

Masstech Case Study/White Paper

STAR India

Mumbai, India

About STAR

STAR, a wholly owned subsidiary of the News Corporation, launched in 1991 with five television channels. A pioneer in satellite television in Asia, STAR now broadcasts over 60 services in ten languages, and as the largest wholesaler of pay TV content in the Asia Pacific region, offers a comprehensive choice of entertainment, sports, movies, music, news and documentaries.

STAR reaches more than 300 million viewers in 53 countries across Asia, including India, and is watched by approximately 100 million viewers every day. In partnership with leading companies in Asia, STAR businesses extend to filmed entertainment, television production, cable systems and wireless and digital services.

MassStore Provides Digital File Based Workflow for STAR India

Any program producer or supplier that has been in business for any length of time will have accumulated thousands of hours of videotaped material. In this digital age, videotape libraries are just not efficient. It can be difficult to find the right tape and then locate the desired segment. Tape stock is expensive, and physical tapes take up lots of space. There's much manual labor involved in creating tape dubs and maintaining the tape library. And over time, tapes wear out. For these reasons, companies are looking for ways to convert their vast valuable videotape libraries into digital file-based assets.

STAR India in Mumbai, India, knew the time had come to digitize. STAR has more than 50,000 hours of videotape material sitting on their shelves and keeps adding new material at a rate of about 9,000 hours per year.

But how could STAR begin such a seemingly daunting task? Masstech Group MassStore Workflow Asset Management suite provided the right tools for STAR to start the digital conversion process now without totally re-doing their whole facility, and to provide STAR with the necessary resources to make more efficient use of their content assets.

The STAR India facility in Mumbai is geared to program production, not distribution, and so it does not have, nor need, any program playback capabilities like video servers or a

transmission automation system. This meant that STAR India couldn't take advantage of whatever ingest tools that such systems might have offered.

STAR India required a way to digitize older material in an orderly way, digitize new programs, save these newly created files in long-term digital storage, utilize these files in non-linear editing suites, create videotape and DVD copies of stored files, and easily and efficiently manage the entire process including metadata.

The MassStore Workflow Asset Management (WAM) suite provided all these functions and more.

Masstech MassStore WAM Provides End-to-End Digital Workflow Solution

The Masstech MassStore Workflow Asset Management (WAM) suite provides end-to-end ingest, near-line and digital tape library storage, and asset management and tracking capabilities for media content and its associated metadata. The system interfaces with an IBM DS4100 storage array, Spectralogic T950 storage library, LTO3 tape technology and provides the asset management database core.

Users interact with MassStore by using a Web based client application (the graphical user interface). While operation with menu driven functions is powerful in itself, the real strength of MassStore is the rules-driven Workflow Manager. With user defined rules, MassStore Workflow Manager manages asset migration and storage, with automatic file transcoding and transformation where needed and based on essence parameters that indicate the content type or related metadata.

As core functions MassStore does the following:

- Provides an active picture of the location of all assets.
- Continuously tracks all digital media assets in MassStore and makes them available for print to videotape or DVD as needed.
- Stores and uniquely identifies different formats of the same asset.
- Dynamically defines the metadata associated with each asset.
- Allows expansion of the data structure at any point with no negative impact on the system.
- Allows the use of facility specific terminology so that STAR India was able to define its own metadata fields at any point in the asset capture process, even after items have already been stored and tracked in the system.
- Provides access to metadata via XML interface.
- Automates workflow processes through customer determined rules.

MassStore performs dynamic load balancing to ensure optimum data flow, and has security policies so that only those who are assigned can access or manipulate particular material.

Other specific MassStore modules (software plug-ins and associated hardware) help STAR India increase productivity. MassStore M-Ingest allows STAR India to digitize content from videotape—older videotape material as well as new contributions—to a high quality, high bit-rate master MPEG2 file format. MassStore can import metadata about the videotape library from a STAR India database or metadata can be entered in M-Ingest.

The content files with their metadata are recognized by MassStore and are stored in nearline cache (spinning disk array) or a deep storage central digital tape library.

Once the master content files are created and stored, they are then available for a variety of uses, including non-linear editing sessions.

STAR India utilizes an Avid Unity system with various editing workstations. STAR also has Apple Final Cut Pro editing systems. Each of these NLEs has its own way of formatting digital files. But this is no problem for MassStore, since MassStore can copy, in whole or in part, files from the central digital library and automatically transcode/transform them to the format required by the particular NLE system. MassStore also can copy and transform files from one type of NLE system to the other.

The MassStore WAM modules for these functions are MassTrans-It which performs the content transformation and creates low resolution proxies, M-Connect which interfaces between MassStore and Apple Final Cut Pro NLE, and SAVI which provides the interface to the Avid environment. SAVI handles both Avid TransferManager Data Handling Module (DHM) and Dynamically Extensible Transfer (DET) file transfers.

MassStore Manages Cache Storage and Digital Tape Library

In the STAR India system, MassStore automatically controls and maintains the storage capacity on two near-line storage arrays and the central data tape library.

For the cache storage, one 20TB IBM DS4100 storage was created with a single partition to store both the high resolution content and the low resolution proxies of ingested material. All low resolution proxies remain active on the system while the high resolution content is available.

A second cache storage, a 3TB IBM DS4100, was created with a single partition and configured as a secondary cache. Although this cache is online and configured, content will not be stored there unless its role is changed from secondary to main, in an event that the main 20TB cache becomes unusable.

Each cache storage is mounted as a RAID via redundant Fibre Channel connections to MassStore data movers, including the application server, to facilitate data movement from the tape library to the cache.

The Spectralogic T950 digital data tape library is automatically managed by MassStore which controls all content migration to and from the library. These operations are augmented by user defined rules that allow for automated workflow definitions, obviating the need for manual intervention for content movement through the system.

The configuration setting for the library at STAR India is to allow for only one copy of each instance type to be stored in the library.

MassStore Tracks Content in all Locations

MassStore maintains a database record of the entire inventory of digital files for every storage device that it's connected to. This information is used to keep the MassStore Content Management Database updated with which assets are in which physical location.

This information provides an accurate picture of the location of all assets in the entire environment. For example, an authorized user can use the MassStore user interface to locate a particular asset and then query the system to find out where it is currently stored. MassStore will then report which library contains the item. By automatically keeping this information up to date, MassStore can be used as the central knowledge point for locating assets.

When a request is made to have an item moved or copied from the tape library, MassStore initiates a source/destination transfer and the Content Management database is updated to show that this item now exists on the destination storage device.

When a digital asset is required to be archived to the digital data tape library, MassStore initiates a source/destination transfer and the Content Management database is updated to show that this item now exists on the tape library.

MassStore Groups Content in Digital Tape Library

While MassStore knows where every instance of content is stored, down to the specific location on a specific data tape, it's sometimes helpful from an operations point of view to group content with similar characteristics on one data tape.

STAR India required that content be grouped in a specific way on the data tapes in the library. The groupings as initially established are:

1. Destination Channel
2. Promo
3. Packages
4. Advertisement
5. Music

Groupings can be added to or changed as required.

Content grouping within MassStore and the digital library is based on defined rules being applied to content as it arrives into the MassStore system. Each group definition is created using a rule set. The definition of the rules can be based on various asset and instance metadata using simple or regular expression criteria as required.

For each of the defined groups in the system, data tapes within the library are assigned to it. As new content arrives into the system, it is tested against the rule sets. When a piece of content matches a defined group rule, it is then directed to the specific data tape assigned to that group within the data library. If any content arrives that does not match a criteria, it is passed on to the default group which is a final catch-all.

The association of a data tape with a group can also be done "on demand" from a pool of un-assigned tapes as storage requirements for that group grow, or manually with operator intervention.

Any number of groups can be theoretically defined within the system, however effective use of the library storage is achieved by selective usage of groups.

MassTrans-It for File Format Transformations and Proxy Creation

Not every digital file is the same. The master file format for STAR India is 50Mbps MPEG2 MP@ML.4:2:2 I-frame (IMX50). However, other applications, like editing, require different wrappers or bit rates for the MPEG2 file. Other applications may require different file formats altogether. Also in STAR India's case, the creation of low resolution proxies of ingested material was required.

To provide multiple transcodes and transformations, the MassTrans-It engine is available as a network resource integral to the MassStore environment. MassStore communicates with MassTrans-It over Gigabit Ethernet. The MassTrans-It resources are accessed automatically through rules-driven protocols of MassStore as configured in Workflow Manager.

MassTrans-It is also outfitted with transcode blades (different transcoding software applications) that are used with M-Connect to transform files to and from Apple FCP, and SAVI to transform files to and from the Avid DET and DHM environment. (These are discussed further below.)

MassTrans-It creates from high resolution files, frame-accurate low bit rate proxies in the Windows Media 9 format at a resolution of 500 kbps. The proxies contain video, eight tracks of audio and burned-in timecode, and are stored in the IBM DS4200 disk storage array with 20TB usable storage.

The proxies are accessible within the network environment, and can be searched and browsed with MassBrowse.

The MassStore extensible infrastructure allows STAR India to add other MassTrans-It transcoding scenarios to their system, should they desire to do so in the future.

MassBrowse II for Proxy Viewing and Content Checking

MassBrowse II provides a virtual cut editing and program preparation tool which can be used to manipulate and preview low resolution assets via any TCP/IP connection without the high cost of traditional editing equipment. The MassBrowse user-friendly interface includes an advanced hardware jog/shuttle panel as well as full metadata support, so that a user, working on a computer, can easily see what content is stored in MassStore, without having to copy the high resolution file to a video monitoring system or edit system.

MassBrowse also can be used to segment content while viewing proxies, and to create edit decision lists which can be imported into a non-linear editing system. MassStore can use the segment data (in and out timecode points) to copy the high resolution version of the files, or parts of files (partial restore), that were chosen in MassBrowse.

MassStore Workflow Manager

Workflow from a Masstech point of view involves working with file-based content and automating the various processes required to move and transform that content throughout the many pathways it takes, over the course of its lifecycle, from the time it's ingested to final deletion. This approach eliminates most if not all of the tasks that may have been done manually.

While digitizing content through the ingest process is indeed a part of the overall workflow, it is only the beginning. The idea is to ingest once and then take that file and create a map of where it needs to go, how it's going to get there, and in what format. Configurations can be set up so that people are no longer involved in handling the content over its lifecycle, or that selected user commands can start a series of processes.

To accomplish this mapping process, STAR India is using the MassStore WAM suite with its powerful Workflow Manager to describe, in user defined rules, how to process the content at every stage.

Workflow Manager, as an integral component of MassStore, manages the automatic operations on instances of content (the digital files) located in MassStore. For example, Workflow Manager directs what format to encode content ingested from videotape, when to create a proxy and what type of proxy to create, when to move the content from nearline storage to digital tape library, when and how to move content from digital storage to a non-linear editing system, and how to transcode/transform it.

The Processing Profiles of Workflow Manager are used by the application administrator to configure the way the application will process the notifications generated by various events. The commands defined in the Processing Profiles are executed when registered events occur.

STAR India Digital Workflow Plan

Before entering the workflow parameters into Workflow Manager, STAR India collaborated with Masstech engineers to define and fine-tune its workflow for the Mumbai facility. It was helpful to write down the steps that the operators and MassStore needed to perform, since a wide variety of workflow combinations can be configured in MassStore. The workflows discussed in this document are those developed for STAR India.

While it's easier to describe each MassStore function separately, it should be noted that each is integral to MassStore as a whole and all operate seamlessly together.

Ingest Workflow

STAR India defined two different ingest paths, a primary through M-Ingest and a secondary through the non-linear editing systems (discussed below in the non-linear editing section.)

Description of Workflow for Primary Ingest Path through M-Ingest

1. When ingesting content from the existing videotape library, MassStore takes input from the existing STAR SQL-based library system in the form of CSV files.
2. The existing STAR library system supplies information about each spot held in the existing tape library, including ID, Title, and Segment SOM/EOM (start of message/end of message) at a minimum.
3. MassStore imports the extracted CSV files and holds all metadata from the STAR videotape library system.
4. Operators use M-Ingest to search, prioritize and define videotapes to be ingested. The operator uses the results to locate the tapes to be ingested.
5. Each M-Ingest workstation controls a Sony DVW Betacam VTR to physically ingest the SDI material.
6. In the M-Ingest "Search" window on the user interface (GUI), an operator enters the required Tape ID (Asset ID) which returns the all the segment SOM/EOM metadata.
7. The operator then "Confirms" to import and populates the metadata to the M-Ingest workstation.
8. The operator puts the required tape in the VTR, enters the tape ID into the M-Ingest GUI and M-Ingest takes the SOM/EOM segment metadata to control the frame accurate ingest of the material to eliminate operator errors during ingest. The operator can also adjust the SOM/EOM if necessary.
9. Once ingest is completed, the operator can enter additional metadata.
10. Finally, the operator confirms the ingest by hitting the "Upload" button. When M-Ingest receives this command, MassStore automatically performs the following:
 - a. Moves the files to cache.
 - b. Automatically creates a low resolution proxy through MassTrans-It module.
 - c. A MassStore asset metadata field called "Approved" defaults to "No" for each segment.
 - d. Updates MassStore essence metadata is for each instance.

The process for ingesting new or external content is the same, except that in these cases, MassStore does not retrieve metadata from STAR's database. Rather MassStore creates a new asset and the operator enters metadata and selects the SOM/EOM through the M-Ingest user interface.

M-Ingest

M-Ingest is considered by STAR India to be the primary means for ingesting content. In addition to creating digital content files, M-Ingest is also used to decode digital files and copy them back to videotape ("Print to Tape"). STAR India installed five M-Ingest workstations.

M-Ingest Creates Digital Files

M-Ingest is a frame accurate video encoding and decoding module that provides direct and automated control of baseband (SDI) video with eight AES3 audio tracks. The user can select any or all eight tracks, which can be grouped into pairs (1-2, 3-4, 5-6 and 7-8) during content encoding and playback. Only one of these functions can operate at a time. The SDI and AES inputs and outputs from the VTR are connected to M-Ingest.

STAR India uses one Sony DVW Betacam VTR for both ingest and print to tape. In addition to the DVW A500, M-Ingest supports these VTRs: MSW-M 2000P, MSW-M 2100P, DVW-M 2000P, DVW-M 2000, J Series compact players, BVW-70P, BVW-65P, BVW-75P, PDW-1500, DSR-1800P, with the latter two not currently implemented.

M-Ingest includes an easy to understand and straightforward user interface for operator control of the ingest and playout ("Print to Tape") processes.

Through industry standard Sony RS422 VTR device control protocols, operators can play, rewind, fast forward and shuttle, jog through a tape and mark in and out points using the embedded timecode on the tape. They can also cue to SOM or EOM, and preview a segment.

M-Ingest utilizes SOM and EOM data, either manually entered or retrieved from stored metadata, to control the VTR and the frame accurate ingest. M-Ingest can ingest multiple segments from the same videotape.

The operator can use M-Ingest to input metadata related to the videotape material, add to existing metadata, or modify it. As noted above, M-Ingest also imports database files from STAR's existing database.

Once the metadata is stored in MassStore, an operator using the M-Ingest metadata interface, can search, retrieve and update metadata, as well as enter new information about the

content. The MassStore or MassBrowse GUI can also be used to access metadata. The ability of a user to modify metadata is based on their permissions within the system.

Once the operator completes all the steps for ingest, and selects the “Ingest” option on the M-Ingest GUI, M-Ingest is ready to go.

M-Ingest – Workflow for Ingest

To create a digital file from videotape content

1. Cues VTR for play (pre-roll).
2. Cues M-Ingest encoder for record.
3. Initiates and monitors recording from VTR to M-Ingest.
4. Stops ingest and cues to next segment. Initiates encode and continues until all segments are ingested.
5. M-Ingest monitors and stops encoding if black is detected on tape for approximately 50 frames.
6. If that occurs, M-Ingest triggers a simple parallel port GPO alarm.
7. Stops VTR, rewinds and ejects tape

Once captured, the MPEG2-IMX50 digital file resides on a directory of the M-Ingest ingest server. Each M-Ingest workstation runs an FTP server for the transfer of MPEG2 files to MassStore and is configured as an input storage location in MassStore. Connectivity of M-Ingest is via Gigabit Ethernet for content movement.

When the capture of the content is complete, the operator clicks on the “Upload” button on the M-Ingest GUI to accept the ingest. MassStore then initiates a transfer of the ingested clip to nearline cache and also to the Spectralogic digital tape library, per user-defined rules set up in MassStore Workflow Manager. M-Ingest and MassStore communicate with each other via an XML connection.

Each M-Ingest workstation provides video and audio monitor outputs for connection to external broadcast quality monitors. In addition all audio channels can be monitored visually using the M-Ingest graphical display on the user interface during ingest function.

M-Ingest “Print to Tape” Function

In addition to ingesting and encoding material from videotape, M-Ingest is used in the other direction as well, for decoding digital files to SDI video and AES audio and copying them back to videotape. This is called the “Print to Tape” function.

M-Ingest Workflow for “Print to Tape” Function

For both single files and sequenced files to a VTR

1. An operator uses MassStore or M-Ingest GUI to search and define required assets to be played out to VTR.
2. The operator hits the “transfer” command. Then MassStore via FTP transfers the selected instances of content to an M-Ingest workstation. The FTP transfer process is independent of the ingest or playout functions and can be scheduled at any time in the background.
3. Each M-Ingest server controls a Sony DVW Betacam to physically record the SDI and AES outputs from the M-Ingest “Print to Tape” function.
4. On the M-Ingest GUI, the operator creates a playback list using the transferred content. The operator visually displays any selected audio tracks on the M-Ingest GUI.
5. The operator puts the required tape in the VTR and M-Ingest controls the frame accurate playback and recording of the material onto the Betacam deck.
6. M-Ingest user interface provides controls so that the operator can:
 - a. Cue VTR for record (pre-roll).
 - b. Cue M-Ingest decoder for playout.
 - c. Initiate and monitor playback from M-Ingest to VTR.
 - d. Stop VTR, rewind and eject tape.
7. Video and audio is played out of M-Ingest and recorded onto tape.
8. Once the playout is complete, the operator confirms successful print to tape for disk clean up (file deletion on M-Ingest).

STAR commonly uses the “Print to Tape” function to transfer edited pieces to videotape for shipping to their off-shore playout and transmission facility, among other uses.

MassStore Outputs to DVD Authoring

As a part of the STAR India integrated MassStore system, Masstech supplied an automated DVD authoring and burning solution by Pulse Digital.

Pulse Digital SelectNet operates on a server provided by Masstech. A configured FTP location on the server receives content transferred from MassStore that has been selected for DVD creation.

The Pulse Digital software communicates with MassStore via the XML API to initiate the necessary commands to receive MPEG2 content from MassStore and then generate a DVD of which format is based on pre-existing templates within the Pulse Digital software. One of these templates contains a visible watermark.

An operator first selects the clip or clips that need to be created into a DVD and then initiates a transfer to the DVD authoring station. The file or files selected are then transcoded via MassTrans-It to 8Mbps and the resulting content is transferred into a directory created within the FTP location on the server.

The Pulse Digital software monitors the location for arriving content.

After the files to the authoring station have completed transferring, the operator confirms the selection within the DVD application and then initiates the creation process. Each set of files that are transferred to the FTP location result in a single DVD being created.

MassStore Interfaces to Avid and Apple Non-Linear Editing Systems

Once digital files are stored in MassStore they become available for a wide variety of uses. This is a major benefit of a digital workflow, one that STAR India takes full advantage of in moving files to and from MassStore and their Avid and Apple Final Cut Pro non-linear editing systems.

MassStore not only copies files to the editing systems but it automatically transforms them to and from the house MPEG2-IMX50 and the formats specific to each editing system. MassStore can also effect content to be exchanged natively between Apple Final Cut Pro and Avid Unity.

Mass SAvI Avid Interface

The STAR India Avid editing environment includes 12 seats of Media Composer Adrenaline, ten seats of Avid Express Pro, four seats of Avid SDI Mojo on MC Soft, two seats of

Avid DS and DS Assist for digital editing and a further four seats installed with Protools. These suites share Avid Unity storage.

MassStore SAvI (Smart Avid Interface) interfaces to the Avid Unity using a combination of both Avid DET (Dynamically Extensible Transfer) and Avid DHM (Data Handling Module) transfer tools.

The key difference between DHM and DET is that the DHM implementation is based on a multiplexed stream of frames and creates media clips, while the DET implementation is based on transfers of existing media files. Or in other words, DET is used for archiving projects and DHM is used to create a flattened playback formatted file.

STAR India supplied a GigE Ethernet switch, which is used to make the connections between the Avid Unity and the network.

MassStore SAvI – Avid DET (Dynamically Extensible Transfer) Interface

DET functionality of MassStore SAvI allows Avid Unity users to transfer native Avid project material to and from the digital tape library using the Avid DET capabilities.

DET allows for the full transfer of OMF (Open Media Format) or AAF (Advanced Authoring Format)-wrapped media files into and out of the Avid Unity system via the Avid TransferManager to be archived or restored from the MassStore system. The editor must choose either OMF or AAF as the native Avid media file format.

Editors can store their projects into MassStore including metadata, sequences, and referenced media files, including MXF, in their native OMF or AAF media file format.

MassStore protects content and provides critical database and tracking capability, allowing for media to be searchable and recovered at any time. This preserves the future ability to be able to edit the program material without having to re-ingest or transcode. The material along with the project is stored into a defined workspace of Unity.

MassStore SAvI – DET Workflow

To Store an Avid project in MassStore

1. Select the bin containing project to be stored.
2. Identify the project timeline to be stored.
3. Right click on material.
4. Select “Send to Workgroup.”
5. Select “MassStore.”
6. Transfer is then initiated and all associated content and media of that timeline is transferred to MassStore.
7. Operator can now search for project within MassStore.

MassStore SAvI – DET Workflow

To Restore an Avid project from MassStore to Avid

1. Search in MassStore for the project to be restored to Avid.
2. Select the project instance in MassStore and initiate transfer.
3. Select Avid storage location as the destination.
4. Content then begins transferring to Avid.
5. Upon completion of transfer, the operator can search for the project in Avid workspace.
6. Drag project timeline to bin in editor.
7. Begin editing on the project with all media intact.

MassStore SAVI – Avid DHM (Data Handling Module) Interface

DHM functionality allows MassStore to communicate with the Avid TransferManager to perform "Send to Playback" and ingest transfers. In this transfer method a sequence is either converted to or from a stream of video frames and audio samples and the house MPEG2-IMX50 master file format.

DHM- "Send to Playback"

Completed projects from the Avid editing environment, in flattened file form, can be stored in MassStore in a playback video format which at STAR India is MPEG2-IMX50. This accomplished with the "Send to Playback" function of DHM.

The "Send to Playback" is performed within the editor environment to facilitate the archiving of finished content. As a part of this process, the operator selects the sequence and initiates a "Send to Playback" to MassStore. The timeline content is flattened (mixed down and rendered) into a multiplexed file containing the rendered video and audio. After the flattening (mixdown) process, the content is then passed to the Avid TransferManager which sends the multiplexed stream of video and audio frames to the MassStore DHM interface.

MassStore then initiates the transfer of the video from the Avid Unity to the cache via the MassTrans-It engine. MassStore accepts the stream of frames and, via MassTrans-It, creates a single clip containing the video and audio tracks in the desired playback format of MPEG2-IMX50. MassTrans-It encodes and wraps flattened programs that are sent to MassStore via "Send to Playback." MassTrans-It works in-line with the MassStore data movers.

MassStore then stores that content onto cache and to the digital library, per user defined rules. The transfer progress of either DHM "Send to Playback" or Ingest can be observed in the MassStore GUI.

Compatibility between MOJO/Adrenaline/ProTools is supported by Avid as Avid generates the end result file.

MassStore SAvI – DHM Workflow

To perform a DHM “Send to Playback” from Avid to MassStore

1. Select the bin containing timeline to be exported.
2. Identify timeline to export.
3. Right click on the sequence.
4. Select “Send to Playback” from the popup menu.
5. Select “MassStore.”
6. A dialogue box is presented where a TapeID needs to be entered.
7. Enters TapeID and click OK.
8. The timeline is mixed down (rendered/flattened) in Avid editor.
9. Transfer is initiated from editor through Avid TransferManager to MassStore.
10. TransferManager sends the file to MassStore. MassTrans-It engine inline transforms the Avid flattened file to MPEG2-IMX50.
11. The resultant MPEG2-IMX50 file is saved to MassStore.

DHM-Ingest

During DHM Ingest, an operator can send non-Avid content to Avid using the MassStore GUI. This includes content stored in the digital library, caches, and M-Ingest. The user can select an item on the MassStore GUI and send it to the Avid Unity defined storage location. This begins the transfer process between the MassStore cache, via the MassTrans-It file transformation engine, and Avid TransferManager.

If using MassBrowse to preview and select clips for editing, an operator can mark in and out points in a file to delimit file segments for transfer, rather than the entire file.

After the timeline with a sequence of clips is completed on MassBrowse, the MassStore system is updated with the coordinate information of the segments’ timeline. Using this information, MassStore can then initiate a partial file extraction of the segment or segments to the required destination with system defined handle length. Both Avid and Final Cut Pro are configured as destinations for partial file extraction.

During material movement from MassStore to Avid, the Avid TransferManager accepts from MassStore’s SAvI/DHM interface a multiplexed stream of video and audio frames, one

track of video and eight tracks of audio. MassTrans-It takes the MPEG2-IMX50 file, de-muxes the video and audio streams and presents them to Avid TransferManager as new content for the editor (content which originated from a source other than an Avid archived file).

Specifically DHM performs the ingest to Avid by having TransferManager receive the individual frames and wrapping them into the Avid native file format (OMF or AAF) per the Avid configuration and then checking the associated metadata into Avid MediaManager if this device is configured.

MassStore SAvI – DHM Workflow

To perform a DHM Ingest from MassStore to Avid

1. Search MassStore for program content to be restored to Avid.
2. Select the project instance in MassStore and initiate transfer.
3. Select Avid storage location as the destination.
4. Content begins transferring from MassStore to Avid.
5. Content is converted to the Avid pre-configured file type by MassTrans-It.
6. At completion of transfer, operator can search for program content in the Avid workspace.
7. Drag program content to bin in editor.

MassStore M-Connect Interface to Apple Final Cut Pro

STAR India's Final Cut Pro edit suite utilizes six seats for digital editing in a standalone configuration.

Masstech M-Connect seamlessly interfaces MassStore to the Apple Mac G5 Final Cut Pro (FCP) Studio NLE platform. A STAR-supplied GigE Ethernet switch is used to make the connections between the FCP workstations and the network. FCP users can archive and restore their projects in native FCP format including all metadata and media.

M-Connect provides menu options on the MassStore GUI, so that the editor can send and retrieve content from MassStore via FTP services.

M-Connect is used in two ways—to store and retrieve FCP projects and to store and retrieve final edited programs (also called flattened files).

FCP Project Files

Transfer of content out of FCP Studio is done by using the “Export to MassStore Platform” command. This sends projects and their related media files directly to MassStore. This way projects can quickly and easily be saved, and then restored at a later time.

MassStore M-Connect – “Export to MassStore Platform” Workflow

To store a Final Cut Pro project to MassStore

1. Select timeline to archive.
2. From the File menu, select export.
3. Select Export XML to MassStore platform.
4. Enter an ID to save as.
5. Content is transferred to MassStore.

Tapeless transfers of content into FCP is effected by the “Import from MassStore Platform” command. This transfers content into the FCP Studio production environment.

MassStore M-Connect – “Import from MassStore Platform” Workflow

To restore a Final Cut Pro project from MassStore to FCP

1. Search in MassStore for project to restore.
2. Select project instance in MassStore and initiate transfer.
3. Select FCP storage location as destination.
4. Content begins transferring to FCP.
5. Operator selects from the FCP menu “File.”
6. Import: Import XML from MassStore platform.
7. Select transferred content XML file.
8. Content is now available to edit

FCP Flattened Files

To send flattened projects (finished edited pieces) to MassStore, the command “Export Quicktime Movie” is used. When this command is enacted, MassTrans-It converts the FCP material to the MPEG2-IMX50 master file format and stores it in MassStore.

Summary

With MassStore Workflow Asset Management system in place, STAR India has started to incorporate a digital workflow in its operations.

The Central Digital Storage library is becoming the main storage area for the facility, as videotape content progressively is converted to digital files. This makes it much easier to search for and retrieve needed material.

Existing metadata from STAR’s database was able to be imported into MassStore, saving hundreds of hours of manual re-entry.

Having interfaces to the non-linear editing systems increases efficiencies further, in that material does not need to be ingested (or ingested again) in the edit suites themselves. Material in the more economical central storage just needs to be selected and copied to the editing system.

Projects can be saved as projects with all clips, timelines, and metadata stored intact, and quickly restored to the editing environment, allowing more efficient use of two edit suites, and saving on more costly local storage.

The editing system interfaces also means that Apple Final Cut Pro and Avid non-linear editors can easily share files between these two different systems.

Producers conveniently can browse the automatically created low resolution proxy versions of ingested content for review and to select cuts for editing, all from the comfort of their office computer workstations.

MassStore makes it easy to convert digital files to videotape and to a DVD authoring platform.

MassStore provides flexibility to allow the system to grow as STAR India continues to moves forward with its digital workflow.

Overview

STAR India Design Goals

- Ingest and archive existing videotape content of approximately 50,000 hours.
- Digitize and store 9,000 hours per year of new content.
- Ingest all shows in the format of 50Mbps MPEG2 MP@ML.4:2:2 I-frame only (compression rate user selectable), also known as IMX50.
- Group content in the digital tape library according to rules.
- Automatically create a low resolution proxy version of the ingested material.
- Provide primary and secondary ingest paths.
- Produce playback videotape copies of digital library content.
- Produce MPEG2 output for DVD authoring.
- Import and convert existing customer metadata database to new digital workflow system.

The Masstech Solution

Masstech MassStore Equipment

- Digital Asset Management application with:
 - Embedded Relational Database.
 - Web based client software for database interaction and integrated proxy viewing.
- Five M-Ingest Stations:
 - MPEG2 50i file capture of existing tape library content.
 - MPEG2 50i playout
- Interface to Avid Unity non-linear editing (NLE) system:
 - DET (Dynamically Extensible Transfer).
 - DHM (Data Handling Module) which requires customer installation of Avid TransferManager
 - Interface licensing for Avid
- Interface to Apple Final Cut Pro NLE.
- Interface to IBM DS4100 cache storage.
- Interface to Spectralogic T950 mass storage digital tape library:
 - 4x LTO3 tape drives
 - 1x Control Frame

- 2x Expansion frames
- 1x Future expansion frame
- Future upgrade/ migration to LTO4
- Interface to MassBrowse II.
- Interface to MassStore Portal Application.
- Interface to Pulse Digital SelectNet Enterprise DVD authoring.
- Interface to MassTrans-It with multiple transcode blades.

Key External Components Supplied by Masstech

- A Spectralogic T950, digital tape library using four LTO 3 tape drives or higher as they become available, one Control Frame and two Expansion frames.
- A 20TB IBM DS4100 Storage server as primary near-line cache storage.
- A 3TB IBM DS4100 Storage server as secondary cache storage.
- Pulse Digital SelectNet Enterprise DVD authoring.
- Crystal Reports.
- Customer TCT reports via MPA.

Benefits

- An increase in efficiency. Through the automation of workflow, the elimination of manual processes and inherent operator error in the transfer of over 50,000 videotapes to a digital file format and storage.
- The flexibility to expand the capacity of the existing T950 library, to upgrade and provide migration to LTO4 data tapes or higher, and the flexibility to integrate an additional second library as a redundant storage location.
- The ability to selectively identify clips to export from the data tape library to transport to another MassStore system located elsewhere.
- Distributed Redundant Adaptive Cluster (DRAC) extends MassStore's functionality with the concept of Distributed Data Movers (which transfer data between configured end points) to enhance overall system bandwidth.
- Automatic file transformation to/from house file format to format required by Avid Unity and Apple Final Cut Pro editing environments, and the DVD burning system.
- Editing sessions can be stored as projects—allowing the edit session to conveniently resume where it left off with all clips, timeline, and metadata intact, or as completed flattened files.

- Automatic creation of low resolution proxy allows producers to conveniently browse, select, and view content in the comfort of their offices at their computer workstations. It also allows producers to choose files or parts of files to be transferred to the editing.
- Content security is ensured as the Security Matrix configuration determines whether or not a user can access a resource based on security policies assigned to the requested resource.