FIMS, SOA and Media Applications
How modern software systems can serve media businesses

The demands on broadcast systems are increasing. The move to file-based operations and the challenges of delivering in multiple formats across multiple platforms are exposing many weaknesses in existing systems. Many were designed to meet the needs of the last century, for simpler, linear broadcasting.

Traditional broadcasters are facing more competition from new entrants to the media business. YouTube, Hulu, Amazon, Netflix and other over-the-top (OTT) operators have changed the landscape for video on demand. Digital transmission allows broadcasters that once had one channel, to air a multiplex of linear channels, as well providing catch-up and mobile services.

To compete with new, global operators, broadcasters must deliver to more platforms — linear and on-demand — and to a plethora of devices from smart TVs to mobile.

The Future — Agile and Efficient

To meet these challenges, operations must become more efficient and the business must become more agile. Many other sectors have faced similar challenges, from finance to pharmaceuticals. Part of the solution for many has been to turn to new software methodologies, specifically business process management (BPM) and the service-oriented architecture (SOA). Although each can be used stand-alone, BPM and SOA are frequently used together as a platform to improve the performance of the business.

Operations that use videotape were constrained by the need for manual handling, but as content migrates from videotape to digital files the way is open for broadcasters to use IT methodologies including BPM and SOA to aid their operations. They provide a holistic approach that can adapt more easily to the digital media future. They also provide corporate management with better visibility of operations. Stemming from improved monitoring, operations can be optimized to improve efficiency and lower costs.

BPM and SOA have already proved successful in other business sectors, and, with the FIMS Project driving standards and practices to meet their special requirements, the time has come for the media sector.
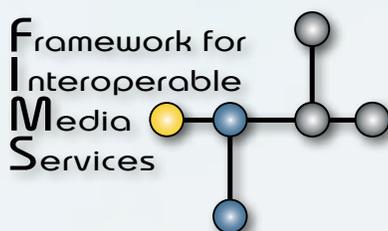
Traditional Broadcast Systems

Broadcast systems have evolved as a number of silos coupled by real time SDI streams or videotape exchange (see figure 1). Within each silo processes and applications are linked by a variety of interconnections with file exchange and an assortment of control protocols.

Such systems were optimized for a specific application and have provided a good price/performance ratio with high efficiency.

However, the tight coupling of these older systems makes it difficult to upgrade or replace one or more of the components. Applications are typically coupled in a mesh, often with proprietary application programming interfaces (API). If one item of software is upgraded to a newer version, the API may also be modified. This will undoubtedly lead to changes to other software applications that are using the API — and this work is usually custom and can be costly.

It can be difficult to add new functionality to the system to meet the ever-changing demands of multi-platform delivery and evolving codec standards.

Storage architectures are changing with object-based and cloud storage becoming alternatives to on-premise NAS and SAN arrays.

When vendors upgrade products, the new versions often do not support legacy operating systems leading to the need to replace underlying computer hardware platforms.

All this adds up to the reality that traditional systems are just not agile enough to support the new demands of the media business without modifications and additional cost. Frequently new multi-platform systems are added on to existing linear playout systems in an ad hoc manner to support a pressing demand. The consequence can be a system that grows in a way that becomes difficult to maintain and operate.
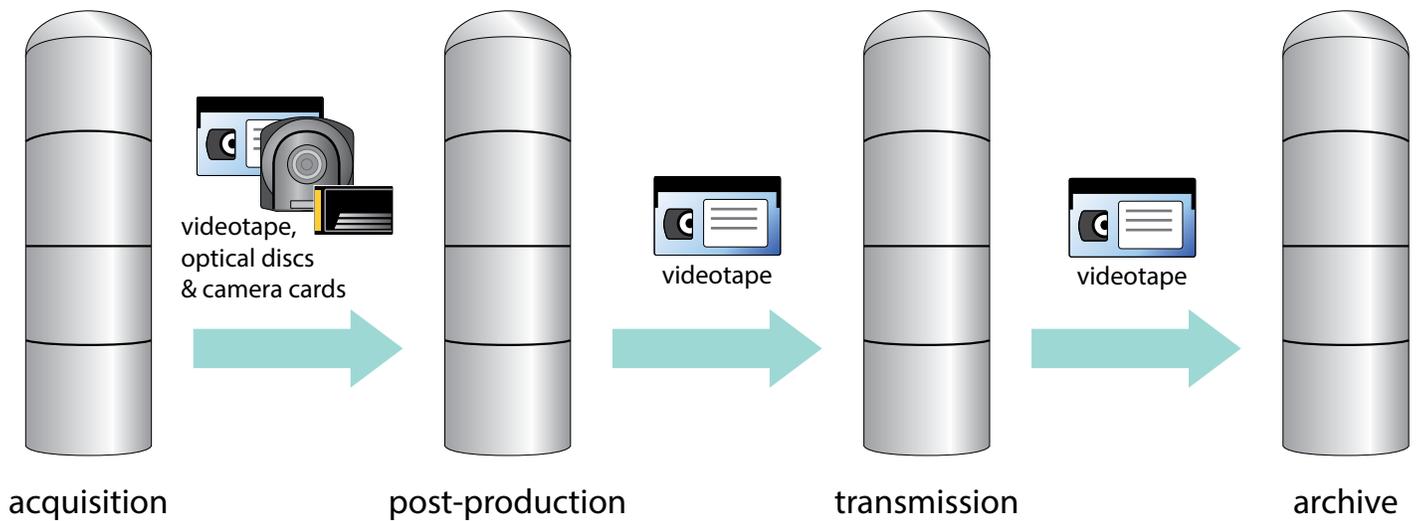

videotape, optical discs & camera cards

videotape

videotape

acquisition

post-production

transmission

archive

Figure 1. Legacy broadcast workflows operate in silos

Visibility of Processes

Traditional systems also suffer from a lack of visibility of the internal processes. Individual processes may display the status on a local user interface, but it is difficult to obtain an overall view (dashboard) of the operation of the business.

As broadcasters strive for even more efficiencies, it is vital to have an overall view of technical operations as an aid to manage existing systems and to guide future investment. Many broadcasters already have end-to-end alarm monitoring, but resource usage may only be monitored for billing purposes, and not to discover utilization factors for hardware and software plus measuring operational efficiency.

What is a Service?

In the context of SOA, a service is a mechanism to provide access to a capability. Examples of services in the broadcast domain include:

- ingest
- transform
- playout
- move a file
- archiving a file

A transcoding application could expose its capability to transcode files as a transform service.

The service is defined at the business level rather than the detailed technical level. This allows different manufacturers to deliver a given service, even though the detail of implementation will differ from product to product. This leads on to a key feature of services—abstraction of capability.

Abstraction

The business management logic may call for a file to be transcoded from in-house mezzanine codec to YouTube delivery format, but it would not define the specifics of a particular make and model of transcoder or the detail of the file formats. It would simply indicate that a transcode capability is required.

This abstracts the business logic from the underlying technical platforms.

A generic service interface for file transform can be defined. Different transcoders will be wrapped by a service adaptor, which handles the complexity of the transcode process. To the business logic, the transcode is simply a job.

Autonomy

In existing broadcast systems, the ingest job is delegated to an operator. He or she configures an encoder, then starts and stops the encoding at the appropriate times. The operator is functioning autonomously during the processes of the job.

These concepts of delegation and autonomy are also fundamental to the SOA design philosophy. The encoding may well be automated as a computer process, but the principles remain the same.

Because the service is abstracted it opens the way for broadcasters to leverage cloud services more easily. As an example, at times of peak transcode demand a cloud transcode service could be used to supplement in-house resources. With a standard service interface for transcoding, the implementation can be an on-premise service or in the cloud.

The operation of the services is orchestrated by a layer of middleware, software that manages business processes according to the needs of the business.

Services are Reusable

A transform service can be used for different business processes. For example a transcoder could be used to transform files at ingest to the house codec or used to create multiple versions of content for multi-platform delivery. The transform services can be redeployed to different departments as the needs of the file traffic change from hour to hour. This provides a significant improvement in utilization and operational efficiency

Service Contract

In SOA, services share a formal contract. Service contracts are commonplace in broadcasting and across the M&E sector, where companies call on others for capabilities, like playout, subtitling and VFX as examples. The service level agreement (SLA) for playout will include quality aspects like permitted downtime (for example the 99.999 % SLA).

Service contracts operate at the business level, and ultimately could result in monetary exchange, for example with cloud services.

It could be said that many broadcasters run departments that provide services to other departments (as silos). They just don't extend the methodology to the architecture of technical systems. Instead they run monolithic silos for the processing of content within each department.

What is SOA?

The service-oriented architecture (SOA) is not a product but an architecture to deploy loosely coupled software systems in order to implement the processes that deliver a business workflow.

SOA provides a more viable architecture to build large and complex systems because it is a better fit to the way human activity itself is managed -- by delegation. SOA has its roots in object-oriented software and component-based programming.

SOA is not new; it has been in use for a decade or more in other sectors including defense, pharmaceuticals, banking and insurance. It developed from the principles of object-oriented software design and distributed processing. The media sector has lagged other sectors in the adoption of such systems for a number of reasons. These include the sheer size of media objects, the file sizes, and the duration of some processes. A query for an online airline reservation may take a minute at most; a transcode of a movie can take several hours. Conventional SOA implementations are not well suited to handling such long-running processes and mission critical activities.

In the context of the media and entertainment sector a SOA can be used to implement a "media factory", processing content from the production phase though to multi-platform delivery. Service-Oriented Architecture (SOA) is a software methodology that a media business can utilize to transform the operation of business into a set of linked services or repeatable business tasks, that can be accessed when needed over a network. This may be a local network, it may be the Internet, or in the cloud. In theory, a media business could access services across the globe; in Singapore, London, New York, and Los Angeles as though they were all installed locally.

Media businesses can rapidly adapt to changing conditions and requirements by bringing together services to accomplish a specific business task

The Architecture

There is no prescriptive SOA, but an ESB is conventional for the messaging layer. The workflow orchestration and business logic are performed by software applications called middleware. Adaptors connect the services to the ESB.

The services are implemented by reusable software modules that are independent of the platform on which they run.

Part of the ethos of SOA is to align the technology platforms with the business goals. Traditionally the operational workflows have been defined by the technology, especially stemming from the constraints that videotape imposed on processes. The migration to handling content as streams and files using generic IT platforms has transformed what is possible.
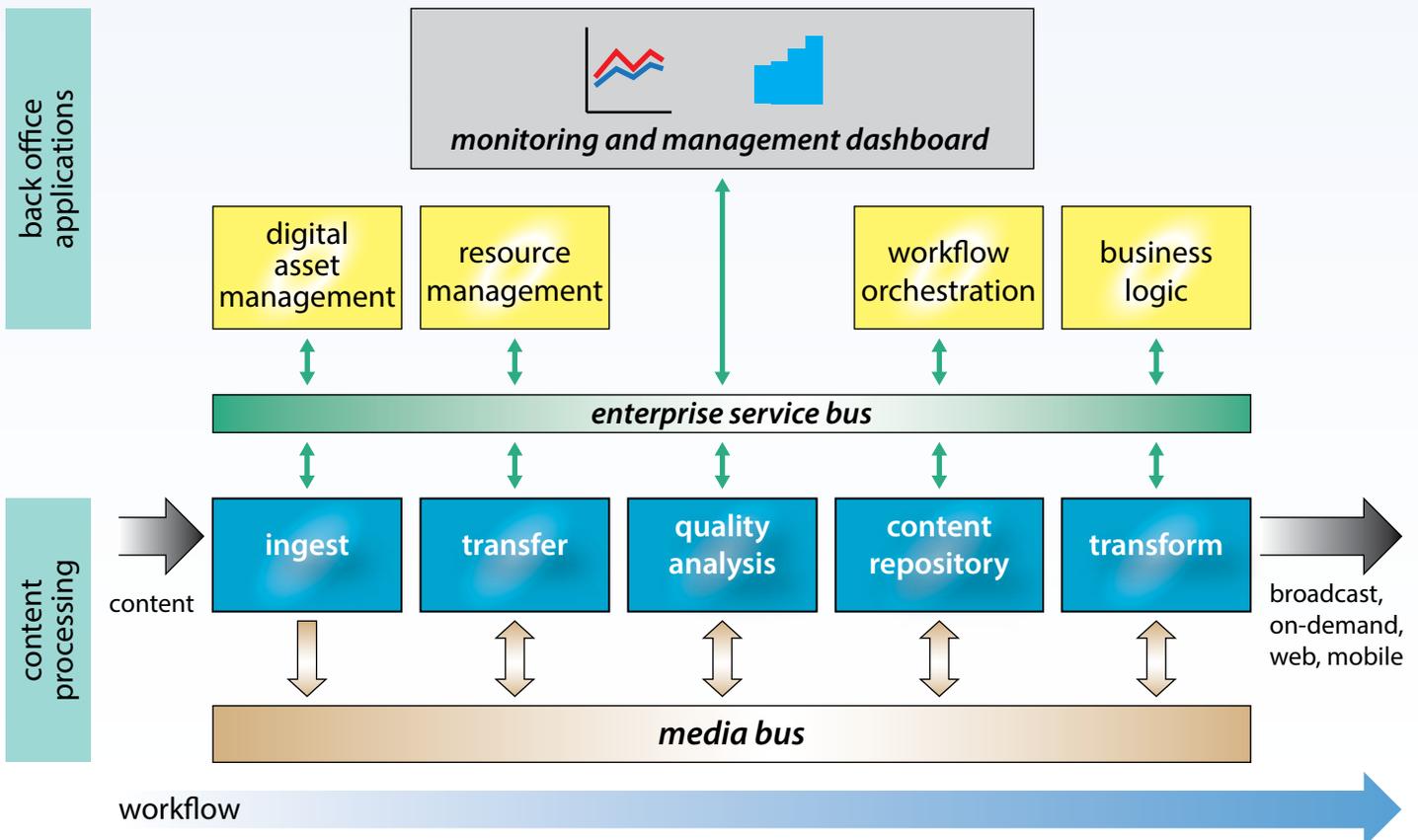
FIMS

The Advanced Media Workflow Association (AMWA) and the European Broadcasting Union (EBU) had been independently looking at the issues of SOA for the media sector. In 2010 the two parties decided to pool resources and jointly set up a project, the Framework for Interoperable Media Services (FIMS). This project would develop standards for a framework to implement a media-friendly SOA.

The FIMS solution has the aim to provide a flexible and cost-effective solution which is reliable and future proof. It should allow best of breed content processing products to be integrated with media business systems

The FIMS team released V1.0 in 2012 as an EBU specification, Tech 3356. Three service interfaces have been specified:

- transform
- transfer
- capture

Services currently under development in 2013 including quality analysis (QA) and the repository service.

The FIMS Project has expanded on the conventional SOA with additional features to meet the needs of media operations. Specifically FIMS adds:

- Asynchronous operation
- Resource management
- A media bus
- Security

Asynchronous operation allows for long running services. A media process may take hours or days; conventional SOAs allow for processes that complete in seconds or minutes. This places specific persistence requirements of the SOA BPM platform.

Although services are loosely coupled to the orchestration, jobs can still be run with time constraints. This may be simply to start a job at a certain time, but services can also be real time, like the capture and playout of streams. In theses cases the job requests for the service will also include start and stop times for the process. For playout, this concept is no different from a playlist or schedule.

Resource management allows process and resource scheduling to be cognizant of very long running media processes.

A SOA typically is based on an ESB that carries XML messages between services.

The **media bus** operates in parallel to the ESB to transport the large media files between services.

Security includes authorization and access control, but for media operations it may well include digital rights management on watermarking of content essence files. The enterprise nature of SOA and ESB will make the need for security policies to be more rigorous than older siloed architectures.

Planning for SOA

Migrating from traditional tightly coupled systems to use the principles of SOA is a big step for a media business. The efficient operation of a SOA requires thorough analysis of business needs and detailed definition of the services that will be needed to meet those needs.

It will also require rigorous planning of the IT infrastructure— the computers and networks—for efficient operation of the services.

It must be remembered that SOA is a means to deliver business goals, not an end in itself. Moving to SOA is an opportunity for a media business to rethink goals, and break from the constraints imposed by earlier videotape operations.

For broadcasters used to running departmental silos, many with real time elements, the move to a SOA will be a radical change to the way the business operates. However, the advantages of the SOA and allied systems like BPM are proving attractive propositions for the broadcaster or service providers that are running complex file-based operations for multi-platform delivery.

A media company looking to embrace SOA and BPM will face challenges including change management, plus they need to keep on air throughout the migration to the new technical infrastructure.

In view of the radical change SOA can bring, many companies have trialed the architecture in one area of the business before committing to that changes across the entire enterprise.

Traditional broadcast system installations were a wiring and configuration exercise whereas SOA requires more IT than video skills.

There are several consulting companies that specialize in the media sector, and

these companies can bring their valuable skills to broadcasters who are unfamiliar with complex enterprise software implementations.

However, the task of delivering a media SOA potentially needs custom development of adaptors to the chosen services. If common standards existed there would not be the same need to duplicate development work creating new adaptors for each project.

It was this issue that the AMWA and the EBU independently realized. Combining forces, they formed the FIMS Project to bring standards to the process.

Early adopters of SOA have designed each service adaptor as a custom project. As FIMS adds more standard service adaptors, the need for bespoke coding will decrease.

The road will be long and many obstacles remain to be resolved, but the success of this project will bring benefit to both vendors and media companies with a more standards-based approach.

David Austerberry, 2013

Questions about FIMS

▶ **If SOA is common in other sectors, why not just buy a system from a middleware provider?**

 » The problem lies with the special nature of media operations. Through the work of the FIMS Project, standards are being created for a framework and for service adaptors specifically designed for the media sector.

▶ **How can I be confident that mission critical tasks, such as program playout, will occur on time?**

 » A playout service, like all services are abstracted and autonomous. This means that a playout service can run in real time, synchronous to a time-of-day reference.

▶ **How does FIMS relate to AMWA Application Specifications?**

 » FIMS is a system architecture. Application Specifications define constrained versions of MXF used for file exchange. FIMS services could well use Application Specifications for content transfer over the media bus.

▶ **How does the FIMS architecture relate to the file based workflows already being adopted?**

 » It is possible to build a file-based workflow in many ways. It could model older videotape workflows, or the FIMS architecture could be adopted, but these are just two ways to use content files in a workflow.

If you are interested in the FIMS Project, please visit www.fims.tv for more details and resources.

If you are interested in becoming a member of the AMWA, please visit the AMWA web site at www.amwa.tv/join.shtml.