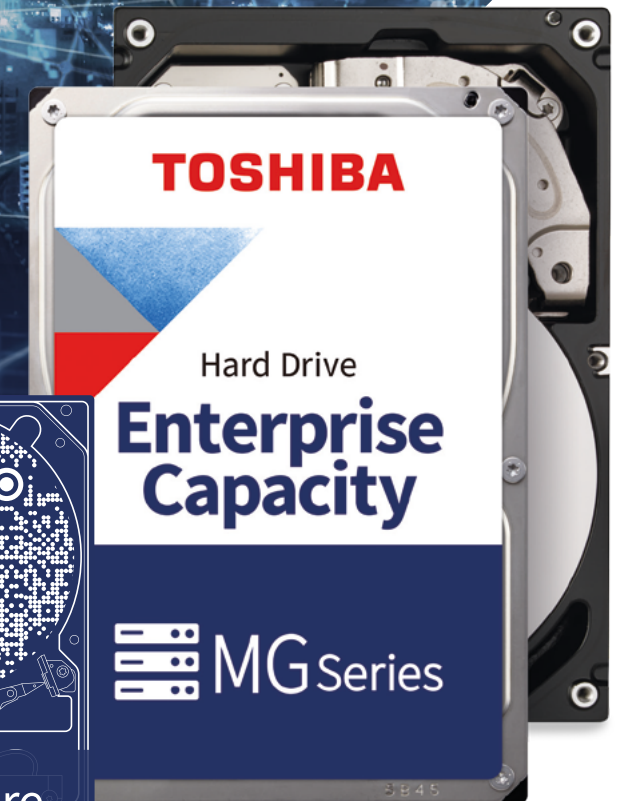
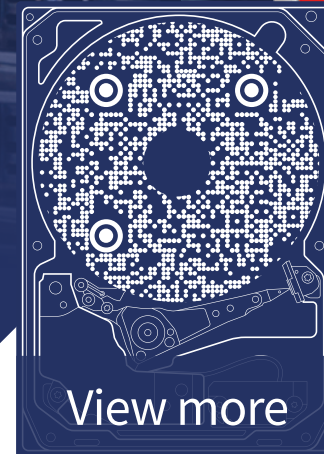
- From 1 TB to 22 TB capacity – for smaller scale storage demands up to large scale storage for 4k/8k workflows and rich media applications
- 200-300 MB/s read/write performance with 7200 rpm – to support the bandwidth requirement of media storage
- 3.5" formfactor with SATA interface – for wide compatibility from post-production workstations and high performance PC to small NAS/DAS up to multi-bay rackmount storage systems
- Optional: Models with SAS interface for enterprise style storage systems
- High reliability of up to 2.5 Mio hours MTTF (annualized failure rate as low as 0.35 %) at up to 550 TB/year reading and writing workload
- 5 years warranty
- Open-E certified models

Storage Server

Performance HDD Solutions
for Media Storage Applications

Cloud

Storage Capacity for
all Media Services

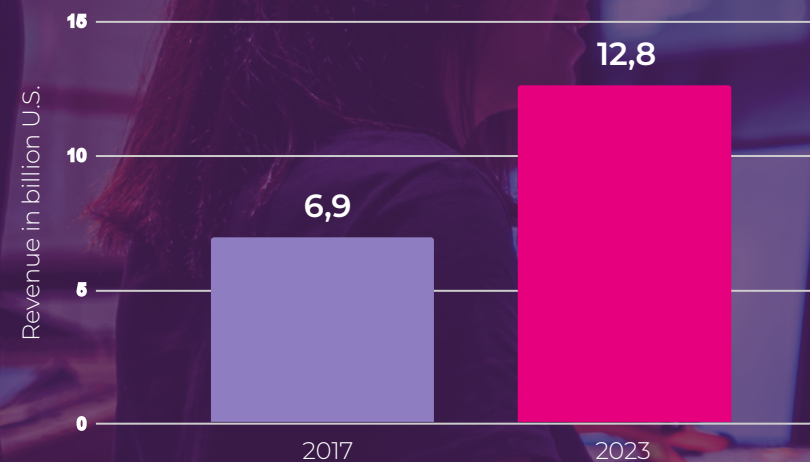


Data Storage Challenges in the Media & Entertainment Industry

Like many industries, media and entertainment produce and consume increasing volumes of data. They struggle with data lifecycle management, causing capacity and performance issues, and complicated disaster recovery. Various market solutions can help these companies address their data storage, backup, and business continuity challenges.

Media & Entertainment Data Storage Statistics:

For non-cloud storage, the data from Coughlin Associates showed that the media and entertainment industry storage revenue worldwide was expected to grow from \$6.9 billion in 2017 to \$12.8 billion in 2023.



Storage revenue share for the media and entertainment industry worldwide in 2023, by segment:



Source: <https://www.statista.com/>



Content Creation, Production, and Post-Production

The media and entertainment sector uses various digital tools to produce and deliver diverse content with a **multitude of formats, resolutions, and norms**, requiring fast, collaborative data storage infrastructures. Often using Apple devices for creative tasks, like **video editing, graphic design, animation**, these companies need storage compatible with **MacOS file system, protocols, and formats**.

- ✓ **Extensive Files and Volumes:** Media files, especially high-definition video and high-resolution images, often are extremely large. Managing these extensive files and volumes efficiently is a significant challenge.
- ✓ **Efficient Processing:** Video and graphic files require efficient processing. The data storage solution must be capable of quickly reading and writing these large files to ensure smooth content creation and production processes.
- ✓ **Search and Browsing:** With the vast amount of media files created and stored, efficient file searching and browsing capabilities are crucial. Tools like Spotlight are key for quick browsing and displaying relevant content. AI enhances this by improving the indexing and retrieval of searched content.
- ✓ **High Storage Capacity, Performance, and Safety:** The media and entertainment industry requires data storage solutions with high capacity to store large media files, high performance to process these files efficiently, and robust safety features to protect valuable media assets.

High-capacity SAS or SATA HDDs are suitable for mostly static content. On the other hand, **SSDs and NVMe drives** provide high-performance storage, offering high availability, cost predictability, cloud flexibility, secure collaboration, modular expansion, flexible consumption models, and easy cloud integration.



TIP: Consider your business needs before choosing a data storage approach. **The media industry often generates, preserves, and distributes large files like HD videos, music, and games.** Efficient management of these processes can be achieved with read and write-intensive drives.

Read-intensive drives are designed for tasks with more read than write operations. They generally have a lower endurance rating, as they aren't designed to handle a high volume of write operations but are **ideal for content delivery networks, media streaming, and data warehousing**.

Write-intensive drives, with higher write performance and capacity (but lower random read performance and endurance) are **suited for tasks like media transcoding, database logging, and video surveillance**.



Content Distribution and Delivery

To distribute and deliver content to various platforms, channels, and devices using streaming, broadcasting, or downloading methods, media and entertainment companies need **data storage systems to support fast and reliable data transfer, adaptive bitrate streaming, and content delivery networks.**

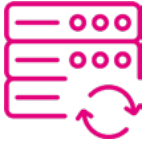
- ✓ **Scale of Content:** Media providers are creating content on such a massive scale that legacy storage cannot handle the volume. This is due to the rapid growth of digital content, driven by higher resolutions, multi-camera imagery, and the growing demand for original content across multiple platforms. The sheer volume of data generated by 4K, 8K, and virtual reality (VR) formats exceeds the limits of more traditional storage solutions that become obsolete.
- ✓ **Predictable Data Rates and Fast Access:** To meet the demand, IT organizations in the media and entertainment industry rely on technologies that provide predictable data rates and fast access to stored assets.
- ✓ **Content Sharing:** The media and entertainment companies use multiple platforms to share content within and outside the organization. The storage solution should integrate with these platforms for seamless distribution. Hence, high-performing, flexible solutions are likely to be used so editors can easily share content between them, and the delivery to viewers, listeners or gamers is available at any moment and rapidly.



TIP: Choosing such a data storage solution may be a complex task, but it is a significantly important decision in this case. There are many factors to consider. Firstly, the type, size, and frequency of data distributed via streaming on various platforms. Secondly, the performance, reliability, and cost of the solution, the security and compliance requirements, and the compatibility with a variety of existing systems and applications used to deliver the content to recipients.

Consider using data storage system architecture that provides a basis for centralizing data, and allows everyone to access the same files easily. These are **NAS (Network Attached Storage)**, **SAN (Storage Area Network)**, or **DAS (Direct-Attached Storage)** and we will cover them later.

Looking at it from a hardware standpoint, **the introduction of PCIe-5 in 2023**, along with the most recent CPUs and memory bus technologies, has brought about a considerable change. Storage systems have been enhanced to leverage the increased speeds of CPUs and memory, leading to significant advancements in the performance of metadata and streaming.



Data Storage Backup

One of the most critical goals to meet is to secure and protect the content from loss. To cope with these challenges, data storage administrators need the right **tools to provide flexible data backup options** (both local and remote to ensure the highest protection against possible disasters and disruptions).

When it comes to data storage backup in a media and entertainment company, an IT administrator should consider the following factors:

- ✓ **Data Backup:** The storage hardware should have modern breakthrough data protection technology to safeguard the content, like **Open-E JovianDSS On- & Off-site Data Protection**. This includes regular backups able to be scheduled and designed.
- ✓ **Data Recovery and Business Continuity Solutions:** These are the core processes during a disaster or crisis. In the media and entertainment industry, this means ensuring that production, distribution, and other operations continue even in the face of disruptions (i.e., via High-Availability cluster appliance) and being able to retrieve the data at any point in time.

Open-E JovianDSS On- & Off-site Data Protection with Retention Plans manage snapshots at source and destination. **Snapshots** contain only metadata, so if managed wisely, they won't take much capacity, which optimizes the storage. **A retention plan** can help manage data effectively, ensuring that important files are backed up and retained for a suitable period. This is useful for production houses, broadcasters, advertisers, and music studios to effectively manage and backup important data for a suitable period.



TIP: Even the most scrupulous backup routines may sometimes fall short, necessitating the need for additional measures. One such strategy could be the implementation of **Open-E JovianDSS On- & Off-site Data Protection**, which can significantly reduce the risk of unforeseen incidents impacting your data via using more than one backup server (on- and off-site) with the ability to take over production server duties by **High-Availability cluster**.



Content Archiving and Preservation

Archiving and preserving content for long-term retention, compliance, or reuse purposes is a must in the media and entertainment industry. It requires **cost-effective capacity, durability, and accessibility, as well as advanced data protection features against silent data corruption** that can lead to data loss in the long-term perspective.

- ✓ **Long-Term Preservation:** Media files need to be stored for a long time, often indefinitely. This requires reliable, durable storage solutions that can preserve data without degradation.
- ✓ **Accessibility:** Archived content often needs to be accessed quickly, whether for reuse in new productions or for distribution to new platforms. The storage solution must, therefore, provide quick, efficient access to archived files.
- ✓ **Metadata Management:** Each media file comes with a significant amount of metadata, such as the date of creation, the creators, the actors, and so on. Managing this metadata and making it searchable is a significant challenge.
- ✓ **Costs of Digital Conversion and Long-Term Storage:** The costs associated with the digital conversion of older analog content and the long-term storage of digital content are significant.



The Vanity, a boutique VFX firm based in Toronto, excels in visual effects, motion design, and coloristics. Their primary goal is crafting commercials and compelling narratives for leading brands in the USA. To enhance their production workflow and manage the growing volume of content, The Vanity needed a data storage system that fulfilled several criteria:

- **Exceptional reliability without any interruptions,**
- **Scalability to accommodate increasing content,**
- **Cost efficiency at its maximum,**
- **Various data access methods,**
- **A maintenance-minimal storage solution.**

The Vanity opted for a CineStor NAS storage solution, supported by ZFS- and Linux-based Open-E JovianDSS software for storage expansion. This shared cluster offers high availability and multi-user access without specific IT admin needs. It's compatible with Linux, Windows, and Mac, enabling Vanity artists to directly interact with data in their preferred applications.



TIP: Consider high-capacity, reliable storage devices for long-term storage, designed for data preservation and efficient access to archives. **ZFS-based features** come in handy here. The **self-healing and scrubbing** features continuously detect and **correct any errors in archived data, making the content safe from data corruption.** It's particularly important because regulations and GDPR policy force marketing and end companies to archive and preserve users' data safely. But let's not forget about operational data, such as the performance of the content, such as viewership numbers, revenue generated, resource usage, or content data like raw media files.



Data Security and Protection

One of the most critical goals to meet is to secure and protect the content from unauthorized access, theft, or loss. To cope with these challenges, data storage administrators need the right **tools to provide encryption, authentication, and authorization, as well as flexible data backup options**. When creating a data storage infrastructure for content security and protection in a media and entertainment company, an IT administrator should consider the following:

- ✓ **Security Management:** Security monitoring management allows for the detection of anomalies and potential threats. This enables the organization to respond quickly and effectively to any potential security incidents.
- ✓ **Cybersecurity:** The storage solution of your choice should be safe and resistant to all kinds of threats, such as human error, downtime, hackers, and ransomware. This is especially important given the high-profile cases of data breaches in the media and entertainment industry, i.e., the 2014 Sony Pictures hack, the 2021 Netflix data breach, or the 2022 The Guardian Ransomware Attack.
- ✓ **Content Monitoring:** Digitized content is one of the most valuable assets for every company. Ransomware attacks can lead to data loss, causing significant financial and reputational damage. Therefore, protecting against them and their consequences (by using snapshots and retention plans) is crucial.
- ✓ **Centralized Security Strategy:** To protect their systems, entertainment organizations need a centralized security strategy among their network of partners. The entertainment industry is constantly shifting, and the storage infrastructure should be flexible and scalable to adapt to these changes.
- ✓ **Data Ownership:** If a third party has access to your data, there's always a risk of that data being misused or mishandled. This could lead to breaches of privacy and potentially significant security issues. You can decide how it's used, who has access to it, and how it's stored. If a third party owns your data, they may have the power to change these factors without your consent. If your customers find out that their data is owned and controlled by a third party, it could damage your reputation and customer trust.



TIP: Consider data storage software with robust security to protect sensitive information. It should prevent unauthorized access, regularly back up data, and restore data after loss. **ZFS-based systems offer snapshot management (retention plans)** that allows for its rollback to the previous state in case of disaster. Use **encryption** whenever you can, as it significantly improves data protection. **SED (Self-Encrypting Drives)** provide enhanced security and prevent unauthorized data access. SEDs enhance data protection with **hardware-based encryption**, offer high security, efficiently handle data-intensive operations without slowing performance, as the encryption method uses the drive rather than the CPU.



Data Storage Optimization

Content-focused businesses need to **optimize their data storage costs and resources without compromising on quality or performance.**

- ✓ **Storage Capacity:** As video resolution and frame rates increase, the storage capacity requirements become staggering. For instance, 8K film would use more than 100X the capacity. Therefore, the storage hardware should have a high capacity to store large amounts of data and allow for scalability covered before).
- ✓ **Cost-effectiveness:** Implementing shared storage solutions improves workflow efficiency and provides fast access to all storage, thereby improving collaboration. Freedom from vendor lock-in allows businesses to combine software and hardware from different companies, potentially leading to cost savings. Using data storage management software based on ZFS simplifies the management of stored data, making the storage infrastructure more cost-effective.
- ✓ **Active-Archive structure:** The Active-Archive concept means that while most of the content resides in a huge archive and can be

accessed quickly when needed. Costly but powerful storage can be reserved for data that requires fast access times, while less frequently used data can be stored on relatively less expensive media. It also ensures that valuable content is not lost or forgotten in the depths of the archive, as everything can be easily retrieved.

Active-Archive structure can also be scaled to accommodate growing volumes of data. As the media and entertainment industry continues to produce content at an unprecedented rate, the ability to efficiently store, manage and access this data will be a key factor in a company's success. Therefore, an Active-Archive structure is not just a data storage solution, but a strategic resource that can provide an edge in the dynamic world of media and entertainment.



TIP: The development of 4K TV and other high-resolution venues in the home and in mobile devices will drive the demand for digital content, especially enabled by high HEVC (H.265) and VVC (H.266) **compression** and even greater standards for compression to enable 8K and higher resolution and frame rate workflows. In daily routines and states of emergency, data **deduplication** optimizes your storage setup, which sets your business up for long-term visibility and stability. **SSD Trimming**, on the other hand, helps maintain high data storage efficiency and prolongs the drive life span. Therefore, storage management is more efficient (especially in the case of frequent read-write operations with huge files), improves performance, and as a result - saves money by cutting the costs of managing the data storage infrastructure by ongoing conservation.



Data Storage Scalability

Scaling data storage capacity and performance according to the changing needs and requirements is one of the most challenging tasks for most IT administrators. These files **require storage systems that can support data scalability features such as modularity, elasticity, and clustering.**

- ✓ **Increasing File Sizes:** As image resolution grows and workflows become faster, file sizes are increasing. This necessitates greater storage capacity, which in turn places a strain on the storage infrastructure. Additionally, it demands quicker network solutions to deliver the content at high speed and quality.
- ✓ **Digitization of Archived Media:** As companies digitize their archived media, storage requirements can change rapidly. The storage solutions need to scale quickly and effectively to accommodate these changes as well as keep the data safe from corruption.
- ✓ **Thick-, Thin-, and Over-provisioning:**
 - **Thick-provisioning** allocates the storage capacity in advance, which makes it always available, which is important in regard to big volumes and file sizes managed by the users in the media and entertainment market. However, if the allocated storage is not fully used, it leads to underutilization and waste of storage space.
 - **Thin-provisioning** meets the current storage needs by providing space from a pool available. It's efficient in terms of utilization but requires more precise management, so in the case of a sudden need - there's always an option for bigger capacity allocation (in case of vast volumes of data to be processed).
 - **Over-provisioning** is a form of thin-provisioning that offers more space to be allocated than needed. This is useful when content consumption is changing rapidly, and there is a significant need for more content (subscription-based video on demand/streaming, gaming, and instant messaging platforms).



TIP: Software-defined storage focuses on some key factors allowing for **optimization of business workflow**. It enhances workflow through flexible management, **scalability, data centralization**, and **freedom from vendor lock-in**. It allows space distribution across hardware and offers various **provisioning options**.

Virtualization plays a key role, allowing easy scaling of storage resources and efficient memory utilization. It enhances monitoring, error reporting, and provides snapshot capabilities for system recovery, preventing data loss from various threats.



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Data Storage Transformation

Adaptation to the **changing trends and demands of the industry, such as new formats, resolutions, standards, and workflows**, is an ongoing task for the sector. Data transformation, migration, conversion, and transcoding, as well as flexibility in terms of hardware used for storing data, are the ones that need to be kept in mind when the decisions on the data storage system are made.

- ✓ **Compatibility:** The storage solution should be compatible with various devices; hence, **hardware-agnostic software** is highly expectable. It should also be compatible with multiple operating systems (Linux, macOS, Windows). Using multiple vendor components and solutions is highly appreciated as the media and entertainment market works on various fields and uses multiple resources and methods to reach recipients.
- ✓ **Data-Driven Transformation:** Media and entertainment companies are increasingly using data on a large scale to deliver the right content to the right people on the right platform at the right time. The storage infrastructure should support this data-driven transformation.
- ✓ **Big Data Capabilities:** Media companies are early adopters of big data technologies, which enable them to drive digital transformation. The storage infrastructure should support big data capabilities.



TIP: Software-defined Storage supports compatibility aspects by optimizing existing hardware before there's a need to purchase new devices.

This means new storage arrays can be added quickly, and users can access storage more easily with self-service tools. It's a heterogeneous infrastructure, meaning it gives a wide range of 3rd party components and software to be applied. This solution also creates an end-to-end workflow that forms a single pool of data that is easy to find, store, access, and protect. SDS handles increasing data volume and facilitates the management of workflows, making it a key enabler of this transformation. It comes in handy for streaming companies providing vast amounts of media at high resolutions and frame rates.

When it comes to compatibility, the importance of multi-channel performance and MacOS compatibility cannot be overstated in tackling industry obstacles. Although SMB is the main instrument, it has its constraints, such as file character limitations. Overcoming these hurdles is essential for guaranteeing smooth interoperability between Windows and Mac systems.

Data Storage Mediums

Various types of storage mediums may significantly impact the storage requirements in the media and entertainment industry. It's a wide sector that uses multiple technologies and is expected to vastly adjust to modernization and novelties also in terms of hardware, such as storage mediums.

The selection of a storage medium is influenced by several factors, including the **performance, capacity, durability, and cost demands of the media and entertainment content**. For instance, **HDDs** are commonly chosen for their high storage capacity and affordability despite their performance being inferior to SSDs. On the other hand, **SSDs** are favored for their high performance and low latency, even though they are more expensive and offer less storage capacity than HDDs. **Digital tapes** serve a different purpose altogether. They are typically used for long-term archiving and backup due to their high capacity and low cost. However, they offer lower accessibility and longer retrieval times compared to HDDs and SSDs. Thus, the choice of storage medium is a balancing act between various factors, each with its own advantages and disadvantages.



HDD (Hard Disk Drive)

HDDs are widely used due to their high storage capacity and low cost. They are ideal for storing large volumes of data, making them suitable for media and entertainment companies that need to store huge amounts of content.

Advantages:

- ✓ **High Storage Capacity:** HDDs can store a large amount of data, making them suitable for storing extensive media files.
- ✓ **Cost-Effective:** HDDs are generally less expensive per unit of storage compared to SSDs and NVMe, making them a cost-effective solution for large storage needs.
- ✓ **Mature Technology:** HDDs have been around for a long time and are supported by a wide range of systems and devices.

Disadvantages:

- ✓ **Performance:** HDDs have mechanical parts that can slow down performance. They typically have slower read and write speeds compared to SSDs and NVMe.
- ✓ **Durability:** HDDs contain moving parts that can be sensitive to shocks and damage. This could potentially lead to data loss.
- ✓ **Power Consumption:** HDDs generally consume more power than SSDs, which can be a consideration for energy-conscious operations.



SSD (Solid State Drive)

SSDs (Solid State Drive) are preferred for high-performance and low-latency storage. They are faster and more reliable than HDDs because they have no moving parts. SSDs are used to accelerate experiences on game consoles, DVRs, and Network-Attached Storage (NAS).

Advantages:

- ✓ **High Performance:** SSDs have no moving parts and use flash memory to store data, which leads to significantly faster read/write speeds compared to HDDs. This makes them ideal for tasks that require high-speed data access, such as video editing and animation rendering.
- ✓ **Durability:** Since SSDs have no moving parts, they are less prone to mechanical failure, making them more durable and reliable than HDDs.
- ✓ **Low Latency:** SSDs provide quick access to data, which is crucial for real-time applications in the media and entertainment industry, such as live streaming.

Disadvantages:

- ✓ **Cost:** SSDs are generally more expensive per unit of storage compared to HDDs. This can be a significant factor for media and entertainment companies that require large amounts of storage.
- ✓ **Storage Capacity:** While SSDs are available in large capacities, they are still not as high as what you can get with HDDs at the same price point.
- ✓ **Lifespan:** The lifespan of an SSD can be shorter than that of an HDD when subjected to heavy write operations regularly, as the flash memory cells in an SSD can only be written a limited number of times.





NVMe

NVMe (Non-Volatile Memory Express) is a high-performance interface for SSDs, delivering faster read and write speeds than SATA. It is used by media and entertainment companies and post-production studios to hit quick deadlines without compromising performance or quality. With NVMe, performance bottlenecks are removed, and collaborative workflows are faster than ever.

Advantages:

- ✓ **High Performance:** NVMe drives are designed to deliver high throughput and low latency, making them ideal for tasks that require real-time data access, such as video editing, animation rendering, and live streaming.
- ✓ **Parallelism:** NVMe drives can handle multiple queues and thousands of simultaneous commands, which is beneficial for multitasking and handling large media files.
- ✓ **Form Factor Flexibility:** NVMe drives come in different form factors, including PCI, M.2 and U.2, providing flexibility in terms of system design and space utilization.

Disadvantages:

- ✓ **Cost:** NVMe drives are generally more expensive per unit of storage compared to traditional SSDs and HDDs. This can be a significant factor for media and entertainment companies that require large amounts of storage.
- ✓ **Compatibility:** NVMe requires a compatible motherboard with an M.2 slot or a U.2 connector, which may not be available on older systems.
- ✓ **Heat Generation:** NVMe drives can generate more heat than traditional SSDs and HDDs, which may require additional cooling solutions in some cases.



TIP: Another problem solver is the read cache mechanism - ZFS L2ARC feature. SSDs and NVMe drives used as L2ARC in a ZFS environment can significantly improve read performance by serving as a fast secondary cache for data evicted from the primary ARC (that resides on RAM). This mechanism is particularly useful in data-intensive industries, like media and entertainment, where quick data access and retrieval are critical.



Tape Drives

Tape Drives are used for long-term archiving and backup. They offer high capacity and low cost, making them ideal for backing up large amounts of data for a long time.

Advantages:

- ✓ **High Capacity:** Digital Tapes can store large amounts of data, making them ideal for archiving large media files.
- ✓ **Cost-Effective:** Compared to other storage mediums like HDDs and SSDs, digital tapes are relatively inexpensive per unit of storage.
- ✓ **Longevity:** Digital Tapes can last for several decades if stored properly, which is beneficial for long-term archiving.

Disadvantages:

- ✓ **Accessibility:** Data stored on digital tapes is not immediately accessible. The tapes must be loaded and read sequentially, which can be time-consuming.
- ✓ **Retrieval Time:** Due to the sequential access nature, retrieving specific data from a tape can be slower compared to HDDs and SSDs.
- ✓ **Hardware Dependency:** Accessing data on digital tapes requires specific tape drives, which may not be readily available or compatible with all systems.

ABACUS

Post Bellum is a Czech NGO that documents thousands of historical witness accounts. They do it by digitizing video and audio interviews with people who lived through significant historical events and storing them as media files to educate the following generations. They faced rapid data growth with various NAS servers, collecting 550TB of raw data with an annual increase of over 300 TB. They partnered with Abacus Electric, an Open-E Platinum Partner, to consolidate their infrastructure for future expansion. They needed a system that offered:

- **Scalable architecture,**
- **Simple capacity growth aligned with budget,**
- **Common, non-proprietary hardware without vendor restrictions,**
- **The option to use a clustered data storage solution,**
- **Support for snapshots and cloud services.**

They chose the Abacus a-2610Q-KRPA 4U Server, powered by ZFS and Linux-based Open-E JovianDSS. The new architecture consists of two single-node servers for high performance and scalability, with ZFS as the base and potential storage capacities exceeding dozens of PBs.



The Role of Data Storage System

The data storage systems should be chosen with three main aspects in mind for delivering, archiving, and protecting content in the media and entertainment industry:

✓ Key Features

The data storage systems need to have the flexibility to support everyone from editors in the studio to marketers mining audience demographics to users picking and choosing their streaming content. It should provide fast read/write between various drive types (HDD, SSD, NVMe), compatibility between Windows and MacOS, and be easily scalable to optimized capacity requirements.

✓ High-capacity Storage Devices

Choosing the proper data storage devices should be done with care. It is crucial to choose wisely between miscellaneous storage devices for caching, storage, or archiving, as they may affect various processes in the media and entertainment market.

✓ Networking

Solutions used by media & entertainment companies should guarantee:

- **reliability**, as they operate 24/7, business continuity is crucial
- **versatility**, to fit market requirements, be easily adaptive to different OS, and avoid soft- or hardware lock-in
- **simplicity**, to reduce operational costs and time spent by staff on learning about new solutions
- **interdependence**, to be adaptive to more and/or new broadcasting or streaming mediums (that includes TV, VOD platforms, gaming sector).

The data storage systems comprise diverse types of storage solutions. Each has its advantages and disadvantages if used in various stages of the media and entertainment workflow.



Network-Attached Storage (NAS)

NAS is a file storage system that operates on data files, allowing multiple users and heterogeneous client devices to retrieve data from a centralized disk capacity. In the media and entertainment industry, NAS is often the preferred choice due to its ability to centralize data, offering significant scalability and availability for applications that require reliable data access and sharing. NAS supports various protocols, such as SMB or NFS, providing easy integration with different platforms and devices. Its main advantage is its support for heterogeneity, accommodating Linux, Windows, and macOS environments. NAS also offers robust backup solutions, including backup to different storage system locations with the same software, disaster recovery, and archiving, specifically tailored for the media and entertainment industry.



Storage Area Network (SAN)

SAN is a type of network of storage devices that multiple servers can access. It enhances their capabilities by making them appear in the operating system as locally connected devices. SAN can also be supported by various file systems, which is a great advantage compared to NAS. However, it also has its drawbacks. The first is the complexity and cost, which has made it less popular in the media and entertainment industry than NAS. Another one is that access to data is limited to a single client system. There is a way around this problem with a clustered file system, but the complexity issue arises again.



Direct-Attached Storage (DAS)

DAS is digital storage directly attached to the computer, accessing it without a network in between. DAS is a good option for businesses that need to keep costs low. However, it lacks the scalability and network accessibility of NAS. It's suitable for small environments operated separately, making it less efficient than NAS and SAN. Despite its limitations, DAS can be an effective solution for businesses with small data storage needs or for those requiring a simple and direct data access method.

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A stylized world map composed of a grid of dots, serving as a background for the statistics section.

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+25 years of experience

+120 countries worldwide

+800 certified engineers and sales professionals

