Advanced Editing & Content Management Installed and Operating in Australia

Abstract

Centralisation is driving considerable product R & D activities to focus on system solutions, cost effectiveness and reliability. Pinnacle's "Palladium™" vision for the future broadly describes an architecture that accommodates advanced MPEG-2 editing, shared content and server playout channels. Importantly Palladium recognizes the value of strong integration to innovative hardware and software applications.
New systems are being commissioned that incorporate open XML interfaces to allow full system access and control making proprietary databases and closed interfaces a thing of the past.

Introduction

We have reached another landmark in the evolution of Australian broadcasting, where the concept of "video" has truly been replaced by "data". While this concept is not new, only recently have commercial broadcasters taken this technology all the way. Complete Centralised broadcast Operations now deploy end-to-end systems that use MPEG-2 nonlinear editing, file transfer media exchange, near-line caching, archiving, asset management, multi-channel SD/HD SAN server playout, MPEG4 proxy creation and smart disaster recovery but never process the content as base band video.

Remote sites produce commercials or news content on MPEG-2 native editing systems and perform FTP content exchange over WAN's to Centralised broadcast Operations. The Material handling system communicates with the remote facilities for content gathering and automatically archives the content. Metadata for each item is parsed to update databases and if necessary make it compatible with automation systems. Proxy copies of each item are created for reviewing and checking by the traffic department or others using off the shelf Media players. Asset management automatically controls bi-directional file transfers between servers, intermediary cache and to one or many AIT3 tape Libraries.

This paper will cover in detail how one such project came together at Southern Cross Broadcasting which has centralised Broadcast Operations in Canberra, Australia using Pinnacle Systems' MediaStream Server as the Play-to-Air Servers, Remote Commercial Production on Pinnacle Liquid Editing Products,

Massstech Products for Media Management and Media Movement, Spectra Logic Archival Storage System, and Ingest and Play-to-Air Automation from Encoda Systems.

Overall System in Breif

The overall system consists of several important pieces that will be discussed in more detail in the following sections, but will be briefly described here. A simplified block diagram appears in *figure 1*.

As mentioned briefly in the Introduction, the Remote Production Sites get in raw commercial content, which is to be edited. Once an edited piece is completed, the operator will add certain metadata specific to the content, which is not directly contained in the edited piece itself. After the metadata is entered, this content is automatically sent to a local workstation. This local workstation acts as a staging area and also automatically converts the MPEG I-Frame into long GOP MPEG, which is appropriate for the Play-to-Air servers at the Central Site. Additionally, the content is bundled with the metadata.

At the Central Site a Media Management System watches the staging workstations at the Remote Sites for new content. When new content consisting of video, audio, and metadata is seen in the staging workstations, it is pulled across the WAN into a Nearline Cache server at the Central Site. When the content arrives in the cache server of the Media Management System, a proxy version is created. Additionally, the metadata, which is used by the Media Management System, is expanded into a form, which the Automation System will also use later when the content and the Automation specific metadata are on Video Server. The video, audio, metadata, and proxy are also archived using a Spectra Logic AIT3 Library. The system efficiently optimizes the use of the online server storage arrays via high-speed Fibre Channel connections. In addition to long term content storage, the library provides another level of backup in the unlikely event of a disaster.

The Traffic System at the Central Site gets schedules, which determine what content is to be ingested and when content is to be played. Content can now be brought into the video servers. The content may come from several ingestion points.

Some content is ingested and encoded at the Central Site under control of the Automation System. The Automation System then knows this content and it's database because it was ingested under its own control. This Automation System now informs the Media Management System that it would like to transfer a copy to the Nearline Cache Storage. The Media Management System then pulls the content and metadata and again creates a proxy of the audio and video. This content consisting of the video and audio, proxy, and metadata is then moved into the Archival Storage.

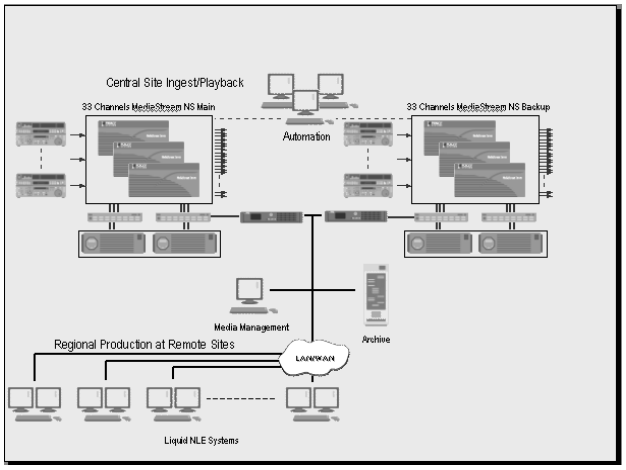

Figure 1 - Simplified System Block Diagram

When content needs to be played out, the Automation looks down the play lists in advance of the time when content needs to be played. The content being requested could have been previously ingested by the Automation System into the Video Servers or it could have originated from the remote sites. In either case the Automation System will make a request to the Media Management System to retrieve the content.

The retrieved content is then transferred to the Video Servers and can now be played out according to the schedule.

Remote Site Systems for Editing

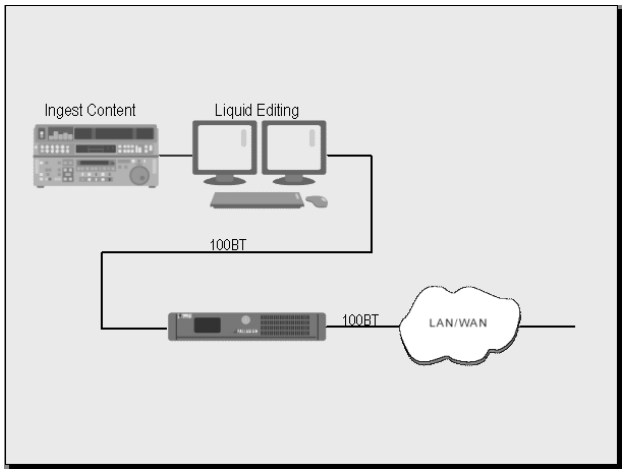

Figure 2 –Remote Site Block Diagram

Commercial Production

The Southern Cross Broadcasting group has greater than 20 sites geographically distributed. Each site acquires local footage and maintains high quality and consistency at each of the sites by encoding video content using MPEG-2 I-frame at 50 Mb/sec. This is done in a Pinnacle Systems' Liquid blue or Liquid silver editing system. The Liquid products support a range of full craft editing to quickly allow production of the commercial content.

Graphics and effects are added as necessary and importantly a slate is also added to the material. Once content is completed the user will set the SOM and EOM markers on the actual time line of the piece.

At this point the operator selects to XSend the content to Palladium Exchange™. Palladium Exchange is another product from Pinnacle Systems, which is used to convert the MPEG I-50 content from the Pinnacles' Liquid Editing Systems into a long GOP MPEG, which is more appropriate for the Play-to-Air servers at the Central Site in Canberra. Figure 3 below shows the GUI used. Many of the fields such as SOM and EOM are populated automatically and the user will populate other fields. The inputs in the GUI are populating an underlying an XML template. Once the window is closed the video, audio and XML content are sent to a location in the local Palladium Exchange.

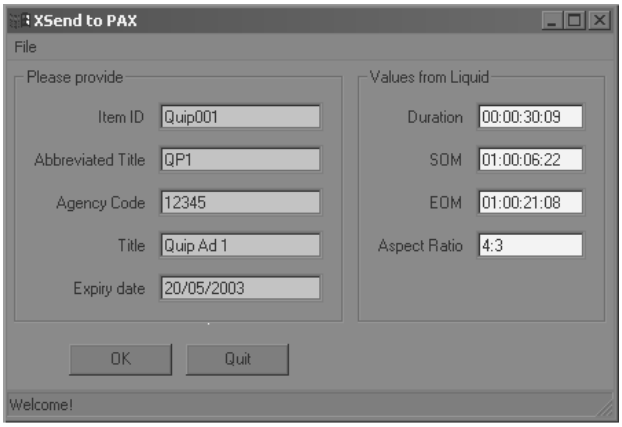

Figure 3 - XSend GUI on Liquid to Transfer Content to Palladium Exchange

Format Conversion and Palladium Exchange

As mentioned above Palladium Exchange is a conversion engine, which can among other things convert between I-frame and long GOP formats whether between Pinnacle products or between other companies' file formats and MediaStream format.

The *Incoming* directory in the Palladium Exchange is continuously monitored for newly arriving content and will automatically convert the new content from I-frame 50 Mb/sec and separate audio into long GOP MPEG at 15 Mb/sec with multiplexed audio which can be played out later on the MediaStream Servers at the Central Site.

The converted content is placed into an *Outgoing* directory along with the XML file containing the metadata.

Divide and Conquer Approach to Media Compression

One might wonder why each of the remote sites has its own conversion instead of sending all files to a central point for conversion.

The system is architected with a *'divide and conquer'* approach to conversion of I-frame content to long GOP and therefore the conversion task is distributed across the remote production sites which allows conversion horsepower to automatically scale with number of sites. Additionally, by compressing prior to transmission back to the Central Site, the network traffic is reduced by a factor of greater than 3 to 1 because the 50 Mb/sec I-frame content is taken down to below 15 Mb/sec long GOP. The workstation also acts as a "local" library holding the fused master and provides access to the media management central database for browsing. These factors are particularly important at the end of a week when there is a push to get commercials from the Remote Production Sites to the Central Site to fulfill new airing schedules.

Media Management and Media Movement to Central Site

Media Management from Masstech Group is used in order to accomplish the movement of material from the Remote Sites to the Central Site.

The MassStore product from Masstech Group automatically polls an arbitrarily large number of remote or local locations of various types including Video Servers and directories on standard Windows® PC in order to look for new content, see figure 4 below. Various polling rules are setup and functions of what to do with new content.

Once media exists in a completed form at one or more of the remote sites the content is moved over the wide area network into a large local disk cache, which is part of MassStore. In this local cache the proxy generation and metadata extraction occurs.

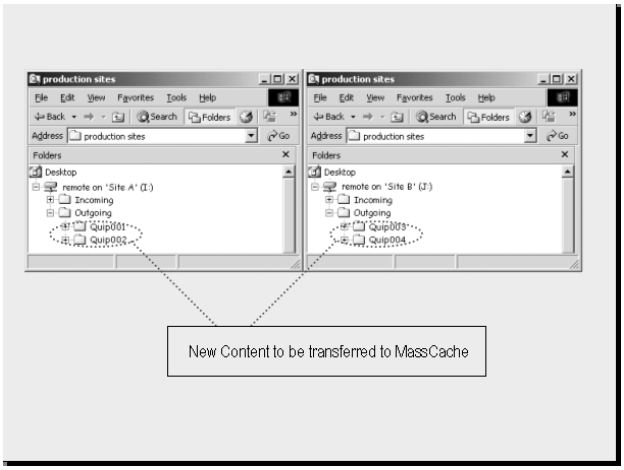

Figure 4 – Stylized View of content monitoring at Remote Sites

Central Site Systems

As mentioned above content at the Central Site may be edited commercials from the Remote Sites or locally ingested long and short format programming or spots. Several important pieces exist at the Central Site in order to get media assets to air. Media Management and Media Movement hold together the non-real time movement of content from Remote Production Sites, Archive, and the On-Air MediaStream Servers.

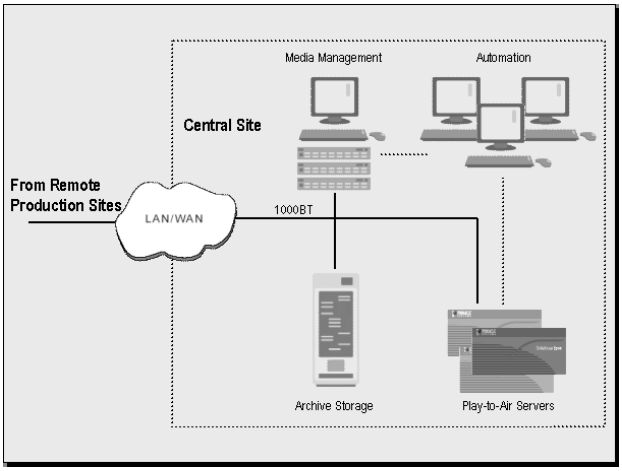

Figure 5 – Basic Central Site Interconnectivity

Content Management at Central Site

Content management is used to automatically get assets from the Palladium Exchanges at the Remote Production sites. As mentioned earlier, this content is composed of the MPEG-2 long GOP audio/video file, a frame table, and metadata. Some of the metadata is the XML file containing all of the characteristics of the content: SOM, EOM, Title, etc. Once the content is at the Central Site, the Media

Management capabilities of the MassStore system will create proxies and registers the metadata as well as created Automation specific representations of the XML data.

All of the content associated with the single asset is now archived into a SpectraLogic 64k archive system. Full tracking of where in the archive content exists and status of the archive is maintained by the MassTech MassStore system.

Upon requests from the Encoda Automaton System, which controls the MediaStream servers, content is moved via MassStore from the archive system to On-Air Pinnacle MediaStream Servers.

A similar Media Movement and metadata and proxy creation task happens in reverse after new content is ingested into the MediaStream servers. This will be described a little later.

Central Play-To-Air Servers

The Central Play-to-Air system is an important piece at the center of the total Southern Cross Broadcasting Centralisation project because it is responsible for reliably ingesting and airing content day in and day out as well as interfacing with the Media Management and Automation System.

The system is constructed based on a highly reliable and fault tolerant core called the Palladium File System which manages the file system of Pinnacle's MediaStream Server Networked Storage System. The NSPOF storage system of the MediaStream Server consists of redundant Fibre Channel switches and connections to RAIDed storage, redundant RAID controllers in the storage arrays and redundant files system controllers, which the video I/O chassis communicate with. Each of the MediaStream Servers systems at Southern Cross today has 33 video channels.

Since greater than 20 regions of the Southern Cross Broadcasting rely on the MediaStream Server system, which in and of itself is highly reliable and fault tolerant, two of the Networked Storage Systems are used for even greater fault tolerance. Figure 6 below shows the system.

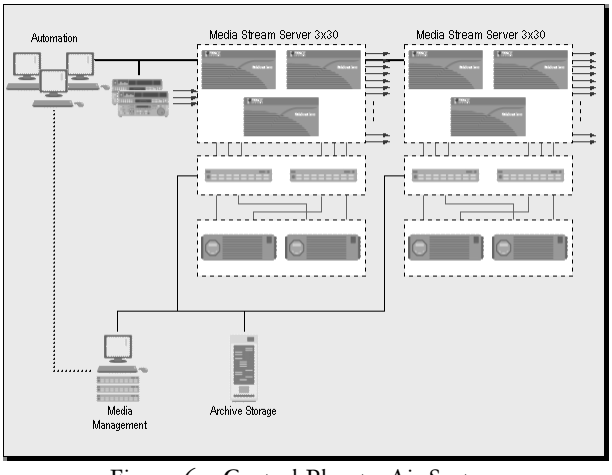

Figure 6 – Central Play-to-Air System

The system was designed to be expandable in channel count and storage capacity. Additional I/O chassis and or storage can be added to each of the MediaStream Networked Storage Systems.

Further, the very system in place at Southern Cross can be expanded seamlessly to air HD content. The MediaStream Servers have supported both HD and SD cards in the same physical I/O chassis for several years. The timing is good because the Australian government is mandating that some HD content be broadcast starting in July of 2003. With the MediaStream Server, Southern Cross is well positioned to meet that challenge.

Not all video servers are the same and the MSS900 SAN systems at Southern Cross in Canberra are already pre-equipped to be able to be expanded to over 100 channels. Additionally, Southern Cross has in place Pinnacle Systems Palladium Exchange gateways, which allow file transfers and conversions from non-Pinnacle servers like those used by Dubsat. The MSS900 SAN systems also feature embedded audio I/O, Dolby-E and Dolby Digital capability, and can have cards added later for doing ASI I/O and High Definition as mentioned above.

Broadcast Industry Moves Toward MXF

Along with making sure that today's systems comprehend both HD and SD, a big push in the broadcast industry is MXF (Material eXchange Format). MXF is being widely publicized by SMPTE, because it is meant to standardize that way that metadata and video/audio are wrapped to help disparate system be able to do more comprehensive file and metadata exchange. Pinnacle Systems is currently adopting MXF in several of its products including the Liquid editing systems, MediaStream play-to-air servers, Vortex News Servers, and Thunder production servers. The first of Pinnacles products to do will be the Liquid Editing and MediaStream Server products and they will be able to support this format natively. Other Pinnacle literature details this, but see figure 7 for some of the MXF interoperability.

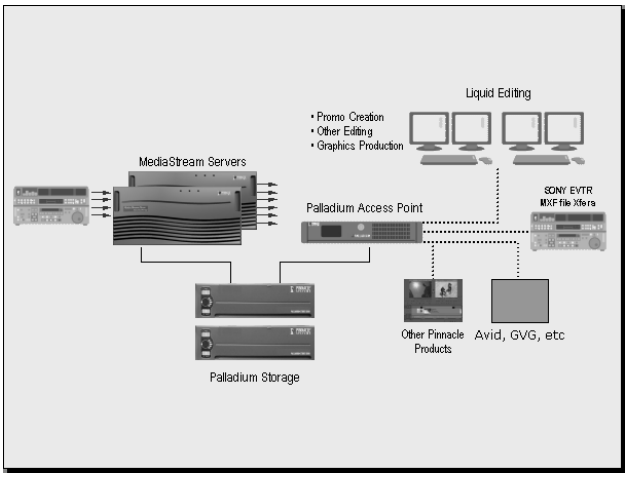

Figure 7: MXF Interoperability and Native MXF support

Conclusion

The primary reasons for creating the above systems are to create an end-to-end system that allows minimal handling of tape, simplifies and standardizes regional commercial production, manages media movement geographically and locally, and integrates play out of regional spots with main centralised content to achieve a smooth centralised broadcast system.

Additional, it was important to create and expandable system which comprehended future needs of HD and MXF.

The benefits of this architecture are equally applicable for broadcasters designing distributed playout servers, remote proxy browsing and editing, versatile news content exchange systems and a variety of applications requiring interopability solutions. Working closely with Southern Cross Broadcasting, Systems Integrator Techtel Pty Lty has achieved the lofty goals described at the beginning of the paper using advanced technology by Pinnacle Systems, Masstech, Encoda, and Spectra Logic.

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