Telestream
Whitepaper

Video Workflow Management

The opportunities and challenges of building an IT-centric, high volume file-based video environment

"Traditional "islands of processing" system architectures are being overwhelmed by the demand for content. This is itself being driven by changes in the available delivery mechanisms and playback devices and the new regulatory requirements"

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Executive Overview

As organizations turn more and more to video as the vehicle for communications and analysis, their video departments are facing enormous change in the way that they do business. The traditional "islands of processing" system architectures are being overwhelmed by the demand for content. This is itself being driven by changes in the available delivery mechanisms and playback devices and the new regulatory requirements associated with those devices, such as the mandate to include caption data in a media asset.

This same expansion in platform is also taking place at the point of capture. While nobody can deny that this freedom of choice is an enabling factor in the growth of the use of video within an organization, it also means that a video department must deal with an ever growing list of file formats which must be supported. Not only do the acquisition devices and playback devices require specific media attributes, but the very workflows themselves dictate that these assets must be processed in very specific ways in order to be of use further down the food chain. Some workflows require extensive editing of material (in whatever format) before the end result can be sent to the consuming device (in whatever format that device itself requires). Some workflows require that material be streamed to the consumer. Some require delivery by DVD/Blu-ray. Some workflows terminate in archival systems. All have unique processing steps in the journey from source to destination.

In many cases, management of these complex workflows dictates the use of some form of asset management system, but while these systems are generally successful in ensuring that an organization's business requirements are being met, they are generally unable to completely manage the lower-level functions that are required in order to integrate the various individual media processes (and processors) into a single cohesive workflow.

Fortunately, video workflow management (VWM) software tools now exist with process design and infrastructure management functionality specific to video workflows. VWM solutions typically focus upon video content-centric processes, as opposed to organization-centric processes, and generally integrate most of the major capabilities required for video operations.

This white paper will review the trends and drivers that are shaping the evolution of video operations to primarily IT-based infrastructures. The challenges and opportunities brought about by this shift will be examined, followed by an introduction to the concepts and components of video workflow management.

The paper concludes with a brief overview of Telestream Vantage, describing how this flexible server-based solution is enabling organizations to build entire video processing, transcoding and workflow automation systems. Organizations can leverage the proven, award-winning capabilities of the Vantage platform for their core processing, while simultaneously utilizing their in-house expertise to deliver the unique capabilities that their specific customers require.

Vantage's fully documented web-services based SDK ensures that custom functionality can be easily and quickly deployed as required.

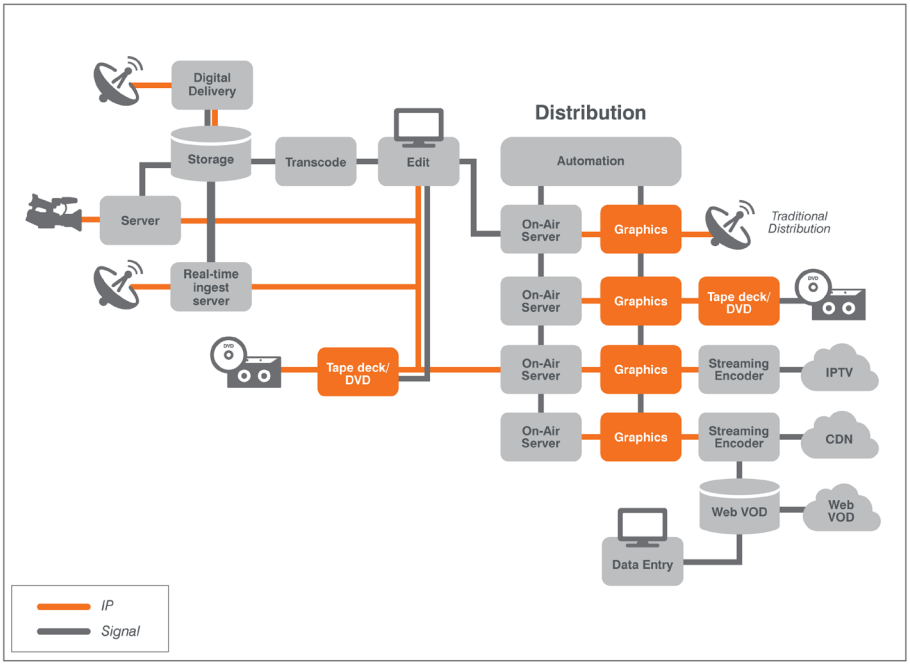


Figure 1. A typical video workflow with a complex mix of signal-based and IT-based infrastructures

Video Industry Migration to IT

Today: Islands of IT-Based Workflow

Over the last ten years, media processing has been gradually moving from purely tape and coax-based (i.e., signal-based) video workflows, to IT- or file-based workflows. IT solutions offer significant advantages over older "big iron" infrastructure:

- Ethernet is much cheaper than coaxial cable
- Ethernet switches allow greater flexibility in signal routing
- IT servers are increasing in horsepower and capabilities and decreasing in price
- Software tools are cheaper and more capable than their earlier hardware equivalents

Despite the advantages, very few major media departments are completely IT-based today. Most involve some mix of signal-based and IT-based video workflows, largely because IT-based video infrastructure components are being added incrementally into existing signal-based operations to implement new workflows, to accommodate growth, to replace aging hardware, improve efficiency, or to cut costs.

This mix of IT-based and signal-based environments means that within most media organizations, IT infrastructure is generally being used today at the workflow or team level but not yet at the organizational level.

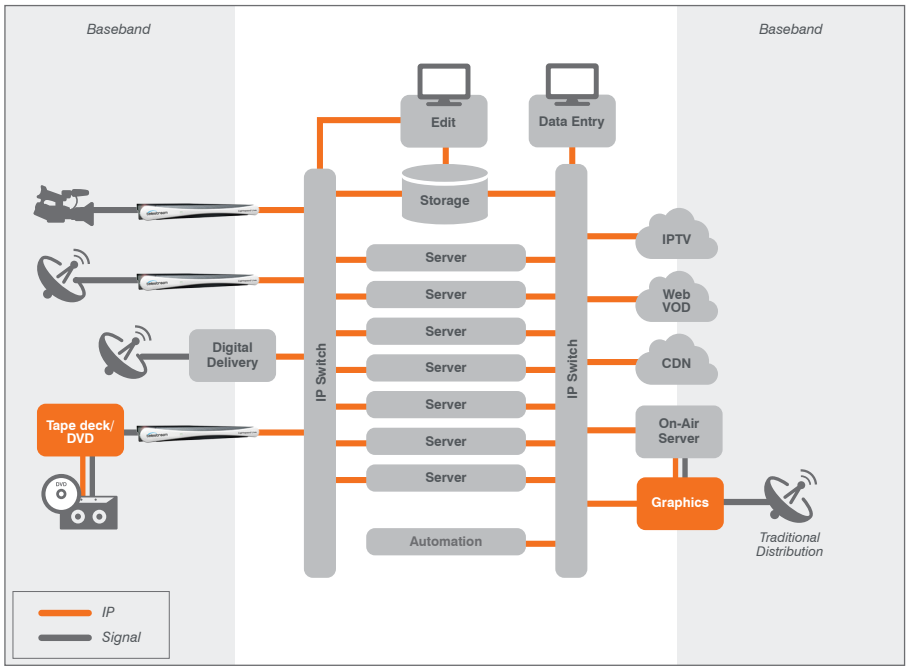
As a result, media operations within an organization tend to have "islands" of IT-based video infrastructure that are linked either by tape, coaxial cable, or through the use of video files which are copied between departments without any unified concept of workflow.

Tomorrow: Migrating the Entire Operation

While the migration to IT thus far has been largely incremental and opportunistic, there are several indicators that suggest the majority of organizations will start to remove these remaining "islands" and bring their entire video operations onto a unified IT environment.

First, much of the remaining signal-based infrastructure exists because specialized video hardware is required - for example, hardware is largely used today to perform tasks such as up-conversion. However, over the last few years, video processing software, in combination with drastic improvements in generic IT server hardware, has caught up to and even eclipsed its hardware counterpart to accomplish these specialized functions.

Figure 2. An IT-centric, organizational approach to video workflow.



Today, software-based up-conversion algorithms exist that easily match and even exceed their hardware equivalents. Software processing has demonstrated capabilities that were never possible in hardware, both in capability and in speed. Because it is performed in software using files, upconversion can now be completed much faster than real-time. So the purchasing of specialized hardware will lessen considerably over the next few years, and there will be a definite preference for software-based solutions, especially within media workflows which focus on pre-recorded content.

Another reason for conversion to IT-based workflows is that many organizations are consolidating their media operations. What previously was done across multiple geographic locations is now possible from just one site. Consolidation can provide many benefits to the enterprise, including reduced operational costs and simplified management of all video components. Major investments are being made in IT-based infrastructure to enable these initiatives. While much of existing IT-based infrastructure was purchased to solve workflow problems, these investments are now enabling organizations to redesign their entire operations around an IT-centric model.

Finally, opportunities now exist to deliver video to a wider variety of digital platforms, including smart phones, tablets, the Internet and other user destinations. To reduce costs and broaden video accessibility, organizations are now moving to a multi-channel, multi-platform distribution model. But each additional opportunity imposes different operational requirements, including new playback software or hardware, delivery platforms, video formats, and other customizations.

Organizations that leverage multiple distribution channels will generally have to increase the quantity and complexity of their workflows, posing new problems for operations to overcome. Further, as each workflow has less value, media departments will need to implement workflow automation solutions as much as possible, and aim for a digital infrastructure that is cost-competitive, efficient, extremely flexible, and easily scalable. It should be noted that for some departments, a transition to a totally IT-based architecture is impractical at the present moment, as they still receive assets in a non file-based format. In these cases, the target is to convert those assets into file-based versions, and process those, leaving the non file-based activities to the periphery of the workflow.

Migrating from "Islands" to "The Entire Operation"

Side Effects of IT-Based Video Operations

With IT-based workflows, several new challenges appear:

- The increase in the number of workflows, makes it harder for human operators to track the moving parts in a video operation.
- Moving parts in the workflow are becoming physically invisible, requiring a software management layer to see and manage what is actually going on.
- IT-based infrastructure, by its very nature, allows the easy copying, renaming, and deleting of video files. This makes it very easy for an unmanaged workflow to get out of control, requiring the implementation of rules to ensure that files are not incorrectly named or misplaced.

As a result of these challenges, successful video operations now require a new approach to process management and workflow automation that goes far beyond what was required in yesterday's coaxial- and tape-based world.

The Requirements of an "Operation" Instead of an "Island"

Software solutions have been used for decades to solve process management and workflow automation in manufacturing, finance, and other industries and are now starting to see application in media-centric facilities. The process management needs of a media operation – particularly when the entire operation is moving to IT – are just as complex and specialized as any process or workflow in other industries. Here are some examples of media-specific management requirements:

- All operations of a media organization must be managed. Instead of simply moving video files around, video workflow management solutions must be capable of capture and delivery (streaming, file delivery and/or real time playout), as well as automated editing and graphics insertion, if applicable.
- Workflow solutions must enable the management of high-horsepower, high-availability IT-based video processing services, guaranteeing 24x7 uptime.

- Tools are required to manage non-transactional video operations, such as scheduled capture or playback, and to initiate video processes arising from proprietary file identification and analysis. This last point is a particular requirement for process management in media operations, as most other applications of this technology are transaction-based - i.e. they largely involve movement of small amounts of data between processes and the management application. Media operations are unique in the huge amount of data that makes up even the smallest of clips.

Because today's IT-based islands typically only move video files around, the above requirements often only surface when an entire operation attempts to migrate to an IT-based video workflow environment. Fortunately, software solutions now exist that can manage the requirements of the entire operation from the top down, meeting the full breadth of today's video operational needs.

The Continued Need for Human Interaction
It is important to note that some of the steps in the video workflow will continue to require human intervention for decision making and artistic choices in video editing. IT-based workflow management solutions can automate and streamline most of the steps and decisions in the video workflow, but they are not intended to completely replace humans in the lifecycle of the video. These new workflow management solutions can free operators from the repetitive aspects of video production and processing, providing them with more time to focus on the tasks where human intervention contributes greater value. An example may make this point clearer: Software solutions can certainly detect when a clip contains some seconds of black video or silence, but a human is required to determine if that black/silence is supposed to be there, as opposed to being the result of an error somewhere upstream.

The intent in any system design is to minimize these human "touch points" – the sheer volume of material arriving at a modern facility, both as tapes, linear streams and files is such that it is impractical to have a human evaluate more than the exceptions. Automating the QC processes is unlikely to completely remove the requirement for human evaluation, but it can substantially reduce the load that a modern facility is placed under (this is especially true when assets can arrive from anywhere around the world).

Understanding Video Workflow Management

What Is Video Workflow Management?
"Video workflow" refers to all of the steps required in the creation, acquisition, repurposing, finishing, and delivery of video. In addition to all of its formal steps and processes, video workflow also includes decision making steps that occur as these processes are executed. Video Workflow Management solutions allow the design, management and automation of video workflows.

Effective Video Workflow Management solutions should include the following capabilities:

- The design and automation of content-centric processes, which include steps unique to video operations such as capture from signal, transcoding, editing, metadata transformation, and integration with the available distribution channel(s)
- The ability to translate information about video content into actions to transform video content
- The ability to pass video-specific information, such as captions, between steps in a video process
- The ability to integrate with third-party video systems and use their file systems and metadata models in workflow design

Video Workflow Management solutions typically focus on content-centric processes, meaning that the processes typically start executing when content becomes available to the process. This is in contrast with organization-centric processes, which may involve content as a small part of the process, but typically will start executing when a client requires an output.

For example, consider the case where a client submits a request for video content. Responding to the client request might involve checking an asset database, summarizing available asset information, sending an email to the client – primarily an organization-centric process. In contrast, consider the automation of the analysis, preparation and delivery of video content, which is typically done when the content becomes available. In this case, the process is content-centric – it is initiated by the arrival of content, and process steps largely revolve around the content itself.

Video Workflow System Components
The IT-based infrastructure will offer video content producers, processors and distributors the opportunity to leverage powerful software tools that can make video workflow management much more efficient and cost effective, both within and between facilities. However, workflow management is useless without the ability to manage all of the essential components, such as:

- IT hardware infrastructure: Ethernet and Ethernet switches, IT servers, and storage
- Transformational software: Transcoding software, metadata transformation software
- Human interfaces: Metadata entry/operator interface software, editing software
- Assembly/Repurposing software: Automated editing software, automated graphics software
- Delivery software: Web/IPTV/mobile streaming software
- Management software: Workflow design/management software, asset management software
- Analysis software: The ability to look at the content, and provide information based on that analysis that can be used for automated decision making in other parts of the workflow
- Decision-making software: Process control software, often relying on the results of the analysis of the media
- Interoperability: Signal-to-IT and IT-to-signal hardware, legacy interfaces for acquisition/delivery

Video workflow management solutions must incorporate all of the above components if they are to successfully address the full breadth of today's video operational needs.

Integration with Legacy Infrastructure
For most organizations, the evolution to an entirely IT-based workflow will not occur overnight. It will happen first in individual workflows, and then slowly grow to include the entire operation as opportunities to save money, streamline operations, or address new requirements present themselves. This means that for at least a few more years, interoperability with legacy control systems may remain a requirement for established video media departments.

Comparison to Traditional Process Management Systems
Within video operations where IT-based islands are the norm, either digital asset management (DAM) or business process management (BPM) software solutions are occasionally used to manage simple video workflows. However, as organizations move to IT-based workflows for the entire operation, these systems are generally unable to provide the full capabilities of a video workflow management system.

For example, DAM systems are often excellent at managing and tracking the storage of content and metadata, but they are not typically strong in the design of content-centric processes. Further, while they can often automate simple workflows that just copy files, they do not typically extend into managing 24/7 failsafe IT systems, nor do most of them reliably handle scheduled playout, capture, streaming, and graphics operations.

Similarly, where BPM systems are excellent for designing overall business-centric processes, they are not generally suited for designing video content-centric processes. In cases where a video file can be treated as simply another file, simple workflows can be modeled effectively. However, most BPM systems do not understand video-specific data types (such as timecode), cannot pass information reliably between steps in a process, which is generally a requirement for video processes, where the results of content- or metadata-analysis may be used to treat the video, and are not suited for non-transactional operations such as streaming or scheduled capture. Further, very few can understand the proprietary file formats and protocols required to interface with legacy video systems, making them unsuitable for companies where the migration to a full IT-based infrastructure will not happen overnight.

In short, video workflow management software provides a full suite of tools for creating and managing content-centric video workflows and capabilities that are not available in other process or content management systems.

The Telestream Approach

Telestream has invested heavily in all of the technologies that are important for the evolution of video operations. Web streaming, IT-based capture and streaming, transcoding, video file analysis, metadata transformation, and enterprise-class video workflow management are all core technologies that Telestream has under its roof.

As the industry leader in video system interoperability solutions, Telestream has developed the core competency of ensuring that all of its technologies interface with virtually every distribution channel, editing system, origin/cache/playout server, asset management system, and almost any other video technology on the planet. The Telestream approach recognizes that video operations cannot move entirely to IT overnight, and provides the ability to blend both signal-based and IT-based workflows, enabling organizations to evolve to a digital video environment whenever it makes sense, without ever requiring a complete overhaul of existing video infrastructure.

Telestream Vantage
Telestream Vantage enables organizations to design, automate, and manage the entire digital video workflow. This fully integrated family of products provides the ability to tie together all workflow capabilities seamlessly, flexibly, and cost effectively. Vantage makes it possible to design and manage virtually any video process required, regardless of format or delivery option.

Vantage was built from the ground up on a future-proof platform that provides flexible integration with existing systems. Web service interfaces can be used to access Vantage video processing capabilities as part of a larger external process. Alternatively, Vantage can be the primary driver of a workflow and can leverage outside web services to trigger external transactions as appropriate. This enables a whole new level of integration between business process management solutions and Vantage's video workflow management solution.

Vantage - Designed for flexibility
While many video workflows are similar, no two workflows are ever the same. This is particularly true in medical, security, transportation and government applications. Many media departments employ image processing or business management experts to create and maintain custom solutions tailored to their specific needs. There are many components to those workflows, however, which are identical, at least in basic operation. Vantage offers an extremely powerful and well documented web services API which allows customers to focus their in-house engineering teams on their unique processing requirements, while integrating Vantage to perform the traditional video, metadata, captioning and data movement activities. Such hybrid systems bring a "best of breed" approach to engineering-specific video processing solutions, without requiring that in-house engineering talent be fully versed in all of the nuances involved in more general purpose processing, transcoding, analysis and delivery activities.

Telestream Vantage has already been deployed in this manner at several large video processing facilities to great success.

Visit www.telestream.net for more information on Vantage and the capabilities of its API.

Summary

The evolution from signal-based video workflows to IT-based environments continues to make significant progress. Now, with the availability of powerful new digital workflow solutions, organizations can successfully make the transition from "islands" of IT-based video workflows, to fully IT-centric video operations. What Telestream did for transcoding automation, it is now doing for the rest of the digital workflow. Telestream's fully integrated Vantage infrastructure, coupled with its full featured and well documented control API offers media companies tremendous flexibility, control, visibility, scalability, empowerment, and an unshackled workflow. It streamlines all video process operations to create efficiencies across the entire video workflow lifecycle.

About Telestream

Telestream provides world-class live and on-demand digital video tools and workflow solutions that allow consumers, businesses, and organizations to transform video on the desktop and across the enterprise. Many of the world's most demanding traditional media companies, as well as a broad range of business, government, and non-profit environments, rely on Telestream products to streamline operations, reach a broader range of users, and generate more value from their media, while simultaneously reducing operating costs.

These companies choose to work with Telestream as they know they will get a trusted and highly skilled technical partner. Telestream prides itself on taking a true consultancy approach to customer relationships and is known for providing unparalleled customer service and support.

Telestream products span the entire digital media lifecycle, including capture and ingest, live and on-demand encoding and transcoding, captioning, playout, delivery, and live streaming, as well as management and automation of the entire workflow. For more information, please visit: www.telestream.net

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