EGUIDE

Building the right Storage Ecosystem for your business

masstech

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INTRODUCTION

It's no great revelation to say that there is a LOT of video around these days. Video creation and views are sky-rocketing, and the amount of video data organizations need to store is expected to quadruple in the next two years, from already eye-watering levels. Unsurprisingly, this continual increase in capacity requires a constant re-examination of how we store our video content.

Fortunately, data storage technology is improving at a rate that is managing to keep pace. However, new technologies, changing terminologies and shifting digital landscapes can bring challenges of their own; it's all too easy for an organization to end up on a confusing path, attempting to navigate upgrades from outdated storage technology and media formats, while successfully managing their content to ensure efficient storage and ease of access when required. Emerging technologies, such as AI and Machine Learning, are creating interesting new revenue opportunities, but incorporating these into everyday operations adds another layer of complexity.

This is where a video storage management solution comes in. In this guide we explore the different options for video archiving and management along with some considerations you should address when looking for a solution.

This guide is designed to present an overview of the challenges of video storage management and some of the considerations and solutions. We hope it helps you navigate some of the complexities you're likely to face. However, if you're implementing a new system, or need to migrate, expand or enhance an existing storage system, we'd very much recommend that you consult an expert video storage resource. If you would like to speak to one of Masstech's technical architects, please email info@masstech.com

MAMs, PAMs, DAMs & ISMs

In a typical M&E focused organization, there may be one or more **different management platforms** or applications, some of which are specifically designed to service that particular organization's activities. For example, there are applications designed specifically for creating and processing content for Newsrooms, or sports organizations.

Some applications control and track file locations and usage, others are specifically dedicated to certain types of content in transit, while some are specifically designed to manage content storage and the storage ecosystem itself - more on that later.

In this guide we'll be discussing those platforms designed for storage management, and we'll touch on how they have to communicate and integrate with some of the other management applications in the M&E industry.

DAM – Digital Asset Management

An all-round content management platform, to track, share and organize digital assets of all types (documents, images, videos etc).

MAM – Media Asset Management

Similar to DAM but with a primary focus on video media and the requirements of organizations that create, process or distribute video

PAM – Production Asset Management

Similar to MAM, but aimed at production workflows with specific feature sets to enable processing of files that are continuously and rapidly changing (e.g. sports, post)

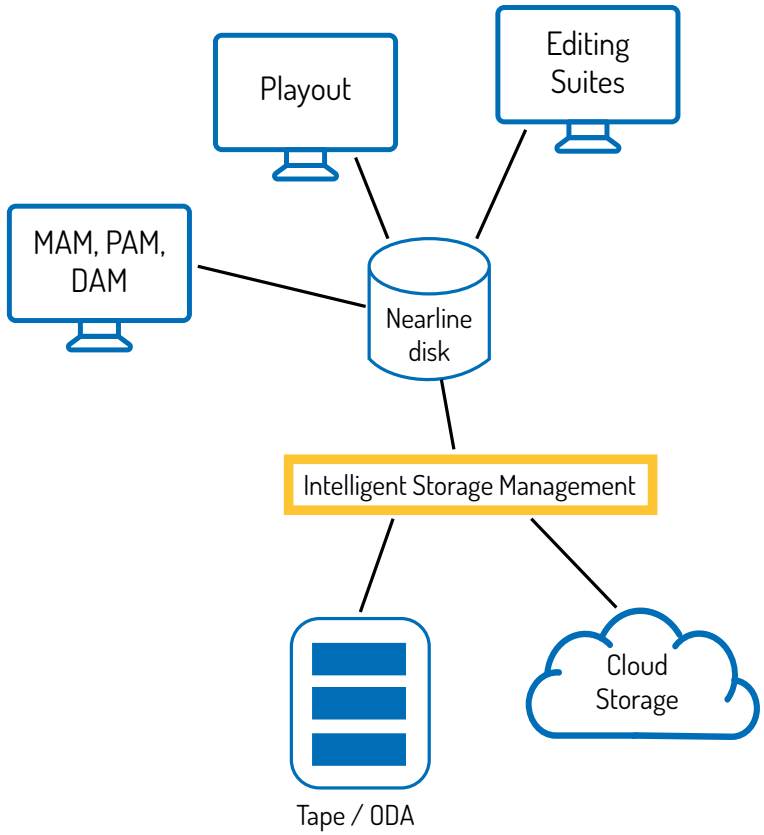
ISM – Intelligent Storage Management

An interface application between facilities control applications (e.g. MAM) and the storage ecosystem. ISMs are possess levels of integration with storage hardware and platforms generally not available in MAMs, PAMs or DAMs.

THE BUILDING BLOCKS

The ideal storage system will vary from organization to organization, with different components being more suitable to some workflows and operational requirements than others. However, as a basic rule, an organization with significant amounts of content will use a mixture of fast, nearline disk storage, and longer term storage, to which completed content can be moved (or 'archived'). This releases local disk for projects that are still in production.

Files on local disk are accessed by production systems, such as editing or playout (though cloud-based production systems are becoming increasingly popular), with file location being tracked by an over-arching MAM or PAM. The role of the ISM is to provide a single interface for all layers of the storage ecosystem - essentially presenting all storage types as a single name space. The ISM handles movement of files across storage, directly controlling devices and platforms and ensuring they always reside in the most cost-effective and operationally efficient location.



With the exception of organizations operating completely on cloud-based editing and processing platforms, companies always require on-premise disk storage, for quick and easy access to working files. The choice of deeper, longer-term storage components (disk, tape, cloud) will vary depending on the types of content stored, and the business operations undertaken. All storage has pros and cons, and weighing the correct combination requires thorough research. Let's take a look at the potential storage tiers, and some of the main benefits and drawbacks of each.

FILE STORAGE: LTO TAPE

Tape storage has existed since the 1950s and as an archiving and backup tool, it is still prominent in the market. Tape is a dependable medium with a shelf life of 30 years in the right storage conditions, providing an economical and reliable way to safeguard massive amounts of inactive data for long-term preservation.

Pros:

- Data stored on tape is separated from the read/write mechanism, creating a natural “air gap” protecting it from viruses and potential cyber-attacks to which disk and internet-stored data may be susceptible
- LTO tape technology advances regularly (a new generation roughly every 2 years over the last decade), providing faster speeds, higher capacities, greater efficiencies, increased reliability and quicker retrieval times
- No onward charges - once you’ve purchased a library and tapes, there are no more data-related charges, e.g. for retrieval of data
- Lifetime cost of tape is generally perceived as being low

FILE STORAGE: LTO TAPE & ODA

Cons:

- Tape libraries, and their components (drives and robot arms), require annual maintenance; drives can fail and require replacement
- Backward compatibility of LTO tape versions is limited; at most, backward compatibility extends only to 2 versions (e.g. LTO 6 drives can read LTO4, 5 and 6 tapes). In order to take advantage of enhancements in tape technology (e.g. capacity and speed), outdated tapes have to be fully migrated to the latest version every few years
- Finite capacity - once the library is full, you need to add slots (if there is space) or buy a new library. Some library owners remove tapes and keep them on shelves, which requires human intervention should the data they contain be required
- Libraries can have a relatively high carbon footprint, requiring power and cooling
- Depending on the set-up, tape libraries require human intervention, especially if some tapes are held outside of the library. Administration is not possible in a remote working environment
- MAMs and PAMs are unable to directly request data held within a tape library
- Requires a large amount of upfront capital for hardware, installation, software licences, data backup, support etc

Optical Disk Archive (ODA)

Optical Disc Archive is a proprietary storage technology that was introduced by the Sony Corporation. It uses removable cartridges, where each cartridge holds 11 optical discs. Each of the internal optical discs is similar to, but not compatible with, a Blu-ray disc. The latest version of the cartridge (gen 3, released 2019), which has a total capacity of about 5.5TB, uses discs that hold about 500GB each.

The pros and cons of ODA are very similar to those of LTO tape; ODA libraries contain slots and drives and robotic technology for cartridge movement. The significant difference between tape and ODA is media longevity; Sony claims an estimated media lifespan in excess of 100 years.

FILE STORAGE: PUBLIC & PRIVATE CLOUD

Even before the Covid-19 crisis forced a widespread introduction of remote working and an adoption of the shared storage it requires, public cloud storage was very much on the agenda of many M&E companies. While in the early days there were concerns around the security of cloud-based storage, providers consistently update their software to keep their customer's data safe from vulnerabilities and now cloud is used to store sensitive data across industries such as finance, medical and security – and increasingly M&E.

Public cloud storage offers measurable financial benefits and operational flexibility. But clouds come in different shapes and sizes: cloud providers offer various levels of pricing, access speeds, data egress charges and asset redundancy. The trick is choosing a cloud provider – or even combination of providers –most suited for your workflows and asset types.

A note on private cloud

One of the major benefits of public cloud is the ability to share content globally. However, this can also be achieved using a private, wide area network, commonly referred to as private cloud.

Private cloud is often considered the realm of enterprises who generate a very large volume of content and have the expertise and resources to build private storage which approaches the scale, but can exceed the cost efficiency, of public cloud providers. However, there are numerous private cloud vendors who can deploy enterpise-specific private cloud systems at a relatively reasonable cost.

FILE STORAGE: PUBLIC CLOUD

Pros:

- Cloud offers access to data from anywhere with a reliable internet connection, enabling extremely simple and effective content sharing
- Multiple backup copies can be created instantly then stored in different regions for the greatest file redundancy
- There is little to no immediate expense; ongoing storage costs are easily predictable (as long as usage remains constant)
- With no on-premise components there are no ongoing maintenance costs, and no transition to new generations as your hardware reaches the end of its life
- When you are working with cloud storage, every time you make changes to a file it will be synced and updated across all of your devices that you use to access the cloud
- Most providers offer multiple tiers of storage, with different levels of access speeds tied to scaling charges (generally short-term access tiers are more expensive)

Cons:

- Cloud based storage is dependent on having an internet connection. If you are on a slow network you may have issues accessing your storage and internet outages mean loss of access to data
- Pricing can be complex. Different providers charge for different storage and access activities
- After a certain tier of storage or a certain percentage of storage space is used, most cloud providers have a new pricing structure that is more expensive than the previous one
- Some providers charge for uploading or downloading files from the cloud; this can quickly add up if you are trying to access lots of files often
- When you use a cloud provider, your data is no longer on your physical storage. Data security becomes the responsibility of your provider, and like all internet data, the potential for cyber-attacks remains

FILE STORAGE: HYBRID CLOUD

Hybrid cloud storage combines on-premise disk and tape storage with cloud to create an ecosystem that contains a type of storage suitable for every type of content. Many organizations have found that a combination of cloud for quick access and tape for archiving is extremely effective at ensuring reliability, security and cost savings.

In this model, content is managed by a smart multi-domain storage management system which makes a number of storage locations available for use and automatically and dynamically moves content, based on associated metadata, to the location that has the best commercial and technical attributes for the next business operation.

Hybrid can be an attractive step for companies with existing on-premise tape archives who are looking to include cloud storage as part of implementing remote working environments.

Pros:

- The best of all worlds? Possibly. Multiple technologies provide all the benefits and allow users to mitigate most of the drawbacks
- With the correct administration, content is always stored in the most cost-effective tier and location
- Represents a logical next step for those looking to migrate from on-premise to eventual all-cloud storage
- Multiple copies of content can be kept in secure, reliable locations meaning should one fail you always have access to your entire library

Cons:

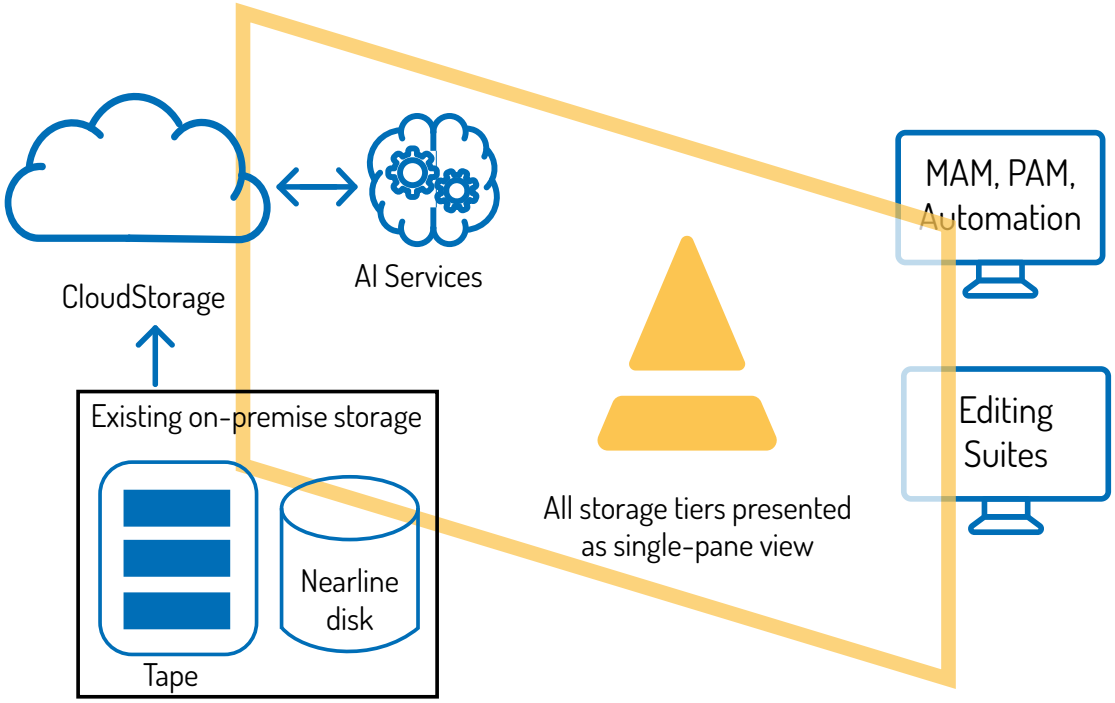
- Without an ISM to handle all storage locations, administration requires multiple interfaces from each storage provider, and integration is difficult
- Modelling of cloud storage costing remains an issue.

WHY DO YOU NEED STORAGE MANAGEMENT?

As discussed, multi-component, hybrid storage systems can be complex. They each have their own interfaces, require their own administration, and don't communicate natively with each other.

A single application that interfaces with each storage layer on one side, and provides access to content to each of the controlling applications **removes all of this complexity**.

Whatever the function of your organization, having files where you need them, when you them and in the correct format is essential. Files in use need to be instantly available, completed or infrequently-accessed files should be stored as inexpensively as possible and all of this should be automatic, without the requirement for human intervention. In these environments, an Intelligent Storage Management platform (such as Masstech's Kumulate) is essential.



WHAT IS INTELLIGENT STORAGE MANAGEMENT?

There are a number of storage management solutions available to video companies, each featuring differing levels of functionality. All have a core that manages file storage and movement, but above and beyond those is something that we at Masstech simply call Intelligent Storage Management (ISM).

The most complete ISM combines intelligent storage with workflow and lifecycle management for video assets. It allows you to create your perfect object storage ecosystem, providing a seamless link between control systems (such as MAMs and PAMs) and your storage. Automatic lifecycle management controls the movement of content between local and deeper storage tiers.

In addition, ISM utilizes asset management, workflow orchestration and transcode to ensure that wherever your assets are stored - public cloud, private cloud, on-premise disk or tape – they are always stored in the most efficient storage tier, then delivered to the right location in the required format as processes require.

ISM also allows you to add value to your assets, harnessing cognitive services and machine learning systems on platforms such as AWS, Azure, and Google to add enriched metadata to your assets (more about this later)

Some benefits of ISM include:

- Partial File Restore - restore any segment or clip from long-form content. This not only saves local disk space, but if the original is stored on public cloud, PFR significantly reduces egress charges
- Automate media ingest, transcode, packaging and delivery
- Maximum storage cost efficiency
- Streamline processes - automate batch workflows that consume human and technical resources, and simplify the way you process, store and distribute content
- Practically unlimited scalability, whether deployed on-premise or as cloud compute/VMs
- Simple but powerful metadata allows content to be located and re-purposed extremely easily
- Shared storage (whether cloud-based or via e.g. Kumulate Federated Search) enables fully remote workflows across departments or entire enterprise, with no content silos

QUESTIONS TO ASK

As well as the pros and cons that we've discussed around storage types, the ideal storage ecosystem requires that a number of other considerations be addressed; these can be broken down into questions:

How often do I need to access my files?

Regularly: You'll need nearline disk, or other storage that involves little cost to restore your assets. Don't use cloud providers with high egress charges
Infrequently: Deep storage, such as tape or deep level cloud storage works here.

How quickly do I need access to my different content types?

Can't afford to wait!: Local disk is best for files in flight; if you need disk space, nearest level cloud offers quickest restore speeds.
Speed's not an issue: Tape or mid- to deep-level cloud storage will represent the best cost-efficiency

How much of a limiting factor is budget?

Cost conscious - You're best opting for deep archive in the cloud or tape storage to optimise your budget
Not a problem - If speed of access if more important than budget then near level cloud storage is a great option

Some other things you may want to think about:

Will I keep my current storage or replace it?

Which systems and applications must storage serve/interact with? Does new storage software integrate with all of my systems and platforms? *(see page 15 for more information)*

Am I under any security/DRM/ geographical restrictions that might limit the countries or regions in which my content is stored?

Do I have any content that requires migration? *(see page 14 for information on migrating content between storage tiers)*

DO YOU NEED TO MIGRATE EXISTING DATA?

If you're adding a new storage tier to an existing storage ecosystem, or replacing a component or entire existing layer, then you may need to migrate existing content that is stored on the technology that is expiring to the new storage.

Traditionally, the term 'Migration' carries negative connotations, as it often involved months-long projects, copying data and then re-writing it to the new location.

However, with the correct storage management systems in charge, migrating content between storage tiers is not the disruptive process it used to be. Some cloud providers even provide their own migration services for tape-based data (the AWS service is called Snowball), but this involves copying tapes, then allowing them to be taken off-site for batch upload to your cloud account.

Having an Intelligent Storage Management platform handle the process allows content to remain on premise.

In fact, when handled by an ISM, such as Masstech's Kumulate, migration represents an opportunity to address issues with existing data libraries.

As part of the migration, outdated files can, for example, be normalized to house formats with a transcode service that forms part of the migration workflow. Or older content, that may not have the necessary metadata attached to it, can be passed to AI services that can generate content and file-based metadata, using services such as facial or object recognition, or speech-to-text transcribing. This rich metadata helps catalog outdated libraries and can even enable greater monetization opportunities for content previously left 'on the shelf'.

DO YOU NEED TO INTEGRATE TO EXISTING SYSTEMS?

Video Editing Suites

Whether you work with AVID, Premiere Pro, or another video editing suite, you want a Storage Management solution that will enable seamless integration of file management and processing into your editing systems and tools, meaning you can access your video assets and projects, without leaving the environment you already love.

Benefits of choosing an integrated solution:

- Archive, locate & retrieve individual files and/or complete projects to/from any local or cloud storage tier
- Archive & restore entire projects, or just segments of your project, from directly within your editing application
- Search anywhere across your entire organization, regardless of whether the file is located in the cloud or on-premise
- View progress of all jobs without leaving the editing suite

PART 4: WHAT ADDITIONAL FEATURES MIGHT YOU LOOK FOR IN A SOLUTION?

As well as controlling storage layers, and ensuring that assets are always where they are needed, Intelligent Storage Management solutions such as Kumulate allow users to easily build out into wider platforms that fulfil many more content processing and other services that form part of the end-to-end media workflow. This ability to add functionality directly onto the storage layers elevates next-gen ISMs from more traditional storage management platforms, which generally only handle file location management.

Some of the options offered by ISM platforms:

- *Optimized content management* - integrated processing applications such as transcode and a media player UX to facilitate Partial File Restore
- *Optimized hybrid cloud/physical storage* - highly effective at managing a wide range of storage systems, allowing users to add the components of their choice, without restrictions or 'vendor lock'.
- *Maximum operational efficiency and content monetization* - the ability to deploy services or applications to save costs (e.g. automated content acquisition) and increase revenue (e.g. content sales)
- *Automated workflows* - reducing operational overheads and eliminating human error from batch processes using automated workflows leads to significant savings

Having these services integrated into the storage management application results in significant financial and operational savings. For example, deploying a workflow that transcodes video assets as it moves them from on-premise disk to cloud storage delivers completed files without operator intervention.

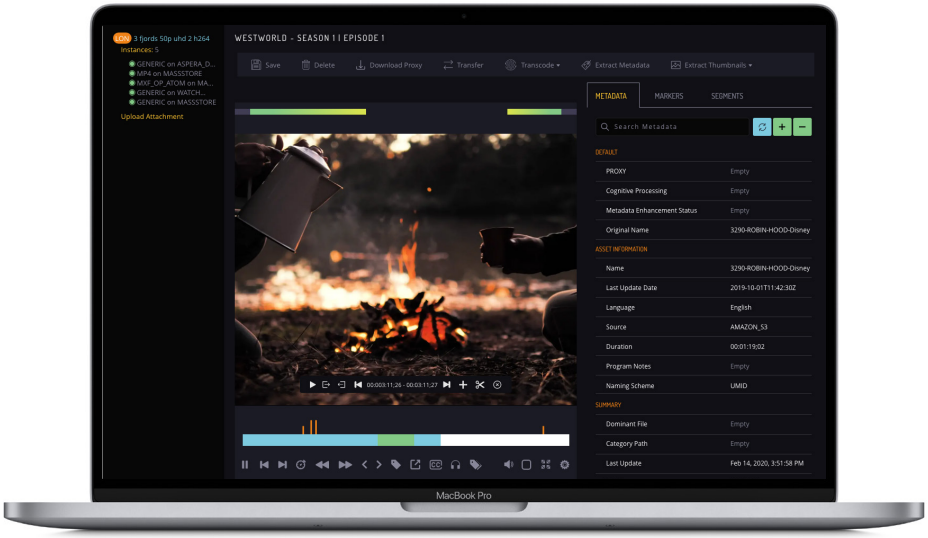
Take this one stage further by adding an integrated Workflow Orchestration application, allowing you to fully automate the batch processes that typically consume a large amount of staff and technical resources, without worrying about where the assets are currently located, or where they need to be upon process completion.

CONTENT MANAGEMENT & ANALYTICS

Content Management

The best storage management solutions not only handle file lifecycle management and locations, but also feature rich content management functionality, including:

- A simple and easy to navigate UI, letting you quickly find, edit and store your content assets
- The ability to search seamlessly from your applications, using rich metadata generated from multiple sources including AI
- The option to only partially restore a file from any storage tier with simple mark-in, mark-out
- Elasticated, federated search across multiple sites and storage tiers
- Frame accurate media playback with segment markers and simuscrub
- Integrated transcoder supporting all major file formats
- The ability to extract embedded video files and attach them to assets as searchable documents



Analytics

Analytics allow you to assess the performance of your content and the storage layers in which it resides. Analysis of current and historical usage patterns and system health allow predictive modelling, which is crucial in forecasting and budgeting costs and budgets. Your ideal ISM solution should feature accurate analytics, easy reporting, at-a-glance dashboards, and predictive modelling.

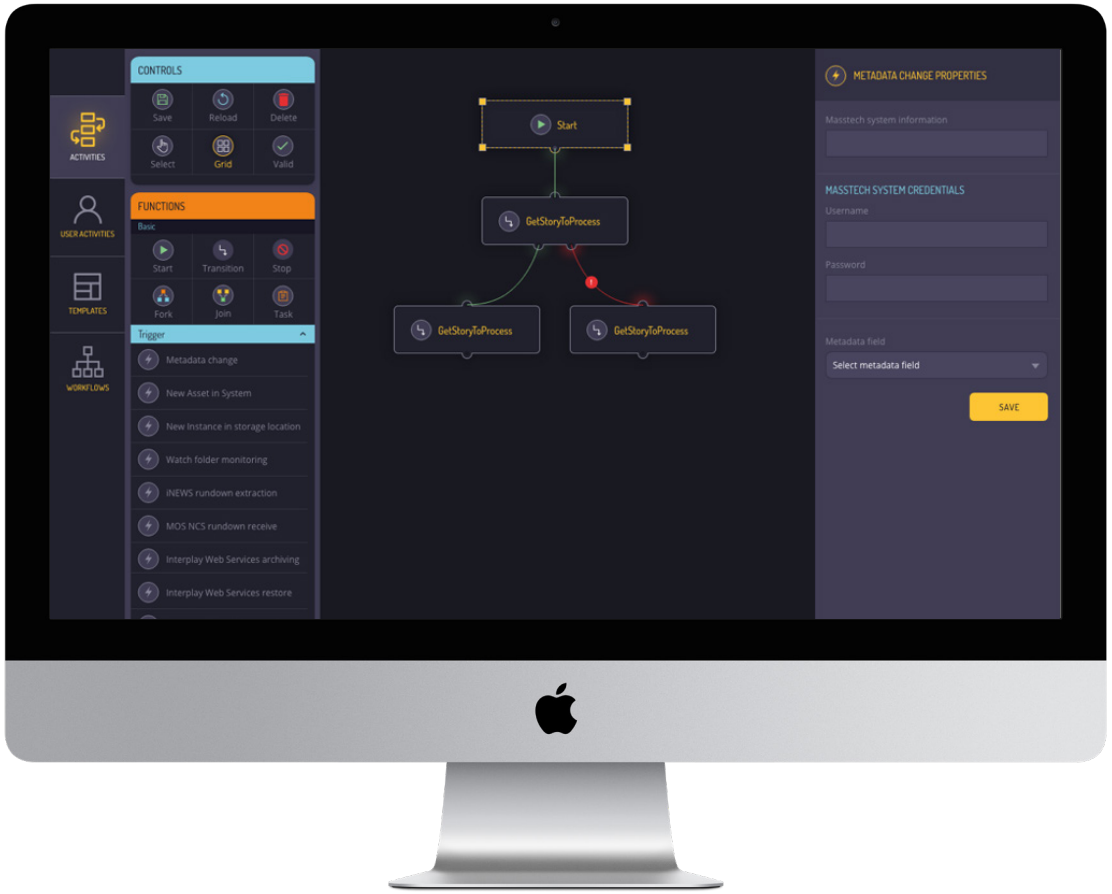
WORKFLOW ORCHESTRATION

Workflow Orchestration

One of the largest budgetary items for an organization is workforce cost. Your staff's time is valuable, and performing batch processes that can be achieved automatically isn't the most efficient use of it. Automated workflows save money, and carry the added benefit of reducing human errors.

From the processing of dailies, to the movement of content between storage tiers, through to archiving of assets for long term storage, or simply transcoding and delivering content to a third-party service, platform or provider - the more you can automate, the more efficient your operations.

To achieve optimized content processing, look for a solution with a workflow orchestration functionality that automates processes and simplifies the way you process, store and distribute content.

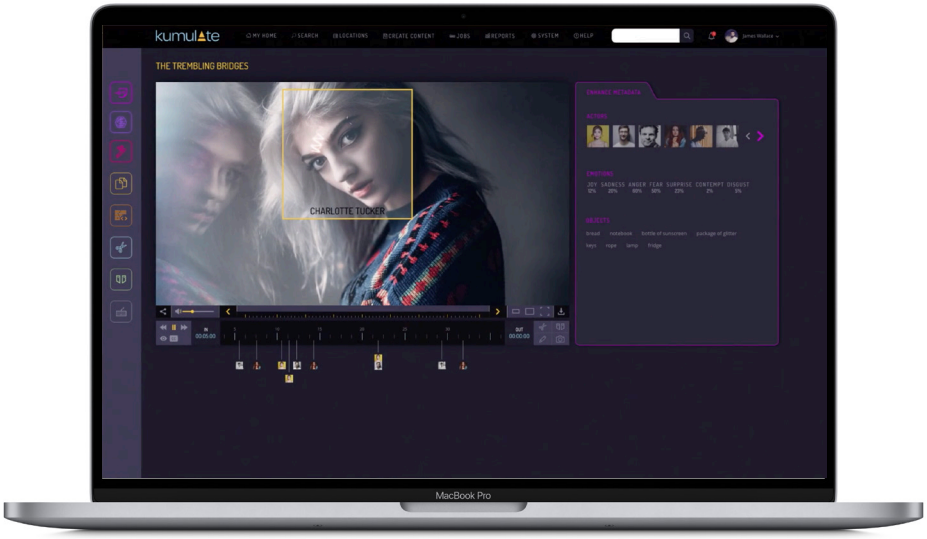


ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

AI & Machine Learning

Artificial Intelligence and Machine Learning are cloud services offered by providers such as AWS and Microsoft Azure. These services perform analysis on (in the case of the media & entertainment space) video, identifying and cataloging useful data such as cast, location, object information, sentiment and conversation. Incorporating AI and machine learning services into standard broadcast workflows can quickly and effectively add these metadata in a way that would have previously required manual logging by a team of subject matter experts – a luxury that few organizations could afford.

This metadata allows better search and identification of asset content, resulting in more accurate categorization and location, with the potential for re-monetization. Further along the supply chain this data even helps populate scheduling and electronic programming tools for end user service providers.



Next-gen ISM platforms such as Kumulate are able to seamlessly integrate AI, machine learning and cognitive services into any workflow, without user intervention, and without having to make changes to existing processes.

CONTENT SALES & ACQUISITION

Content Sales

If you can't get your video assets in front of the widest audience possible, you're not reaching maximum revenue streams. Maximise your ROI of your content by making it available to other B2B and B2C audiences. Some platforms feature integrated web-based stores, making the process of selling your content to third parties quick and easy.

Things to look for:

- An online storefront, connected directly to your storage management which enables customers to find, preview, buy and download your video content whenever they want
- The ability to intuitively manage rights by pre-approving and setting audience groups, so when a customer logs in, they see only the assets they have permission to purchase
- Single click publication allowing you to rapidly make content available for purchase
- Real-time visibility into what's selling and trending, so you can flex your content sales based on actionable insights.

Content Acquisition

As broadcasters access wider international distribution to satisfy OTT libraries and broadcast schedules, they need to control and automate the input of the content they receive into their broadcast operations. If you accept content from multiple providers, you want to bring content in-house quickly and efficiently, and to automatically check that it complies with your house conventions and formats.

You should be looking for functionality which enables you to:

- Cut the time and resources you spend bringing content into your platforms
- Choose content submission rules so incoming content meets your required parameters, including basic metadata, codecs, wrappers and language versions. Auto-rejection reduces manual checks
- Keep track of all your projects with a single view dashboard that provides timely management of all processes
- Maintain supplier confidence by providing a familiar branded experience

PART 5: WHAT TO LOOK FOR IN A PROVIDER

Experience

Video assets aren't the same as other data. Look for a vendor who has considerable experience with and expertise in the management of video files, and who understands the processes and systems that comprise video workflows from end to end.

Agnosticism

- Vendors that are storage agnostic are more likely to provide you with an unbiased opinion regarding the advantages of different storage hardware and platforms. **Remember that many vendors actually sell their own hardware / platforms, and, as such, their storage management is designed to facilitate sales of the hardware/platform. This can make future migration away from that provider tricky.**
- Vendors that are format agnostic can process content no matter what format it is originally created in, removing the need and the associated cost of re-formatting legacy content.

Great references

The proof is in the pudding! We all want confirmation that we are making the right decision, particularly when money is involved, so ask for references similar to your current situation and requirements to check that the provider you're looking to work with has successfully navigated the road you are about to travel.

WHO IS MASSTECH?

Masstech has been creating storage management solutions for video creators, processors and broadcasters for over 20 years. More than 420 customers of all sizes and across the entire media & entertainment spectrum trust Masstech solutions.

National broadcasters, post production houses, sports organizations and broadcasters, film studios, newsrooms, higher education establishments, houses of worship - Masstech's solutions are trusted by them all to keep content secure and at hand.

If you have any questions, or would like to discuss your storage management requirements, please email info@masstech.com and one of our technical team will be happy to help - no obligations, cost-free.

Introducing Kumulate

Kumulate is the latest evolution in intelligent storage, workflow and lifecycle management for video assets. Kumulate is a modular platform that creates your perfect object storage ecosystem, utilizing asset management, workflow orchestration and transcode modules to ensure that your assets are always stored in the most efficient storage tier, and delivered to the right location in the required format.

Across public cloud, private cloud, on-premise disk or tape, Kumulate's intelligent workflows automate media ingest, transcode, packaging and delivery, integrating seamlessly with your MAMs, PAMs or NRCs.

A system that does it all...

Only one M&E archive and storage management vendor integrates with all major cloud providers, writes natively to S3, and supports the widest range of storage hardware, allowing you to truly harness the potential of the hybrid cloud.

Kumulate from Masstech not only provides storage management but all of the additional features that allow you to maximise your content.

Get in touch today to find out more about Masstech can help you with your video storage management needs.

www.masstech.com
+44 2080 502 761
+1 917 268 9270