



Managing the Transition to Tapeless TV Production

Preface

The broadcast and production industry is in a period of intense and disruptive change that is creating multiple internal and external pressures for broadcasters and production houses.

- Legacy production technology and processes limit the ability to respond to new market opportunities in an effective manner.
- Regulation—particularly for public broadcasters—slows down or even blocks the necessary transition
- Decreasing advertising revenues due to competition from Web-based newcomers such as Metacafe and YouTube are driving the need to reduce costs and limit capital investment.

New technologies, distribution media, and increasing consumer choice mean that organizations must adapt quickly in order to thrive or indeed survive. Nonetheless, many broadcasters are resistant to making the change from a long-established TV production environment towards a modern IT infrastructure that will help them address their challenges. Some, however, have recognized the risks these challenges present for the future and have initiated programs to evolve to a tapeless TV-production environment. This document highlights the results and insights gained during such a program at the Austrian Broadcasting Corporation (ORF), which are applicable to many broadcasters and TV publishing houses.

Project briefing

In early 2003, ORF launched multiple tapeless initiatives at their central and regional studios to take advantage of the possibilities offered by new technologies and processes. They began by migrating their news production facilities and subsequently other program departments to a tapeless environment. In 2005, ORF engaged EMC® Infrastructure Consulting to help support their transition to tapeless TV-production.

The engagement had the following objectives:

- Identify bottlenecks and inefficiencies in current and future technology and processes
- Review the initiatives in progress at ORF and their contribution to a future file-based production process
- Identify other areas of technology and process that must be addressed in order to enable file-based production—in particular, an online archive leveraging EMC's core competencies on storage
- Analyze the business impact and risks associated with this change and enable ORF to mitigate those risks

EMC consultants analyzed ORF's current situation by following the generic television production process: pre-production, production, post-production and broadcast, and subsequently identified the changes for infrastructure, business processes, and financials to evaluate the benefits ORF would gain from the new TV production infrastructure.

Insight

The status-quo analysis provided an understanding of ORF's limitations due to tape-based production technology and processes. ORF's infrastructure was inflexible and increasingly expensive to support and maintain. In particular, tape-based and mixed file/tape workflows were inefficient for both technical and creative personnel. Business processes were labor-intensive and time-consuming (e.g., movement of videotapes, archiving of tapes, and rights management). Additionally, new distribution channels—for example iPod video—required a significant amount of manual work.

Migrating to an end-to-end file-based TV production, however, would be complex and impact the whole organization. A technology inventory—from camera equipment to an online archive—would need to be performed. Business processes would need to be adjusted and accompanied by change management efforts—especially training. Simply swapping the infrastructure would not be sufficient.

Additionally, ORF would need to create a five- to ten-year budget plan to finance this change. This would be challenging, since ORF, like most broadcasters, was not used to planning for such a long timeframe and would have to base some financial decisions on projections as not all information would be available to them.

In the To-Be analysis, EMC made the following recommendations for migrating to tapeless TV production concerning program management, infrastructure, processes, and financials:

Program steering—Formal program control and reporting is required to minimize project dependencies and overruns that would jeopardize the delivery. Such program control must develop and enforce a common strategy, program vision, and program charter (i.e., a program map explaining the final objective/vision and the way to achieve this in the given timeframe).

Tapeless infrastructure—Before building a tapeless infrastructure, the following issues must be addressed:

- **Resilience and availability.** It is critically important to understand the interdependency between systems in an IT environment as one system's failure can have consequences impacting other systems. Systems must be designed accordingly to guarantee resilience and availability. If these relationships are not properly understood, production capacity could be seriously impacted if even ostensibly non-critical components failed.
- **Disaster recovery.** Delivering a disaster recovery solution in a tape-based environment is difficult and an inefficient use of resources. Copying all existing media and storing it offsite is effective but time-consuming and expensive. However, disaster recovery is standard and easy to implement in the IT world (e.g., replicating the online archive to a second location).
- **Centralized ingest.** Centralized ingest better guarantees format compatibility and reduces the risk of multiple incompatible formats being created. Experienced staff can get a higher quality result more consistently. Moreover, it can be cost-efficiently integrated with the production content management system (CMS) and online archive. This, in turn, reduces the overall capital investment and maintenance cost associated with ingest.

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- **Production content management system.** By delivering a production CMS and content storage for the duration of program production from the first day of filming until broadcast, production teams can significantly improve their workflows. A production CMS integrated with the shared edit storage and archive allows production teams to begin ingest, logging, and rough-cut editing during the filming cycle, providing several benefits:
 - Tasks can be performed in parallel.
 - Production teams can determine what additional content will be required.
 - Teams can edit more efficiently by editing together archive material prior to and during filming.
 - Material can be re-purposed and re-platformed quickly.
 - The risk of losing content between shooting and editing by ingesting rushes during the production is minimized.
 - **Online archive and digital asset management system.** Planning an online archive and digital asset management system should begin with the creation of an interim digital archive where all broadcasted content is stored, followed by digitizing the archived content used for current TV productions. A permanent archive, which will hold several petabytes of content and will grow in magnitude each year, can be created in parallel.

Processes—Although most broadcasters have workflows and processes in place, documentation is frequently limited. Moreover, quantitative figures (e.g., KPI) for those processes are often missing or not monitored or analyzed. Without an understanding of the efficiency of current processes, it will be difficult to quantify gains, and issues may go unnoticed and unresolved. Improving the documentation of the traditional processes and implementing KPIs will help to show the benefits of an end-to-end tapeless TV production. Moreover, it will reveal additional savings potential. Process rigor is key.

Additionally, implementing end-to-end tapeless processes without any media breaks will reap the full benefit and avoid frustrations for those who have to work with island solutions. Thus, we strongly recommend changing the infrastructure at once.

Quick wins can be realized by prioritizing the migration of programming genres that gain the most from tapeless production. A simple quantitative process analysis of people hours spent on each process phase and total hours broadcasted will immediately reveal each genre's saving potential. An analysis performed at ORF showed that the news and sports genres would benefit most from a tapeless environment and should be migrated first.

Financials—TV production remains and will continue to remain labor intensive. The cost of a tapeless TV production environment is initially about equal to a traditional environment, which can be explained by:

- Upfront investment costs (comparable with introducing a new videotape format)
- IT technology refresh every 3–4 years
- Rising costs for a growing digital archive (estimated based on our in-depth storage cost expertise)

However, in the long-run, process and infrastructure efficiencies will kick in and either reduce the production costs or allow for more production with the same effort. For example, the ORF can use the free resources to access further distribution channels and earn additional revenue. Moreover, ORF will not buy into a proprietary videotape format and stick with this supplier for 10 years. Instead, they can implement various vendor strategies or even outsource certain process steps to service providers and concentrate on their core competency: producing high-quality content.

Outlook

Looking ahead, further challenges pave the road to a tapeless infrastructure. High definition TV (HDTV) will increase technical needs significantly. Network bandwidth, CPU/GPU power, and storage volume for TV production will certainly grow. New video compression algorithms will ease this pain, but HDTV will certainly raise the bar.

Given the experience of some broadcasters who have implemented HD tape-based technologies, such as NHK in Japan, we strongly recommended to ORF not to pursue an HD tape-based technology as a strategy. One reason was that NHK's experience showed that the established infrastructure and tape-based workflow required costly changes. For example, HDTV editing is done by creating an SDTV version for editing in SDTV NLE devices and sending the edit list back to HDTV for material cuts. Another reason was that metadata was hardly used, making it difficult to reuse material.

Another challenge will be designing, implementing, and operating an online archive. According to our analysis, it will not be accomplished by installing a DAM system with a huge tape library attached. An online archive will need several different semi-automatic interfaces—i.e., human interaction will be required to decide what needs to be archived and to attach metadata “wisely” to the content. An archive without metadata will be worthless for search queries.

One interface will handle the content from the production content management system; a different one will deal with the on-air content from various distribution channels; and an additional one, which is most important, will be used to ingest the present on-the-shelf archive. Therefore, more than a third of the overall cost for an online archive will be labor cost (e.g., people attaching metadata to new content and old content and ingesting tapes).

However, such an archive will not be of much help without a user-friendly and intuitive GUI in place, which should be continuously enhanced according to the needs of the program departments. Thus, journalists can do the rough cut accessing the P-CMS and DMS from their desks.

Furthermore, the online archive needs to have partial file restore functionality. Partial file restore is of critical importance if the archive is to be able to operate effectively and efficiently. Without partial file restore, it would be necessary to restore an entire program to extract even a very short clip.

The archive solution as a whole will need to be capable of mapping time code to byte ranges within stored files. These mappings will need to be frame-accurate across multiple formats and bit rates. In recent years, open means of indexing MPEG files have emerged, which make this mapping simpler to achieve.

In summary, such an online archive would support the classic TV-production process and significantly shorten the pre-production and production phase. In addition, it could simplify the production for other distribution channels, providing the basis for new genre channels or on-demand services.

Looking at the tremendous investment necessary to establish such an online archive, economy of scale could be realized by centralization. This means that combining all island archives for radio and TV within one organization, on a national level, or among several broadcasters would considerably reduce cost—and would open the door towards the highest level of an end-to-end tapeless TV production. Imagine the possibilities.

About the authors

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