Preservation & Valorisation of Audiovisual Heritage

Second edition

Vectracom
VIDEO SOLUTIONS

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Welcome,

This document is for all those who are in possession of audiovisual heritage.

If it has not been digitised yet, it is time to do something. Digitise it before any paper document. They can wait. They are not in danger.

Audiovisual digitisation is affordable. But within 10 years, it will not be the case anymore. Your tapes are going to be really old and sticky and difficult to read. And the main issue is that it'll be just impossible to find devices to play the old media.

If your collection has been digitised, then, you are probably looking for better ways or new methods to value your assets. There are solutions. Every day, new technologies create opportunities that you may want to explore.

Have a look at this document and go to the next level, whatever is the status of your audiovisual heritage.

Enjoy it.

Jean-Michel Seigneur
Head of Marketing at Vectracom

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Preservation of Audiovisual Heritage

According to UNESCO, 200 million hours of video programmes are in danger of being lost.

In fact, much more than that needs to be preserved. Recent reports show than more than 500 million of audio recordings exist only in USA.

A lot of valuable assets will disappear soon.
There are not enough resources today to digitise and save everything.

Preservation

Preserving one's audiovisual heritage means ensuring that it can be seen or heard today, tomorrow and forever.

Attitudes change. Preservation for the purposes of entertainment has long been well understood and acknowledged. Today, preservation for information purposes is becoming evident. Many people understand more today the value of archives and their potential uses. But this understanding varies from one culture to another. In the past, during the analogue era, the copying of content on a new physical media was the only technological way of preservation. Material was copied onto new media, while the old was thrown in the trash. Twenty years later, the same cycle had to be repeated. This technology has now been dropped in favour of digitisation and we can today clearly differentiate two types of preservation:

- ☐ Preventive preservation, which consists in keeping contents in their original media, as it stands.
- ☐ Curative preservation, which consists in digitising material under the best possible conditions.

Preventive preservation

This consists in keeping content in an appropriate environment, one that minimises ageing of media. It requires a keen knowledge of the media and heavy-duty resources. It is a specialist business that most owners of archive data cannot in general handle themselves, due to the high level of expertise required.

Curative preservation

This is the only legitimate way to preserve audiovisual heritage. This technology consists in digitising content, after the correct preparation to secure the best possible transfer quality. It is now reasonable to assume that digitised content can be preserved indefinitely, providing that certain precautions are taken. Also, digitisation allows ubiquity of information, preserving it from disasters like fire. It has been the case at the presidency of Bosnia and Herzegovina in February 2014 where valuable archives burnt and disappeared for ever.

Better to run

For anyone wishing to preserve their audiovisual heritage, digitisation is a matter of urgency.

Postponement only leads to the deterioration of media and makes the content more difficult to read as technologies become obsolete. The longer you wait, the more the original content degrades and the harder it is to produce good digital copies. The old magnetic media, which disappeared from the market 25 years ago, will be completely unplayable 20 years from now. Content will be irrecoverable.

In Afghanistan, a lot of valuable content has been destroyed during the talebans era

Work on Afghanistan film archives (photos from the 2015 film «A flickering truth» by Pietra Brettkelly)

Technological Obsolescence

Analogue media players are simple devices using a collection of technics including electronics, mechanics, and automatism. Each player was using the most advanced technology of its time. It was high-end and very efficient but it was also very fragile and in most cases was requiring a lot of maintenance. Today, depending on the devices, we are 20, 30, 40 and sometimes more than 50 years later and things have not improved. These analogue players are becoming old. Like human bodies, they age badly and the phenomena is accelerating up to the death of the machines. Of course, it is possible to repair them but such

maintenance has limits and it is important to notice that, even today, you cannot expect an old analogue audio machine to read a magnetic record the same way it did it 40 years ago. Purists can already forget to retrieve the quality that was possible to retrieve 40 years ago with the same equipment. Players are just no more as accurate as they were when they were new. As we gain understanding of the way players are aging, we can now predict than in about 10 years, old

The combination of technological obsolescence and media degradation combine together to quickly close the digitisation window.

machines from the 70th and the 80th will not be usable anymore. During the last decade, we heard that the window to digitise audiovisual media was a 15 years window or so. As we are pushed to the wall, we have a better view of its position and 2025 is where it is. After that date, it will become very expensive to digitise a magnetic tape from the 70th or the 80th when it will not be impossible. The digitisation window will be closed and all the content recorded on such magnetic tapes will be lost.

Obviously, if you have more recent magnetic media or film, you have some more time but not so much.

Media Degradation

Depending their nature and the way they are preserved, media are degrading at a different speed. Magnetic tapes are degrading quicker than film. But I am more confident in an old magnetic tape than in an old disc, whatever its type. Discs have proven by the past that they are very easily polluted and deteriorated by chemical or ambient agents.

In fact, the capacity of magnetic tapes, films and discs for keeping their information decreases very slowly with the time up to the moment it decreases very quickly. A classical case is the vinegar syndrome that it is caused by the degradation of acetate films. As soon as it smells vinegar, a film is difficult to play as it starts shrinking and twisting. Its degradation accelerates and it becomes rapidly impossible to use. The same case happens with magnetic tapes. Such tapes are all more or less hydrophilic and this characteristic leads to the degradation of binders that in turn leads to particles cutaway and difficulties to read tapes.

The combination of technology obsolescence and media degradation combine together to close the digitisation window.

Depending the case, the media or the player may disappear first. Whatever the case, the result is similar. Without a playing device, it is impossible to read a media. And a deteriorated media cannot be played, whatever the equipment you have. As these 2 phenomena occur at about the same time, it reinforce predicting 2025 for the end of the digitisation window. After that, some magnetic formats will still be available for digitisation at a higher cost while other may be just impossible to transfer. For films, the problem is different as preservation can be done better and film scanners are still manufactured today. This must be tempered by the fact that the sound is usually recorded on magnetic tapes.

The cost of inaction

A failure to act has its cost. If you are keeping your content over a long period, calculate the cost along with the additional costs of preservation. Add a fraction of the initial production expenses, and you will have an idea of your potential losses when it becomes illegible. Naturally digitisation is an expense, but it guarantees the long-term existence of content and above all, renders it commercially useable. Failure to act simply guarantees the loss both of content and the investment made thus far to create and preserve it. For more info on that topic, you may refer to the AVPS tool at the following address: https://coi.avpreserve.com/

Depending the carrier, the urgency varies

Vectracom services

- Leader of audiovisual heritage preservation
- Dedicated to audiovisual professionals
- More than 24 years of concrete practice
- Expert in the entire range of technologies for digitising and restoring legacy audio, video and film recordings
- All required legacy equipment in stock
- Range of services from consulting to turnkey projects
- Range of certified solutions to manage from
- Very small to very large volumes of media
- Ability to manage projects at your location
- Detailed plans and quotes on request
- ISO 9001 certification

Prioritisation

The most pressing matter is to gauge the condition of audiovisual archives and develop an action plan.As usual, it is a question of budget, timing and prioritisation. Media that are deteriorating faster should be done first. We know the cases of administrations engaged into the digitisation of paper archives before any work on audio and video content. This is a mistake. People do first what they understand better and where they see an immediate advantage. It is fine but when they will come to digitise audio and video tapes, it will be too late and they will lose a part of the heritage they have to take care of.

Paper digitisation should be postponed as it can wait. In 10 years, equipment will still be there and the paper also if it is stored in proper environment. Instead, media should be done in priority. It cannot wait. Instigate an initial strategic action plan. Either work alone or seek help from specialised consultants. Imagine different scenarios and estimate costs.

Move forward with precise data

You need a plan to present to decision-makers and obtain the budget you need for your project. To build this plan, you need clarity about what is involved. You have to know what can be done, at which cost and when and how it can be done. To build the plan, you need to rely on somebody you trust, somebody who understand the problem and know solutions. There are experts but there are not many. So, look for experts who have experience, choose one, trust him and move forward to create your plan. This is your key for success.

Few art forms have appeared and disappeared as rapidly as silent movies. 75% of American silent films have been lost.

Time is running out

Today, there's not enough equipment in the world to digitise all existing analogue media. The cost of digitisation increases and it will be soon overpriced. The first owners entering in action will be well served with an acceptable price. Latecomers will not even have solutions and they will lose their assets.

We hear sometimes optimistic people explaining that new technologies are going to emerge to save the case and all old analogue contents. This is a chimera. Old media degrade and they will die.

The World Day for Audiovisual Heritage is an initiative of UNESCO.

It commemorates the adoption by the 21st General Conference in 1980 of the recommendation for the safeguard and preservation of audiovisual heritage. It is an opportunity to draw public attention to the need for urgent measures and to acknowledge the importance of audiovisual material.

Film

Kodak closed its film division in 2012, while Fuji officially stopped the manufacture of film stock in March 2013. Important Hollywood studios themselves ceased providing 35mm copies in 2013. Increases in the cost of film allied to a fall in the price of digital equipment rapidly justified the film industry's decision. From that point on, specialist companies, equipment and know-how began to disappear.

A heritage in great danger

Audiovisual heritage consists mainly of optical film (8mm, 16mm, 35 mm and all other types covered in the current chapter). Almost every institution in the world possesses film archives. But film stock ages and perishes. Chemical attack, mechanical deformations and shrinkage, changes in elasticity and «vinegar syndrome» are all problems exacerbated by poor storage conditions. In the USA, already more than 75% of the early silent films have been completely lost. Among art forms, the speed of the rise of silent movies and their subsequent disappearance is unprecedented.

If nothing is done, an entire heritage is going to vanish. The equipment capable of reading film is going to become increasingly harder to find, and the films themselves will vanish into dust unless their preservation is assured.

Archived films at Vectracom

There are many types of film formats. We have listed the most common ones in the table below.

Year(s)	Name	Film	Perforations	Use
1900	Micrograph	20 mm in black and white	On 1 side	Amateur
1900	Pocket Stopwatch	Black and white	Central	Amateur
1912	Pathé Kok	28 mm B&W non-inflammable	Central	Family Cinema
1922	Pathé Baby	9,5 mm; sound from 1930	Central	Amateur
1927	Pathé Rural	17,5 mm; sound from 1933	Central	Country
1927	Cellfilm	22 mm ozaphan film	On 1 side	Country
1929	Cinélux	22 mm ozaphan film	No perforation	Country

Some of the numerous early film types

Early films

The first films appeared in 1888. Manufactured by George Eastman, they were made from cellulose nitrate and were 70mm wide. In 1891, William K L Dickson created the 35mm film with 4 perforations. At that time, he worked with Thomas Edison. This format was subsequently used in cinema and for the shooting of pretty much all fictional work. Early films were silent and in black and white. In this period, manufacturers produced many films of every type. They have considerable heritage value.

16 mm with optical soundtrack

Most common formats

In 1923, Kodak launched 16mm as an alternative to 35mm. Economical and lighter, it became the professional format for news reports and fiction on tele vision. It originally had perforations on each side but the appearance of talkies introduced the addition of a sound strip (magnetic or optical) and generalized the use of film with perforations on one side only.

Super 16 is a version of 16mm with a 1.66 aspect ratio, better suited to 16/9 video transfer and enlargement to 35mm. Kodak launched 8mm in 1932, then Super 8 in 1965 for amateur cinema. The perforations in Super 8 are smaller, producing a superior quality enlarged picture. Sold in a cartridge, Super 8 film was much easier to

handle. It is the most widely used format among amateurs. Surprisingly, 8 and Super 8 were only available in sound versions between 1974 and 1997, after which they became silent again.
Offering a good balance between cost and quality, 35mm has stood the test of time. Designated an international standard in 1909, since that time it has been the basis of several picture formats of different width and height. Mostly used in aspect ratios (width/height) of 1.33 and 1.85, it was also chosen by 20th Century Fox in 1953 for its cinemascope format, boasting an aspect ratio of 2.39. The Vistavision format, launched by Paramount in 1954, used the 35mm with an aspect ratio of 2.55. In the latter format, the film rolled longitudinally rather than laterally. In the years following the Thomas Edison era, film had sound added, became non-inflammable and developed colour. It is also the format of photography. Super 35 used 35mm film but offers a larger viewing area thanks to the use of space usually used for the optical sound track.

Large formats

70mm was popularized in the 1950s, after a few attempts in the 1930s, mostly thanks to a renewed enthusiasm for large formats after the arrival of television. 70mm is still used by the IMAX process, as well as by more confidential formats intended for amusement parks.
70mm Panavision uses 6 magnetic tracks located on either side of the picture.

35 mm film with optical soundtrack

Films are composite material

Film stock is a composite material made up of a substrate covered with a binder holding the particles that form the picture or sound. Hence the film mostly consists of:
1) synthetic part, which is the substrate. These substrates have evolved over the years - cellulose nitrate, diacetate or tricetate; polyethylene terephthalate (PET), polyethylene naphthalate (PEN). Also polyvinyl chloride (PVC) for magnetic tape.

- ☐ A mineral part, which constitutes the emulsion - the active element on which is recorded the picture or sound.
  - ◊ For picture, **silver salts** very sensitive to hygrometric variations and pollutants, notably sulfur.
  - ◊ For magnetic tapes, **iron or chromium oxides**, sensitive to hydrolysis and to acids.
- ☐ An organic part - the binder - made from extract of putrescible animal matter and sensitive to the mould that keeps the mineral part in suspension.
- ☐ A lubricant, which ensures the smooth running of magnetic tape. This contributes to their deterioration by leaving a deposit on tape heads.

2) Substrates have evolved over time, most notably graduating from inflammable substrates, known as «flam», made from cellulose nitrate, to less dangerous substrates known as «safety», which are equally as perishable.

Name of substrate	Cellulose nitrate	Cellulose triacetate	Polyester film
Label	«Flame», «Flam», «Nitrate». Sometimes unmarked.	«Safe», «Safety», «Non -Flam»	
Period	1880-1953 1858 for photographs	Existed since 1920 Obligatory from 1953 for copies Continued use in filming	PET from 1952 PEN from 1996
Formats (mm)	75 / 70 / 35	35 / 16 / 9,5 / 8 and super8	All copies
Deterioration	Self decay, darkening, stickiness, becomes dusty then self combustible at 40°C Risk of mould	Self decay, does not perish but crinkles, shrinks and emits acetic acid (Vinegar syndrome) - a contagious condition. Risk of mould	No deterioration (100 years lifespan at 21°C and 50% RH) Risk of hydrolysis and low shrinkage. Possible detachment
Recognition test	Intense blue coulour in diphenylamine acid solution Runs in trichlorethylene.	Vinegar odor. Floats in the trichlorethylene	Remains in suspension in trichloroethylene. Birefringence. Fiber optic effect

Storage and restoration of films

Storage of film archives

The most important face of protecting film is to store it in an environment as cool as possible, but one that is neither too humid, nor too dry. The major Hollywood studios and other big organisations with large film archives have built storage facilities with controlled temperature and humidity to preserve their film.

The life expectancy of media diminishes with increases in temperature, hygrometry and the fluctuation of same.

Archived films at Vectracom

The table drawn up by the Image Permanence Institute at the Rochester Institute of Technology, gives an idea of the life expectancy of stocks according to environmental conditions of conservation.

Expected Lifetime (years)		Temperature						
		2°C	7°C	13°C	18°C	24°C	29°C	35°C
Wet Level	20%	1250	600	250	125	60	30	16
	30%	900	400	200	90	45	25	12
	40%	700	300	150	70	35	18	10
	50%	500	250	100	50	25	14	7
	60%	350	175	80	40	20	11	6
	70%	250	125	60	30	16	9	5
	80%	200	100	50	25	13	7	4

Life expectancy according to conservation conditions

This table indicates, in red, conditions in which there is a high risk of the proliferation of mould, which must be isolated and removed when detected.

Climatic stability is the first objective. The 2003 ISO 11799 standard concerning long-term storage requirements for archive and library materials, indicates the temperature and degree of hygrometry recommended according to types of magnetic tape. Basically, on average, a low relative humidity (35%) is required, along with a temperature lower than, or equal to, 12°C. But it is not that straightforward. Maintaining low hygrometry and low temperature is a complex business. It follows that there is a catastrophic risk of breakdown and condensation.

Restoration of films

To be correctly preserved, either by storage in an appropriate environment or by digitisation, film must first be prepared by a process of mechanical repairs. This is not a straightforward operation, rather a specialist task requiring a great deal of expertise and know how, carried out by qualified restorers. Great care is needed. An operator restores only a few meters of film per day, with the length varying according to the physical state of the film.

Repairs include mending perforations and breaks, regluing, joining together reels and synchronising pictures with sound.

The film has to be cleaned, and any old adhesive (scotch tape) used during mechanical editing needs to be replaced. In addition, old adhesive waste must be eliminated.

It is a rather laborious job as it requires the use of solvents. Operators need workstations equipped with special extractor hoods connected to a ventilation network. Operators search for scotch tape by manually running the film on editing tables and physically scanning for joins by pinching the film between gloved fingers. Depending on its resistance, the removal of old scotch tape is carried out using any one of a number of techniques, often by immersion. Scotch tape leaves visible traces on the film, and work is required to remove any trace of adhesive.

Cleaning film

The cleaning of film consists in removing any remaining particles of dust. It is the final operation in the preparation phase of preservation, whether by storage or by digitisation. Cleaning can be carried out by hand, on a machine fitted with cloths, or in a machine that treats film by ultrasound in a bath. The latest is recommended.

Cleaner at work

Handling and packaging of film

Touching the surface of film must be avoided at all costs. The wearing of gloves is an indispensable precaution for handling any archive data. Reels of film are always handled vertically. The handling of perished film is a job for specialists. The working area must be exceptionally clean and dust-free. Film or tape must not be dragged across the floor. The winding of film is a key process, it must be done using undistorted reels on a hand operated viewer. The risks of distortion means that tension during winding must be neither too slack nor too tight. The lead-in section needs to be correctly fixed.

Operator using ultrasonic cleaner

Cleaned film must then be put away in boxes to protect it from anything that might decompose and form dust: paper, blotting paper, humidification systems, cardboard, paper bags, sleeves, plastic bags, paper clips, etc. And if any boxes contain media affected by vinegar syndrome, it must be thrown out. Boxes must also allow air to circulate and any internal pollutants to be evacuated.

Boxes are lined up horizontally for films and vertically for magnetic tape. The original metal boxes are usually avoided because they rust. Boxes made from chemically stable plastic materials are recommended.

After an extended storage (2 years), it is necessary to slowly rewind magnetic tape completely.

Vectracom services

- On-site restoration , or in Vectracom premises
- Any type of film, mostly 8mm, 16mm and 35mm
- Analysis of films storage condition
- Cataloguing of films
- Handling and safe transport of film reels
- Mechanical restoration (regluing, edge repair) 20 workstations equipped with machines
- Assembling of film reels
- Synchronisation of picture and sound
- Complete cleaning (brushing and ultrasound)
- Repackaging
- Labelling according to heritage standards
- Creation of reports
- Collection and transformation of metadata
- Ongoing reporting with workflow manager

Operator on veiwing/editing table

Digitisation of film

In the past, scanners were exclusively used by film makers.

As cinema industry doesn't use films anymore, this technology found a new market in film mass digitisation where it is now the rule.

Various cases

Cinema has always used a combination of optical films and magnetic tapes. For the larger majority of films that are 16 mm films, there's usually one optical 16 mm reel for the image and one magnetic tape for the sound. But all cases exist. Sound can be optical on the same reel or on a separate one. It can also be magnetic on the same reel.

Telecine and scanners

Telecine (TK) is the name of the technique that's used to convert films into video (PAL, SECAM and NTSC signals).

As PAL and SECAM are 25 frames per second (50 fields/s), films has been speed-up by 4% and sound corrected using a pitch-shifter. When soundtrack is of special importance, some films have been transferred at their normal speed, adding 1 field every 12 field of video.

As NTSC is 30 frames per second (60 fields/s), each image is copied on an average of 2.5 fields. The first image is copied on 2 fields and the next one on 3 fields and so on.

A number of technologies have been used to capture images including the flying spot, the line array and the CCD.

All these technologies allow creating video signals directly. It means that they are real time machines.

35mm scanning operations

Motion picture film scanners are other types of devices creating files. They scan frames individually and create a file sequence in which each single file contains a digital scan of one still frame. They are usually very slow machines and have been used so far in digital filmmaking where resolution and quality are of prime importance. The files are then used in high-end workstations.

As films have completely disappeared from the movies production process, motion picture film scanners are no more used by filmmakers. Instead, as they are now more affordable, they are used by film owners who want to restore their assets and by audiovisual archives industry.

Operations on HD Telecine

Advantages of scanners

As they are high-end devices, scanners use a number of technologies allowing them to capture images the best possible way. They use large format area imagers and diffuse light to reduce the appearance of scratches. They have a 2D pin-registration for best stability of damaged films. They have an infra-red dust and scratches detection providing better correction of these defaults and providing to operators a map of their locations.

In addition, best scanners have been optimised to work also on print films while initial motion picture scanners were designed only to work on negative films. For example, using 3 flashes, they can capture shadow details even when the density of the films is very high (typically the case of print films).

Some scanners are sprocketless to facilitate the handling of old films and to avoid deteriorating

their perforations. This is particularly interesting in the case of legacy and damaged films.
Their low speed is the main default of motion picture film scanners. The higher the resolution, the more the device is slow. Nevertheless, thanks to technology progress and costs decrease, scanners are now the devices of choice for any kind of film digitisation. And the only interest of telecine may be their cost as they have been amortised a long time.

Sound digitisation

When scanners are used to read optical films, a second pass is usually required to capture soundtrack. This the case when audio is on a magnetic strip and when audio tracks are on a separate film reel.

Post-production phase

When working with scanners, at the end of the digitisation processes, we have always one or several file sequences and we may have one or several audio files. They are normally uncompressed, the perfect format for the best post-production. This is done on high-end workstations able to manipulate high volume of data and showing pictures on monitors that are calibrated to reproduce the correct colors.
Minimum post-production synchronises sound tracks and image files. It may also include basic color grading in the case of archive and enhanced color grading as well as restoration in the case of refurbishment for broadcasting.

Film to use

Digitising a print film, you cannot expect a good result as the film itself has a low resolution and is dark (high density). But the process is cheap as minimum color grading is required. Digitising a negative film, you can expect the best result as the film has the highest possible resolution and its density is very low (highest density is about 2.0). Obviously, in that case, you should allow plenty of time for color grading.

What is the right resolution

When studying optical transfer functions of movie cameras, films and scanners lenses, it appears that a 4K scan is well suitable for the digitisation of content from a 35mm camera negative film. Such definition is neither too strong nor too weak. No additional information would be captured using a higher resolution. And if you have only a print film, 4K format is oversized.

16 mm scanning operations

For 16mm negatives, the same reasoning applies with digitisation in HD or 2K. Digitising at a higher definition is a pointless exercise, and 2K offers practically nothing more than HD.
By the same reasoning, SD resolution is sufficient for 8mm film.
Higher resolutions only increase the cost without improving the end quality. This reasoning is valid for original camera negative film. But available copies are often several generations from the original and their quality is notably reduced. It is therefore pointless and unsuitable to capture in too high resolution because it only costs more, complicates the process, introduces more noise and produces larger files.

Creation of a mezzanine file

At the end of digitisation processes, the raw files are kept together with final files. But they have a cinema format and are not really easy to use with today devices. As a consequence, a video file is created in a so called “mezzanine” format, usually between 50 and 250 Mbit/s.

Vectracom services

- SD/ HD/ 2K / 4K scanners
- Super 8, 8mm, 16mm, 35mm, (negative, positive)
- Audio embedded or separated / optical or magnetic
- One light operations or color grading
- Fast restoration (real time) or enhanced restoration
- Deliveries are DPX plus DCP and video formats

Two techniques were involved. First, it was mechanical recording followed by electrical recording initially analogue before digital era.

Cylinders

Mechanical engraving was the first technology used to record sound. From 1880, sound information was carried in the form of grooves, cut onto the surface of a cylinder. Variations are directly proportional to the sound waves. The early cylinders were made of cardboard covered with tin. Directly engraved by a needle under sound pressure operated via an entirely mechanical device, the first recordings were priceless, more so because until 1895, it was impossible to copy them.

With an equipment specially designed, these cylinders can still be played today. Problems arise from deterioration of the medium over time and repeated playing.

Shellac discs and long plays

Discs appeared in 1888. They adopted the principle of cylinders only in a more easily reproducible form. The initial 90 revolutions per minute gave way to 78 rpm in the twenties. Made from «shellac», they measured 25 to 30cm for a 3 to 6 minutes recording. They could be either cut directly or pressed. The concept involves the use of a playing stylus under heavy pressure, which damages the grooves with every pass, increasing crackle and background noise. It is also worth noting that the 78 rpm of the players used at the time was very approximate.

Vinyl replaced shellac in the forties. Discs were then known as «long plays». Vinyl enabled both the length and quality of recordings to be increased, notably through an increase of bandwidth and a reduction in surface noise. In 1954, the RIAA (Recording Industry Association of America) specified the RIAA standard. It was rapidly adopted by producers and publishers all over the world. Three types were established: the 33rpm LP, the 45rpm single and the 45rpm maxi single.

Initially recorded in mono, they became stereophonic in the sixties and quadraphonic in the seventies. They age less rapidly than 78 rpms.

Vinyl replaced shellac in the forties.

The playing of discs is comparatively straightforward but it must be stressed that the restored quality depends a great deal on the equipment and method used. Particular attention must be paid to the digitisation of discs which are being played for the last time during this operation. It would be a great pity not to take the opportunity to achieve an excellent reading of the recording, with the best available equipment in each case.

Compact discs

This is an optical optic, 12cm in diameter, read by laser. Created by Philips and Sony, it was first marketed in 1982 to replace the LP record. Its characteristics are defined in the Red Book. It enables 74 minutes of music to be recorded in 16bits/44.1 kHz.

Magnetic recordings

In 1898 Danish engineer Valdemar Poulsen invented the first process for the magnetic recording of information, the forerunner to tape and videocassette recorders. It used a wire. During the 1900 World Fair, he used his process to record the voice of Emperor Franz-Joseph of Austria. It is, to this day, the oldest magnetic sound recording. The quality of recording was restricted but it was used until the 30's, when it was superseded by Jerry Pfleumers magnetic tape, invented in 1928. This brought a great improvement in quality. This flexible tape was between 1/4'' and in 2'' large. Produced first in acetate, then in PVC and polyester, it had a coating containing tiny magnetic particles of iron, chromium or pure metal.

Analogue technology

¼'' open reel

In professional use, tape runs at 19, 38 or 76cm/sec and is not reversible. Recordings are mono, two-tracks or stereo. According to the country of origin, the recording standard (NAB, IEC, UK) changes. The correct standard with the right equalisation must be set for perfect reproduction. Reels are 9, 18 or 27cm in diameter. Recording duration is directly linked to speed, spool diameter and thickness of tape.

Audio quality is linked to running speed. Widely used in radio, this medium can be edited using scissors.

In use by general public, recordings are mono or stereo (4-track tapes). Tape is turned over to play the other way round and double the duration of recording. Used at lower speeds of 4.75, 9.5, 19 or even 38cm/sec, the format greatly appreciated by enthusiasts from the 50s through to the 80s before being gradually replaced by the Philips «compact cassette».

¼'' open reel

1'' open reel

½'' open reel

This format was mostly used in radio and recording studios for masters and multi-track recordings (8 tracks).

1'' and 2'' open reel

Used in recording studios, the tape has from 8 to 48 tracks allowing separate recording of individual instruments.

Compact cassette

Invented by Philips in 1963, it uses a 3.81mm-wide tape running at 4.75cm/sec. Initially in mono, later in stereo, its quality improved with progress in electronics and metal oxides (iron, chrome, metal) such a way that by the 80s it was comparable to open reel quality.

Used by general public first, then by professionals, who appreciated its size and its ease of use, particularly during field recordings. Later arrival of Dolby and DBX noise reduction systems further improved performance.

Total recording time for both sides could be up to 120 minutes.

Digital Audio Tape

Compact cassette

Audio cartridge

Developed in the early 60s, the audio cartridge contained a 1/4'' stereo, multi-track tape.

It disappeared sometimes in the 80s. Some producers manufactured their own cartridge standards, such as ELCASET, but they met with little success.

Minidisc

Digital technology

Open-reel tape

Two main formats existed at the same time.

- The 1⁄4'' DASH format was introduced by SONY in 1982, producing with 16 or 24 bits uncompressed 24 or 48 tracks digital recordings, usually in 44.1 or 48 kHz. It was used almost exclusively in studios.
- The PRODIGI format was introduced by Mitsubishi in the mid-eighties, producing 16 or 24 bits uncompressed 16 or 32 tracks recordings in 44.1 or 48 kHz on a 1⁄4'' to 1'' tape.

Ephemeral formats

A few ephemeral formats that used video recorders first appeared in the 80s, such as EIAJ, for use by the general public, and EIAJ, for use by professionals. Recordings are uncompressed 16 bits, in stereo. In 1991, ADAT (Alesis Digital Audio Tape) used VHS tapes to produce recordings with up to 8 tracks. In 1993, DTRS (Digital Tape Recording System) used Hi8 tapes to record 16 or 20 bits digital audio recordings with up to 8 tracks in 44.1, 48 or 96 kHz for radio and private studios.

DAT

Introduced at the early of the eighties it used a 3.81mm wide tape protected by a case, slightly smaller than an audio cassette. It recorded stereo 16 bits (20/24 bits in certain versions) sound in 32 Khz, 44.1 Khz, and 48 Khz in certain versions. With its two running speeds, it was used both by the professionals and the wider public thanks mainly to two ranges of completely compatible machines.

DCC (Digital Compact Tape)

A format introduced in 1992 by Philips, it allowed digital recordings on a cassette tape of identical size to the analogue version. It met with only limited successes and was soon abandoned.

Minidisc (MD)

This format, introduced in 1992 by Sony, used a disc protected by a case. Recordings were made using a magneto-optical process. Harnessing ATRAC compression, similar to MP3, it was used by both the general public and by professionals, for interviews and other field recordings. From 2003, players came with a USB port.

Digitisation of vinyl discs

The quality of digitisation of signals initially recorded on mechanical media is dictated by the quality of playback equipment, the type of stylus in the groove, and the quality of filters and preamps.

Discs must always be cleaned prior to playback. A special solution is used. Humidification of a disc may minimise crackle.

The playing stylus chosen is dependent upon the disc. For optimum results, 78 rpm discs are played with diamond styluses specially adapted to the size of their broad grooves. For long plays, standard diamonds are used. The turntable must be of professional quality.

Vinyl digitisation on Studer EMT 938

Automatic production of digital files from recordings on discs is a relatively straightforward operation. Crackle can be alleviated, but care is taken to always keep a copy of the original recording before restoration.

Digitisation of magnetic tapes

The quality of digitisation depends on the machines used, and on the quality and adjustment of the heads. The mechanical adjustments made in the area of the heads are crucial.

Machines are controlled every week with test tapes and special programs allowing operators to quickly verify that the machines are in the tolerances that have been fixed and agreed.

Control reports are logged to keep track of each machine life cycle.

For each magnetic tape, the azimuth of the head must be adjusted to reproduce the precise recording conditions and recording levels. Sometimes we have reference signals

Digitisation of damaged tapes

(1000Hz), but it is quite rare. Analogue/digital converters (ADC) must be of good quality.

Excellent converters are now available, and PCM digitisation can be undertaken with large quantisation (32 bits) and sampling frequencies of 96 kHz (96,000 samples a second) as requested by standards. In practice, given the limitations of analogue recordings, 24 bits/48 kHz is recommended for professional musical recordings, with 16 bits for interviews, etc.

Modification of playback speed

Magnetic tape is usually recorded at a speed of 19cm/sec, but in reality it is often 9.5 cm/sec or 38 cm/sec. It must be played at the nominal speed. Nevertheless, when a large number of recordings is concerned, it is possible to read tapes faster and compensate with over-sampling.

This technique is quicker, and can be used for the slower speeds used on recordings of interviews, but not music. Its use is thus limited and generally avoided in the case of valuable sound archives.

Azimuth adjustment on Studer A810

Large sound archives

To digitise large volumes, several transfer lines are used. Specialised automation systems provide effective control of digitisation campaigns. In general, an automation system assists an operator in managing from 3 to 8 ingest lines depending the duration of the reels and the quality of the tapes.

For the digitisation of compact cassettes, the azimuth adjustments are less sensitive, and it is possible to further increase the number of chains working in parallel.

Multitracks tapes digitisation

Parallel digitisation operation (8 ingest lines)

Multi-tracks tapes digitisation

This is usually a case of recovering original recordings in which each instrument has been captured individually, either during a concert or in a studio.

Original recording in 16, 24, 32 or 48 tracks may be analogue, but they are often digital. The job consists in transferring recording and transforming them into Protools projects. The sound can then be remixed.

Vectracom services

A complete offer

- Parallel digitisation with up to 8 channels under the control of automation systems
- Transfer of multi-tracks recordings (analogue and digital) into “Protools” projects
- Detailed examination of complete archive
- Tapes and cassettes restoration, cleaning and baking plus repackaging
- Automatic QC on all files, and validation by operators
- Tracking of all actions during operations
- Automatic detection of silences
- Custom metadata sets provided
- Equipment maintenance with proofs

A large range of audio players

Clement professional turntables

- More than 60 professional Studer or Schlumberger 1/4’’ players
- More than 20 audio cassette players (Tascam, Denon, Sony)
- More than 12 DAT players (Sony, Tascam, Panasonic)
- 24 tracks analogue recorder Otari MTQ 90
- 32 tracks digital recorder Mitsubishi X850
- 24 tracks digital recorder Sony PCM 3324
- 48 tracks digital recorder Sony PCM 3348 HR
- U-Matic digital recorder Sony PCM 1630

Video recorders appeared in the 50's.

With video tape recorders, television pictures could be recorded on magnetic tape to then be broadcast in their initial format. Prior to that, film was used. The vast majority of professional TV productions used this mode of recording in the 60s. First, VTRs used tape reels, serving as a replacement for films and making recording for television applications quicker.
Then tape was included within a video cassette, which was used with Videocassette recorders (VCR). Later, in the 80s, it was introduced on the consumer market.

A collection of bygone video recorders

A multitude of formats

Video recording formats sprang from a range of technological developments. There are a large number, partly because of rapid technological advances and partly because of the economic wars waged by the major manufacturers (Sony, Panasonic, Ampex, Philips, Thomson) during the latter part of the 20th century.
Each new format needed a specific machine for playback, meaning special equipment had to be created. And each was, with a few rare exceptions, incompatible with the older formats. Thus an impressive number of machines came onto the market, each format having a very limited lifespan.
Today pretty much all machines playing magnetic tapes have disappeared from the market. The tapes are now only playable via specialist outlets.

Operations on quadruplex TR-70 from RCA

Preservation of VCRs

The upkeep of existing machines is a real challenge. Current manufacturers can neither produce them, nor even provide maintenance for their older models. Maintenance is now a job for enthusiasts and, for many formats, it is impossible to find the spare parts that are required for their maintenance.
Vectracom boasts an impressive array of equipment. And the company invests in the purchase and the preservation as much as it can. We often need several aged machines to build one that's working OK.

All machines are used exclusively for service. They can thus be used to safeguard the heritage of a large number of institutions. Their upkeep represents a veritable challenge, one that is met by the company's technicians.
It is clear that all machines are old and it should be understood that even the best possible maintenance cannot preserve then in their original status of performance.
As a consequence, the quality of transfers cannot be anymore as good as it was.

Operations require electronics skills

Very few specialists

Not many specialists have the range of equipment needed to work on any format. Not many have the opportunity to work in PAL, SECAM and NTSC. Usually, specialists focus on one or two formats
At Vectracom, we are not specialised. Projects pushed us to work more on old video tapes like 2inch, 1inch, EIAJ and U-Matic (all types) and also on large volumes of more recent tapes like DVCAM, DVCPro and Betacam (all types).

Operations on quadruplex AVR2 from Ampex

Operations on 2inch cleaning machine

Other tools to preserve tapes

The treatment of old tapes implies reparation, cleaning and restoration. Reparation is manual but cleaning and restoration involves the use of cleaning and heating machines.
In most cases, such equipment has also disappeared. To supplement the lack and sometimes also because existing devices don't respect tapes enough, machines have to be designed. This is quite often the case at Vectracom. We build efficient cleaning machines to preserve tapes and sometimes to include them in cart machines when large volumes are concerned.
For baking, industrial ovens with good temperature regulation are preferred.

Tape and videocassette formats

In the next two pages, you'll discover a classification of these formats. We defined 3 groups and listed main formats by chronological order. Such classification is arbitrary as recording formats have more to do with the use of content than the profession of the end user. Broadcasters have always used both institutional and consumer formats in their assignments.

Vectracom analogue media players

- 12 x 2" inch VTRs
- VTR 1''A
- 8 VTR 1''B, 10 VTR1''C
- 20 analogue Betacam
- 20 digital Betacam
- 20 x U-Matic / BVU
- 70 x VHS / S-VHS
- 12 x EIAJ
- 10 x DVCAM / DVC Pro VCRs
- 10 x D1 VCRs (and double D1)
- 2 x D2 VCRs, D3 & D5
- HDCAM, HDCAM-SR
- XDCAM drives
- 20 machines for rare formats

Partial equipment (sept 2015)

Video recordings

XCAM disc

HDCAM Cassette

DVCAM Cassettes

Digital Beta Cassette

MII Cassette

Betacam Cassette

1 inch tape

2003	**XDCAM** - Sony **HDCAM SR** - Sony
2000	DVCPRO HD DVCPRO P Panasonic
1999	**HDCAM** - Sony
1997	DVCPRO 50 Panasonic
1996	DVCAM Sony
1995	DVCPRO Panasonic
1994	**Betacam SP UVW** Sony
1993	**Digital Betacam** Sony
1991	**Betacam SP Low cost** Sony
1988	**D3** - Matsushita
1987	**D2** - Ampex **Betacam SP** - Sony
1986	**MII** **D1**
1981	**Betacam** - Sony
1976	**1''C** - Ampex **1''C** - Sony
1975	**1''B** - Bosh
1959	**2''** - Toshiba
1956	**2''**- Ampex
1954	**2''** - RCA
1954	**2 pouce** - RCA

Professional formats

Formats referred to as «professional» are those originally intended for TV broadcast.

1954: 2-inch «longitudinal» recording by RCA.

1956: 2-inch «transverse» recording by Ampex.

1959: 2-inch «helicoidal» recording by Toshiba.

1975: 1 inch B by Bosch Fernseh runs at 24 cm/sec with 2 heads recording segments of frames with 52 lines.

1976: 1 inch C by Ampex and Sony, running at 24cm/sec with a drum rotating at a speed of 50 r/sec and including a head that records one frame per revolution. Its design makes it suitable for freeze-frame and slow-motion.

1981: Betacam by Sony, uses the same tape as Betamax (1/2'' tape). Records using 2 tracks per field, or 4 tracks per frame. The format of choice for journalists, Betacam enabled the development of the professional camcorder.

1986: MII by Panasonic. Uses a 1/2'' metal tape cassette for recordings of up to 3 hours (180 min) , comparable to the more widely used Betacam SP.

1986: D1 by Sony, based on the 4:2:2 (CCIR 601) standard, using helicoidal recording on a 19mm tape , delivered in cassette.

1987: D2 by Ampex - Composite PAL or NTSC record. Uses same cassettes as D1 but with metal tapes for the first time.

1987: Betacam SP Magnetic 1/2 inch tape cassettes made from metal (iron, nickel or cobalt) whose properties ensure performance superior to traditional oxide tape, reaching 5.5 MHz (against 4 MHz for Betacam). Length of recording can exceed 90'. Sound is recorded in FM. Drum rotates at 25 revs a second.

1988: D3 Matsushita digital composite on 1⁄2-inch tape.

1991: Betacam SP Lowcost (PVW) by SONY - On 1991, bandwidth luminance 5.5MHz, chrominance 2MHz, 2 longitudinal audio tracks (Dolby C).

1993: Digital Betacam by Sony. Uses a tape format similar to Betacam, only with metal tape

1994: Betacam SP (UVW): uses metal tape.

1995: DVCPRO Panasonic

1996: DV Pro (Digital Video Pro) or DVCAM by SONY, 1⁄4 inch tape ill-suited to difficult filming conditions, more suitable for institutional use. Same as DV but more reliable.

1997: DVCPRO 50 by Panasonic

1999: HDCAM Records images of 1920 pixels in 1080 lines. Can be recorded at different frame rates, in progressive or interlaced mode (24p, 25p, 30p, 50i, 60i).

2003: HDCAM SR by Sony. High Definition digital format

in native 16/9, 1920x1080 (MPEG4 compression, Studio Profiles / 600 Mbit or 800 Mbit/sec). Remains exclusively used by digital cinema and advertising, due to cost.

2003: XDCAM. Blue laser used by SONY to record audio and video content on professional 12 cm discs, of 23.3 GB or 50GB in dual-layer format, similar to Blu-ray. Depending on the recorder, the compression format is DVCAM or IMX.

Hi 8 Cassette

S-VHS Cassette

U-Matic Cassette

EIAJ tape

1996	DV - Sony **D8** - Sony
1995	**Hi8** - Sony
1994	SVHS
1988	**BVU SP** - Sony
1978	**BVU** - Sony
1972	**U-Matic** - Sony
1969	**EIAJ**

Corporate formats

EIAJ: The first non-professional format for the recording of video signals. Initially black and white, it evolved into colour.
U-matic, BVU and U-matic SP: Created by Sony, also in the catalogue of Matsushita and Thomson. It stands at the border of the «broadcast» and «non-broadcast» worlds, notably in its SP versions, recording composite video signals. More than a million machines were installed across the world. It used 3⁄4 ”oxyde tape. With a horizontal resolution of 250 lines for luminance, it was the format of choice for the institutional sector, as well as broadcasters in its BVU version with 300 lines.
S-VHS (super VHS): Developed by JVC and Panasonic, based on VHS, it had 400 lines of horizontal resolution and two longitudinal audio tracks (Dolby B) plus two frequency-modulated hi-fi audio tracks recorded by the rotating heads.
Hi-8 (8 mm high-tape): Developed by Sony and other Japanese manufacturers, this was to 8mm what S-VHS was to VHS.
DV (Digital Video): Developed by SONY, DV is a video recording system using digital data. It ensures a superior image rendering in terms of brilliance, definition and colour.

MiniDV Cassette

Vidéo 8 Cassette

V2000 Cassette

VHS Cassette

Betamax Cassette

1996	DV - Sony
1995	**Video8** - Sony
1979	**V2000** - Phillips
1976	VHS **Betamax** - Sony

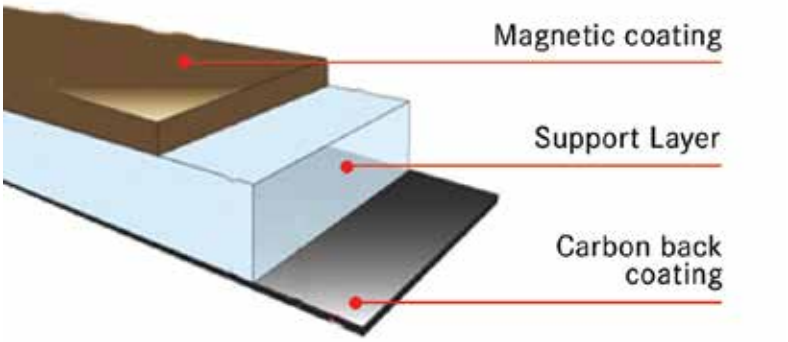
Consumer formats

Two main types of equipment were marketed : Homes VCRs with a tuner to record TV programs and camcorders.
Betamax: by Sony in the mid-seventies became very popular in the eighties. Used the same cassette as the Betacam but recordings were incompatible with Betacam players. It never took off in Europe, but had a strong presence in the USA and Japan until relatively recently.
VHS: Released after the Betamax in 1976, it spread around the world, with more than 300 million players. Allowed recordings of up to 5 hours at normal speed and 8 hours at slow speed. On some machines, sound was recorded in hi-fi. Bandwidth was limited to 2.3 MHz. Horizontal definition was 240 lines. VHS-C is a variant packaged in a very smaller cassette. It allowed recording in camcorders and required an adapter for playing on a home player.
V 2000: Produced by Philips and Grunding from 1979 to 1988, it existed only in Europe and was intended exclusively for the recording of domestic television programmes.
Video 8 (or 8mm): Mainly a camcorder format. The cassette, barely larger than an audio cassette, contained a magnetic metal tape allowing recordings of up to three hours (in long-play mode). Sound was recorded in frequency modulated mono or in PCM stereo. Some VCRs managed up to 18 hours of recording on the same tape. The picture bandwidth of 3.2 MHz was barely higher than that of a VHS. Like the U-Matic, they allowed direct access to component video signals Y-C.

Preparation of magnetic tapes

Preparation is a stage, during which a certain number of treatments are applied to the tape.

The goal is to ensure that at the moment of transfer, the tape is in good shape to provide the best possible signal without any risk of damaging the play heads of the player. It is often the last time the tape is played. Nothing must prevent the player from recovering all the recorded information.



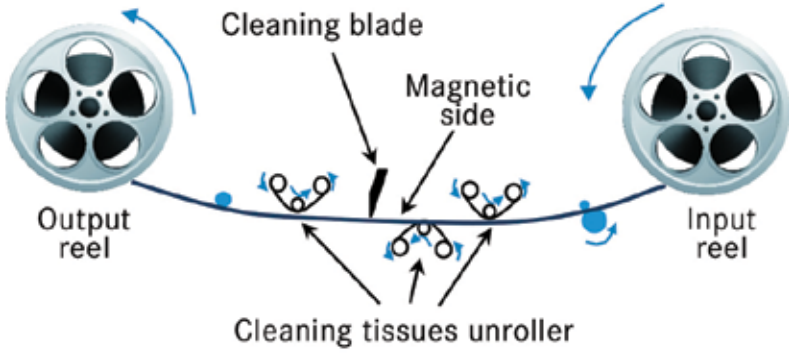
Typical layers of magnetic tapes

Visual examination and repairs

A visual examination of the tape or cassette by an expert decides the initial treatment. Physical repairs, where required, are carried out first. After that, depending on the condition of the tape, it will be either tested in a player or sent for cleaning.

Tapes made up of layers

The deterioration of magnetic tape over time is unavoidable. The rate of destruction varies according to the type of tape and the manner in which it is kept.



Tapes cleaning principle

The treatment of magnetic tapes requires a good knowledge of their structure and of the physicochemical characteristics of the different surface coatings. Tapes were originally made from acetate before PVC, then later, polyester was introduced. These tapes are coated with a magnetic coating of between 3 and 4 microns in thickness, made up of a binder holding particles of iron, oxide or metal. The back face of the tape is covered with a carbon-based layer to assist the elimination of static charge and facilitate running of the tape through the playback or recording apparatus. Not all tapes have this back layer. It tends to be found more on professional tapes or high-end consumer products with a high recording density, such as Hi8 or DV. The latter usually have an additional layer to protect the very thin magnetic coating.

Impact of dust and dirt

As technology improved, binders became more stable and the size of the magnetic particles diminished, allowing more information to be recorded. But the greater the density of information, the more sensitive the tape. Any particle of dust creates playback issues. The problem is exacerbated on more recent tapes because it impacts the playback of a larger part of information. The same applies for creases on the tape.

Tapes cleaning

It is not only about dust. Tapes deteriorate and generate a deposit that often comes from the carbon back coating. This clogs up the rollers during playback, which must then be cleaned. To avoid that, tapes themselves must be cleaned before digitisation. Cleaning equipment used for this task has become less and less available. So the new solution is often to design such equipment using an audio tape reader frame that's equipped with the convenient blades and tissues unrollers. As their motors are very soft, such machines take care of tapes often better than the cleaning devices you can purchase. A tape can be cleaned several times through a cleaning machine if it is particularly dirty. But the process is a trade-off. Cleaning must be carried out without causing further deterioration. It requires constant attention of operators.

U-Matic tapes cleaning

Automatic correction

Many playback issues are automatically corrected at playback time. This is the case with the most recent digital machines when the tape surface issues are relatively minor. VTRs rebuild the signal. There's no impact on pictures. Beyond a certain point, automatic correction stops working and the effects is disastrous. It is important to keep track of such issues when heritage digitisation is concerned. The so-called CRC should be logged as metadata to help curators when restoration is concerned.

On audio recordings, when it is impossible to read some samples, the effect may also be disastrous. If perfection is required, restoration is expensive and time consuming.

The effects of time

As they age, magnetic tapes may deteriorate and become sticky. As running through the playback machine becomes more and more difficult, it starts to make screeching sounds.

This is due to unstable binder (glue that holds the oxide particles) formulation that were used by manufacturers in the past. This issue is known as «Sticky Shed Syndrome» (SSS). It is due to the ageing of tape components and varies from one tape to another, depending on its manufacturer and on its year of production.

Overcoming the effects of time

It is possible to minimise this aging issue by heating up the tapes for a period of time.

This process is known as baking process. It is a common practice to temporarily overcome the Sticky Shed Syndrome.

Tapes are hydrophilic. Baking allows removing unwanted moisture that was accumulated in the tape binder. This corrective measure is effective during a few hours, a few days or a few weeks. It allows the tape to be digitised. After that, the tape reabsorbs water and it is difficult to play it again. The operation may be repeated a few times but it is recommended to digitise quickly the content. The process must be carefully controlled. Be careful with cassettes and avoid plastic reels. We have seen disasters.

Baking parameters vary from tape to tape. At Vectracom, we usually recommend a temperature that's slightly above 50° C (120°F) but this is really adjusted on a tape per tape basis. It can take from 6 hours to 2 days.

Tape baking

To facilitate tapes preservation and avoid moisture to be accumulated in the binder, it is recommended to store magnetic tapes in environments with low humidity.

Baking makes tapes brittle, reduces their lifespan, affects magnetic fields and lower output signals.

Vectracom analogue media players

- Detailed examination of all elements
- Repair of tapes and cassettes
- Cleaning for any formats (2'', 1'', 3/4'', 1/2'', 1/4'', etc.)
- Baking with appropriate parameters
- Repackaging
- Labelling according to heritage standards

Digitisation of video content

More difficult tapes
2 inch
1 inch B (from Agfa)
EIAJ
U-Matic
BVU
D1

Less difficult tapes
1 inch B & C,
All betacam
D2
VHS

This is the process of transferring broadcast content from its initial medium (usually magnetic tape) into files. Sometimes, when the tape is digital, it is a straightforward transfer of information, but when the medium is analogue, audio and video signals need to be digitised.

Digitisation of composite signals

Some old formats (2 inch, 1 inch, U-Matic, VHS) record composite (NTSC, PAL, SECAM) signals. Indeed, playback equipment provide composite signals, which reflects what is recorded on tape. The signal, then, has to be decoded. At this point, the quality of the decoder and its filters is key. This is not the place to cut corners. The decoder provides component signals which have only to be digitised.

Digitisation of component signals

More recent formats, such as Betacam and MII, directly record component video signals. They can be digitised as they are using an encoder, which creates a digital signal in accordance with the CCIR 601 standard that has been used by all professional digital systems for over 20 years. In the created digital stream, encoded audio tracks are added.

Use of time base correctors

A variety of elements may be used for completing the encoding operations in the CCIR 601 format. Their choice is not critical. What is critical is the choice of TBC.

A quality transfer cannot be obtained without a TBC, which allows any errors caused by the mechanical instability of playback and recording machines to be corrected.

Some playback machines offer simple TBC, and if you simply want to visualise content, that may suffice. But in the task of safeguarding audiovisual heritage for posterity, a more sophisticated external TBC is required in order to produce a stable and consistent signal.

Recording format

Digital signals can be recorded as they are, without encoding or compression. This way quality is optimised but the files are space-consuming.

More often recordings are treated to reduce file size and make them conform to the established preservation format. This stage can be accomplished on the fly during digitisation, by the processor in charge of the signal recording or it can be done later in a special render farm.

The result is the same in both cases. The choice is made according to the resources available for the task. When High Definition is concerned, MXF/OP1a/MJPEG 2000 and ProRes HQ are often created later as they require more computing power than recorders usually provide.

Standard ingest workstation

When there's only a few tapes to transfer or in the case of very old tapes or difficult transfers, standard ingest workstation are used. It is about the same configuration, whatever the format of the tape is. A couple of VTRs of the right type, a good TBC , a good A to D converter and a good software to grab, even short pieces of recording. On top of that, you need an operator who is very aware of what can be done. Senior operators are able to do miracles. Tapes appearing to be unreadable can finally deliver very acceptable quality when they are prepared properly and the VTR adjusted.

Using cart machines

For some formats, such as Betacam or DVCAM/DVCPRO, cart machines are available and they can be used to digitise 24 hours a day with no special supervision required apart from that provided by a suitable automation.

Operators load and unload tapes. Transfers survey is mainly done by the automation system controlling the players, the cart machine, the transfer chains and the signals under digitisation.

Workstation for operations on difficult tapes

Wall of playback machines

For formats like VHS, given that such equipment is inexpensive, a wall of equipment of several videocassette players can be used and supervised by a small number of technicians.
Naturally, this type of system is more automated as the operators only have to load the cassette players. Few checks are carried out during transfers.

Wall with 32 VHS recorders in operation

Cart machines operations

Digitisation with monitoring

When tapes get old, sticky or fragile, they become difficult to digitise. In that case, operators carefully supervise the digitisation process and halt it when they judge that desired quality is not achieved.

1 inch C operations

They then clean the tape, bake it, clean the playback heads, tracking mechanisms, etc. Then they restart the digitisation process. Several passes may be necessary as many issues can arise, and may require repeated operations. At the end of the transfer, the best recordings are selected by the operator and assembled automatically.

Special equipment is required

For mass transfers of audiovisual heritage, standard encoders or SDI video servers are cost effective equipment so instead, sepcially designed systems are required. This is a MUST to guarantee high quality of work while maintaining competitive pricing.
Vectracom has developed its own hardware and software over the last 10 years enabling us to use all types of architectures with the most efficiency. Ranging from the simplest ingest channel to the most complex digitisation processes including walls of playback equipment and cart machines of al types and any capacities.
A home made workflow manager completes the range of efficient equipment that we developed. It allows us to track what has been done, when it was done and by which operator as well as any metadata delivery.

«EasyAlive»

for difficult tapes

«EasyFlex»

for cart machines

«EasyAlone»

for walls of VTRs

Vectracom services

- High quality mass transfers
- In-house special hardware and software
- Appropriate systems are used for each job
- Qualified operators, technicians and trainers

Main media files formats

There are many ways to store the audio and visual information that makes up content.

An exhaustive study is almost impossible, so great is the number of obsolete and existing formats and new formats appearing every year. Shown here are a number of formats that are the most popular and most used.

Technology is becoming obsolete everyday. This part of our document is intended to evolve with time. Please, check your version of this document, make sure you have the most recent information and update as required on the Vectracom web site.

Selecting video formats

File formats become more specialised as technology improves. Some containers and some types of compression are better suited to transmission, some to production, and others to preservation. In the end, the administrator will choose one or several formats. Hence it has become increasingly clear that, archive data is preserved in at least three formats.

- ☐ A preservation format, usually of very high quality and very high resolution. It creates the biggest files.
- ☐ An intermediate format, also called mezzanine format, which uses less space and allows for immediate editing but not suited for the creation of a final element.
- ☐ A low resolution format for web browsing.

Main video formats

DPX is an ANSI / SMPTE (268M-2003) standard. It is the exchange format commonly used by laboratories in exchanging fixed images as it is very flexible in storing colorimetric information. It also offers the addition of a large quantity of often obligatory metadata, such as image resolution, colorimetric space, name of original file, date and time of creation, project title, copyright information, etc.

It records images. Several files are necessary to record and exchange sequences of pictures. This standard is broadly used for post-production by cinema industry. Pictures are often stored without encoding and without compression. This results in very large file sizes. DPX is not a container format. It does not include an audio track. Audio tracks are therefore kept in separate files.

MJPEG2000 is an ISO/IEC standard which specifies the use of JPEG2000 for image sequences. It is an open source format based on wavelets compression. The JPEG2000 compression can be lossless or not, in SD, HD, 2K, etc. It is the recommended format for digital cinema (DCI) and is currently the only standardised profile. JPEG2000 is increasingly regarded as an option, and has been adopted for national archives (US/Canada). It is also promoted by the major studios in the US (Fox, Warner bros). It is considered as a compression solution for high quality formats such as 4K and 8K.

MXF is a container or wrapper format. It supports various streams of essence including JPEG2000 and MPEG2. MXF is interesting as it has full timecode and metadata support and is supposed to be a stable standard for future professional video and audio applications.

DCP (Digital Cinema Package) is a distribution package for digital cinema. It is a collection of MXF files for audio and image plus XML files for auxiliary and indexing files. Image tracks are JPEG2000 and Audio are PCM/WAV coded.

ProRes is a proprietary format developed by Apple. There are a large number of profiles, with varying degrees of compression including lossless visual compression. All resolutions are supported, from very low to HD and 4K. Its main advantage is ease of creation and editing using the brand's tools. This explains its wide use for storage and post-production.

H264 (MPEG4 part 10 or UIT-TH 264) is a standard developed jointly by UIT and ISO/CIS. It has a wide range of applications since its numerous profiles cover the needs of both the Internet and cinema.

H265/HEVC (High Efficiency Video Coding) is the new standard intended to replace H264. It was finalised in 2013 but still not in use at the time of writing this document. In comparison with H264, the aim is to obtain the same quality while reducing the data rate by half.
Its applications concern both the compression of very high definitions (such as 4K and 8K) reducing the bit rate of SD broadcasts for television applications, VOD, as well as video on the go.

The DV, or Digital Video format, dates back to 1996. Developed by a consortium of 50 companies, including Matsushita, Philips, Sony, Thomson, Hitachi, JVC, Mitsubishi, Sanyo, Sharp, Apple and IBM, it is supported by all editing systems. It is a historical format that has been available in different DV versions, miniDV, DVCAM (Sony), Digital8 as well as Panasonic's DVCPRO25 and DVCPRO50. Recording digital elements in 4:2:0 at 625 lines and in 4:1:1 at 525 lines, it gives excellent quality rendering but is limited to certain post-production operations. Its main advantage lies in the fact that it is usable on all professional editing equipment.

MPEG2 offers a better rate of compression than DV. It is a (ISO / CIS 13818-1, 2 and 3) standard that is thus used for this aspect, particularly with different picture resolutions, in DVD and for broadcast.

Selecting audio formats

There are also several audio formats, but given that less information is transmitted compared to video, the importance of compression is reduced. Sound is thus more often recorded without compression, with good resolution and a relatively high sampling frequency.
In audio, only two formats are mentioned. One is for preservation, the other for browsing. The editing format is the one that's used for archiving. WAV/PCM is the most common format for the purposes of preservation. Hence MP3 tends nowadays to be replaced by AAC.

Main audio formats

WAV is a Microsoft and IBM standard used to store digital audio in various formats. It is now an old format allowing storage in numerous formats, such as MP3 and WMA, but in general, it is used to store sounds digitised in the PCM (pulse-code modulation) format.

PCM is used to digitally represent sampled analogue signals. This sampling technology is widely used, notably in audio compact discs, DAT tapes, mini discs, DVD and Blu-ray, as well as WAV files. Usually, this is how sound content is preserved, with a sampling frequency of 44.1 kHz (used for CDs), and 48 kHz or even 96kHz (used in studios).

FFLAC (Free Lossless Audio Codec) is widely used because it is a free, open source codec that allows lossless compression of audio signals. In comparison with WAV, it allows file sizes to be reduced by half on average, which is significant.

MP3 is the sound specification of the MPEG-1 and MPEG-2 standards. It is a compression algorithm able to drastically reduce the quantity of data necessary to restore audio. From the 2000s onwards, the majority of exchanges of musical files have been carried out using MP3, making the format ubiquitous.

WMA is a Microsoft audio compression format. Its use is widespread around the Internet, and is compatible with most portable audio playback equipment.

AAC (Advanced Audio Coding) is a standard created in 1997 to replace MP3. In terms of quality, at 128 kb/sec it is identical to MP3 at 256 kb/s. There are several AAC profiles to suit the particular needs of DTT and mobiles. It is compatible with digital rights management and is used or supported by the products and services of a variety of manufacturers such as Apple, SONY, Nokia and Nintendo.

Vectracom services

- Consulting to decide the appropriate format
- Transcoding from any format to another
- Support for all preservation file formats
- Creation of any «mezzanine» files and proxy files
- Creation of DCP packages for cinema projection
- Creation of VOD packages that meet worldwide platform requirements
- Conversion of standard NTSC <-> PAL
- Modification of aspect ratio to meet requirements (4/3 — 16/9, and others)

Media files quality control

It is a mistake to think that ‘‘digital’’ means quality.
If that were true, there would be no need for quality control.

‘‘Digital’’ does not mean quality

Control is essential in a digital environment. Reading digital content does not mean that you’ll be able to read it on other devices and it does not mean that the structure of the file is valid, neither its image nor sound are correct.

A range of tests needs to be carried out. Its cost can be higher than the total cost of the creation of the digital file itself. Therefore it is important to set the cursor at the right level.

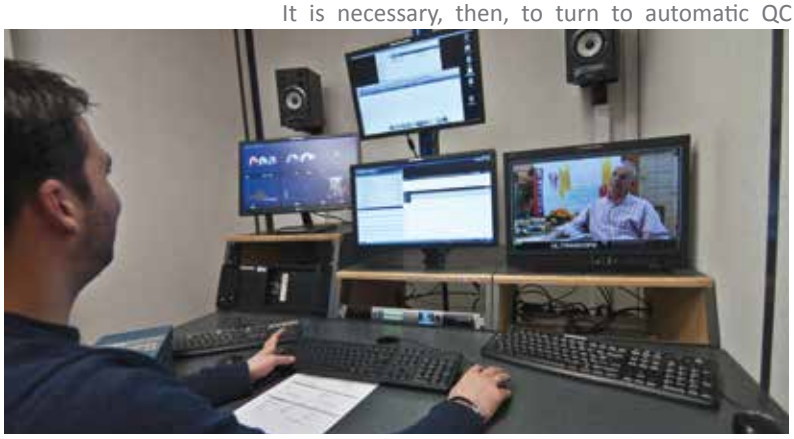
Packaging and content

Both the content and the containers need to be validated. The integrity of audio and video streams must be compared to standards and, quality must be checked. The EBU has listed around 150 tests or checks applicable to audiovisual content recorded in files. For every project, a scheme must be prepared which defines the tests to be carried out. It is a matter of identifying the rules to be respected and the degree of acceptable error each time a measure is considered.

Automatic QC and manual QC

100% of files created should be analysed. But manual control is a long, expensive and unreliable operation. There are defects that an operator would not be able to see. And an operator cannot have the same attention 100% of the time. In any case, if a file is readable, it does not make it correct and compatible with all playback equipment.

It is necessary, then, to turn to automatic QC systems. There are many on the market, each with different characteristics. In the end, for good checks, quality control must be shared between man and machine. Machines are used for what they do well, while man is used because he is irreplaceable. Finally, machine helps man but man makes the decisions.



Quality control workstation

The testing must be carried out as soon as the files are created. At that time, the expense of poor quality is at its lowest level. The later you test, the more you’ll have to redo. If you are using a bad file in a new production, it is better to realise that the file is of poor quality before starting post-production.

Automatic checks

Automatic tests systems are usually used during and after digitisation.

1) During the transfer, analogue audio and video signals are analysed in real time by specialised analysis tools. This verification allows us to be sure that proper signals are digitised. If issues arise, they are immediately interpreted by the automation system For example to stop the digitisation of black, silence or noise. All reported issues are logged for later analysis by QC operators.

2) After transfer, automatic tests systems are perfect to validate the compliance of audio and video streams settings, and of metadata in the specified file format (sampling, length, rate, size, ratio, encoding). These systems can also measure the audio and image components of contents (levels, phase, range, etc.). Generally, it is preferred to be done during the transfer level as it is simpler and more valuable. Finally, additional information about other image quality defects, such as pixelisation or drop outs can be retrieved.

Tests during the digitisation process are key to ensure the quality of transfers. Without a test, there's no chance to correctly transfer large volumes of media without issues. But tests create additional workload and cost that are not compatible with the economy of such large volumes transfers. So finally, tests must be correctly adapted to each case.

Human validation

Operators carry out the final validation. In order to do that, they must check the presence and quality of audio and video signals at the beginning of the programme, at one or several intermediate points, and at the end of file.

- ☐ Checking the beginning of the programme allows to ensure that it is not cut, and that a header or a slate is in place when required;
- ☐ Viewing the body of the programme allows the quality of audio and video signals to be checked (levels not too saturated or too low, no clogging of playback heads during transfer);
- ☐ Checking the end of the programme ensures that it has not been cut, and the lead-out is in place if required.

Results provided by automatic testing systems are very useful in helping operators to make decisions

more quickly and in full knowledge of the facts. As they know where potential issues are, they can quickly verify the matters and decide about what should be done.

When mass digitisation is concerned, all the files are not supposed to be 100% perfect. Depending the destination of the content and its value, the acceptable quality level varies. A NEWS content with no evident value will not be qualified with the same attention than a feature film that needs to be broadcasted the next day.

For each project, it is important to define the parameters characterising the standard of quality required. This is a task that's not easy to do. Here again, you have to be an expert to translate the requirements into measures and acceptable level and to balance between the requirement for high quality and the need for low cost.

Quality control workstation

QC results are metadata

All QC information is useful metadata that need to be saved. It includes the results of automatic tests and the notes and decisions of QC experts.

Better QC with two operators

QC is not an easy task. It requires a lot of attention. As a consequence, it is difficult to do the job well during hours. So there are some rules to follow. Operators in charge of QC should do other tasks. It is impossible to do good QC a day long. The same way, when an operator controls a file, he shouldn't have been involved in the creation of that file. A double-check limits the risk of error.

Vectracom services

Vectracom analyses and validates :

- ✔ All files produced by its transfer channels
- ✔ All files entering its treatment channels

In-house QC software designed for specific needs

- ✔ Validation of large quantities of files
- ✔ Use of results from tests performed by the most common systems on the market (Baton, Cerify, Aurora)
- ✔ Shows results of automatic tests to operators

Quality control information is logged by Vectracom workflow manager and compiled to be forwarded to media asset management systems.

Digital storage

Playback of audiovisual content requires a player. Historic devices, like projectors and VCRs are rapidly disappearing along with their media. But don't think that these problems belong to the past, and that they are behind us. It is not the case. It is still impossible to store an audiovisual medium and forget it.

Preservation of audiovisual content requires an active management strategy of stores and players. The challenge consists in always having a copy of content that's legible, usable and can be copied. Digital technology allows information to be copied an infinite number of times without any loss of quality or deterioration. So, by implementing a certain number of techniques, it can be safely preserved for ages.

Be careful as these techniques request expenses that should not be underestimated. Cutting cost generates risks that need to be carefully assessed.

Archive Storage by FGC in Saudi Arabia

Magnetic discs

It is today the easiest and the cheapest way to preserve small volumes of audiovisual content. But media are not safe in such hard disk drives. Several copies need to be kept in several different places. Also, a list of the content of each disc needs to be managed.

To improve security, discs must be organised in clusters (RAID). But here again, several copies need to be done on several systems.

Desktop Hard Drives

Magnetic cartridges

Magnetic tape offers the most efficient method of low cost storage and transport for large volumes of digital information. You can trust the magnetic tapes technology. It has proven its reliability for years since the 70's. The LTO (Linear Tape Open) cartridge is the most widely used. Its capacity grows as technology progresses and there's a roadmap ensuring that this format will still be maintained for some time.

In 2013, LTO6 could store the equivalent of 200 one-hour DVCAM tapes. By 2019, the storage capacity of the projected LTO8 cartridge will be the equivalent of 1000 DVCAM tapes.

LTOs are safe and quite cheap but their management is difficult. A special LTO drive is requested and a list of the content of each tape needs to be managed.

LTO cartridge

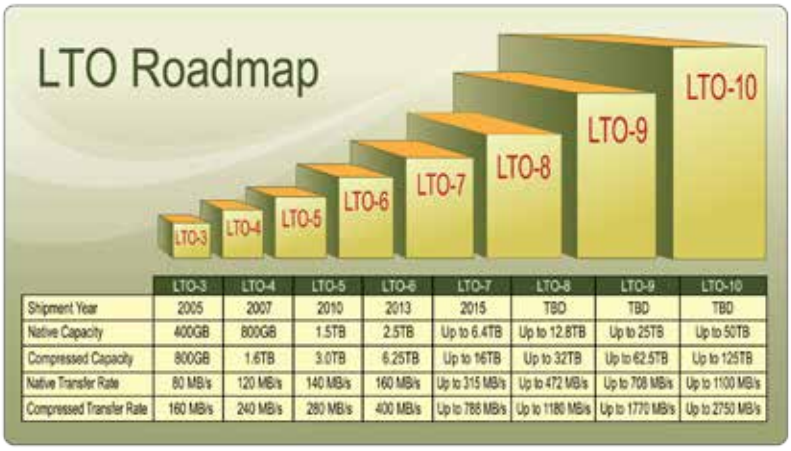
Computer systems

When a large quantity of data needs to be saved, computer systems are required for preservation and distribution. And the costs are not limited to hard and soft. Systems need to be maintained and managed. This is the cost of preserving and maximising the potential of audiovisual heritage.

Clouds

Clouds are large computer systems that are installed in secure data centers. This technology has a lot of advantages. Content owners don't have any more to take care of the complex technology that needs to be managed. They have no capital investment, just an operating expense. There are now many providers for such services, but most of the time, they only store data and don't consider the audiovisual nature of the content.

It is better to choose a provider considering the nature of audiovisual content and providing additional services to ingest, index, convert, migrate and deliver your content according to your needs. In addition, such provider will give you access to a managed catalogue of your assets.



	LTO-3	LTO-4	LTO-5	LTO-6	LTO-7	LTO-8	LTO-9	LTO-10
Shipment Year	2005	2007	2010	2013	2015	TBD	TBD	TBD
Native Capacity	400GB	800GB	1.5TB	2.5TB	Up to 6.4TB	Up to 12.8TB	Up to 25TB	Up to 50TB
Compressed Capacity	800GB	1.6TB	3.0TB	6.25TB	Up to 16TB	Up to 32TB	Up to 62.5TB	Up to 125TB
Native Transfer Rate	80 MB/s	120 MB/s	140 MB/s	160 MB/s	Up to 315 MB/s	Up to 472 MB/s	Up to 708 MB/s	Up to 1100 MB/s
Compressed Transfer Rate	160 MB/s	240 MB/s	280 MB/s	400 MB/s	Up to 788 MB/s	Up to 1180 MB/s	Up to 1770 MB/s	Up to 2750 MB/s

LTO roadmap

Drafting preservation projects

First, you need to draw up an inventory. Make it as detailed as possible.

Knowing your audiovisual heritage

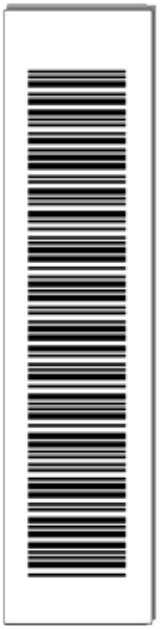
Without a clear inventory, you'll have too many assumptions and it will be impossible to build an accurate plan. All the content, and anything to do with it, must be gathered together. Anything may be useful. Devote as much time as possible to this task. Every minute spent here will save you at least an hour in subsequent stages of the operation.

Specify requirements

Once you know exactly what you have, it is easier to imagine potential uses and estimate or define the value of your heritage. Quite often, content is required in a digital form and digitisation is a necessity.

Research budget

At this stage, researching the digitisation budget becomes a priority. You will need to identify organisations that are able to finance the project and get them interested by showing them its value. You will need patience and help.
Do not embark upon this adventure alone or your chances of success will be slim. Check out what other people have done and how they found financing. There is a lot to learn from others.



Inventory in progress for a 2 inch tapes archive

Estimate resources, costs & delays

We have come to realise that owners of audiovisual content overestimate the expense of digitising their media. It is best to ask for the help of a specialist to estimate the resources required and have evaluations validated by a second opinion. Digitisation of heritage demands the application of little-known, specialised techniques. Reading this document will help you but you should realise that expert assessment is necessary to achieve accurate cost estimation.
Digitisation of audiovisual heritage can be considered as a job for artisans. At the same time, repetitive tasks are required. And in that sense it does have an industrial aspect.

Do it yourself or outsource

It is unlikely that, within your operation, you have all the skills necessary to complete your project. Anyway, the skilled people you do have are supposed to perform other tasks. Thus you will look outside and raise the benefits of outsourcing. Sometimes, colleagues will tell you that they can do job easily and quickly. Hear them out and make comparisons. Compare everything. Expertise in the preservation of audiovisual heritage cannot be improvised. To extract the best signals from old media, special techniques are required and the learning curve is a long one. At Vectracom, we have often been asked to step in to redo what had already been done by inexperienced staff who had promised to work quickly and efficiently but ended up delivering a botched job that exceeded the initial budget.
A carefully selected specialist company will supply guarantees with regard to the budget, deadlines and quality you require as it will succeed in doing the job on time and on budget.

On-site work

It is simpler for your service provider to work in his own premises where all the required equipment is based. But for you, transporting your heritage might be difficult or even unthinkable. A compromise will then have to be found, and your service provider asked to intervene, either on your premises or somewhere nearby.

When the budget is allocated, the second critical phase of the project begins. It is time to launch the digitisation phase. At that point, your main obsession should be to preserve your heritage with the best possible quality. Respect of budget and planning are also obviously expected. To guarantee all these critical requirements, you'll need to contract with a service provider that you can trust. Be careful. Believe in people rather than companies. Avoid newcomers, ask about references and verify.

At this point, your main focus should be to preserve your audiovisual heritage with the best possible quality.

Defining procedures to be undertaken

Defining processes is the first concrete step in the process of going tapeless. Seeing your service provider carrying out these tasks will make you appreciate his value to your project.

Everything needs to be defined: processes, procedures, tasks, workstations, skill sets of operators, recruitment, training and maintenance planning, production and testing schedules, delivery, etc.

Recruiting, training and managing teams

A large number of tasks has to be carried out, and every task is important. The recruitment of skilled personnel is an important step, but staff may need training, and this is, of course, a critical operation. Experience means hiring the right people. You do not always need to recruit skilled technicians. More often you need staff who are careful, attentive and passionate.

After recruitment, training is necessary. It isn't a case of dispensing technical knowledge as would a school, rather how to handle audiovisual heritage. Every new employee is trained to operate on archive data workflow according to his or her personal aptitudes.

After that, managing the personnel is another task which should generally be left to the service provider, in order to avoid the worries that the appointment of temporary employees in your organisation might bring.

System verification before shipment

Designing a production system

Real systems for dematerialising audiovisual heritage are special set-up made up from equipment not easily available on the business to business market.

The playback equipment has not existed for a long time. The same is true for the preparatory machines. As for digitisation chains, those found on the market are only appropriate for the digitisation of new programs. They are unsuitable for the treatment of old media.

Of course you will have chosen your partner because he has all the necessary equipment, and you are quite right, because without the right equipment, the required work can only be partially accomplished, with a reduced quality output.

Availability of the right tools is a minimal condition for ensuring secure digitisation projects.

Managing production

It may seem simple but here again, real skill sets are required to manage production, oversee operators and guarantee, within an agreed budget, the quality of the final files. After training, the staff knows how to operate equipment, but they lack experience. In the best-case scenario, they ask questions constantly. In this way their expert advisers are on hand throughout the project to help them and guarantee quality and productivity.

Playback equipment is a sensitive issue for any preservation project. Mostly these are old machines requiring proper maintenance.

Technicians trained in maintaining and repairing these machines are required, and are thin on the ground. When selecting your providing, be sure there's enough security at that point.
To successfully complete all these tasks with a minimum of risk, a team of specialists to manage production and oversee operations is needed. Opt for the service provider who appears to have the greatest experience. He will be your best partner.

Trust but check all

When production is running, you will have to monitor the work to ensure that the promises made to you are kept. Appoint a project leader and call regular progress meetings. Insist on being given regular updates. Make your presence felt with your service provider. Make sure a suitable tool is in place for managing and assessing the quality of the processes underway. This will help your service provider, and you will be helping yourself. To reach the ends, one must have the means.
Each media delivered by your service provider will be controlled. And it is better twice. Then, you should have your own quality check. It is the last time you have a chance to verify that you have the delivery you expect and you pay for.

Control desk of running processes

Vectracom services

- 24 years of experience **ISO 9001 certification**
- A range of experts for all types of media: discs, magnetic tapes and film
- Advices with binding estimates
- Cataloguing of media, transfers and indexing of content on archive sites
- Use of mobile systems for on-site operations
- Mobile teams made up of experts and operations managers
- Recruitment of local manpower for digitisation and indexing operations
- Supervision of operations by experts to guarantee productivity and quality
- Quality control and validation of all media files
- Delivery of files directly within the digital storage
- Formatting of metadata for MAM
- Regular progress reports during operations

Planning

ISO 9001 certification

Use case 1 : Film preservation for CyBC

By the end of 2013, the Cyprus Broadcast Corporation contracted with Vectracom for the digitisation of part if their historical audiovisual archives. The project mainly included 1800 16mm films for 200 hours (most of them Black & White) and 50% mute. For 30% of them, audio was on a second tape (SEPMAG). Also, some audio heritage was concerned with a limited quantity of ¼ inch tapes and LP discs.

All films have been manually restored. Perforations and breaks were mended. Old adhesive have been replaced when required and adhesive waste has been eliminated during manual cleaning to prepare digitisation process. Finally, all reels were stored in new ventilated cans.

Ultrasonic cleaning was performed before scanning on Spirit 2K Telecine synchronised with a magnetic tape reader. AV sequences are stored in DPX sequences while audio is on wave files (24bits/96KHz).

Color grading and restoration took place just after the transfer, mainly on NUCODA to finalise the preservation versions of the AV heritage. The idea was to clean enough the media to provide versions that could be used in NEWS broadcasting so main scratches were eliminated without alteration of the initial content.

HD versions for daily use at CyBC were created in AVC Intra (100Mb/s) directly by the restoration systems. Also, H264 browsing versions were created from the exploitation versions using Promedia Carbon transcoding technology and posted on Vectracom server/site for CyBC to have a permanent view of the on-going processes and for them to apply a first level of acceptance test.

After quality control of all files, preservation and exploitation versions were delivered on LTO cartridges in scheduled deliveries together with reporting spreadsheets.

The complete project was finalised in about 8 months. Logistic and custom clearance issues were managed by Vectracom. Airfreight was mainly concerned.

Use case 2 : Preservation of french overseas AV heritage

A project for the preservation of French overseas has been initiated by the French Senate. They designated INA to supervise the operations and they launched 2 European appeals for tenders by 2012. One was for the contents located at the head-quarter in Malakoff, near Paris and one for the contents located in the French overseas territories. Vectracom was awarded for both contracts.

To manage the content in the overseas territories, Vectracom created a system made of 16 ingest channels. Each channel can manage Betacam or DVC pro. The system was built in fly cases small enough for transportation in small planes as required in some areas. It has been designed by vectracom engineering team that's also in charge of the set-up at every location.

Operations started in 2012 with content of St Pierre et Miquelon before managing content in Martinique and New Caledonia. At each location, local operators are hired and trained by our permanent project leaders who stay with the system from the beginning. During the six years of the project, the system will go through the 9 French Overseas territories. At the end a total, of 140 000 hours of programmes will be digitised. Created files are provided to the local stations of the broadcaster "France Outremer" providing the original contents. As they are in charge of the contents preservation, INA receives also a copy of every file on LTO cartridges.

The tapes are repaired, cleaned and baked as required as storage conditions have not always been optimum in the overseas territories which are hot and humid.

Use case 3 : Preservation of audio heritage for RTS

At RTS (Radio Television Suisse), keeping their valuable heritage is a key point. A service was created to manage the transition from tapes/cassettes to files for the archives of the company. It was done on several phases over the last 10 years and Vectracom took part in some of them. The last that RTS takes care of is an audio archive of about 80 000 hours that are recorded on classic open reel ¼ inch. After consultation of a number of companies, RTS requested offers and finally selected Vectracom to do the job. It is supposed to be a 4 years project but this time frame may vary with volume and budgets.

Vectracom installed a 8 ATRs system for parallel ingest with a Quadriga automation system from Cube-Tec to supplement the existing similar platform equipped with NOA automation system that Vectracom has been using for 5 years now.

Vectracom pick-up tapes at RTS in Lausanne every quarter or so and bring them in Paris at the main office of Vectracom. The tapes are delivered back in Lausanne at the same frequency. Final files are delivered on HDD on a regular basis roughly every month and they will be ingested in the MAM at RTS by RTS engineers. The delivery is done on BWF files with headers including a set of metadata describing the content and its container. Before the digitisation, the tapes are cleaned and some tapes will receive a special treatment as required. Tapes with vinegar syndrome and tapes with moistures are part of that.

New with this project, Vectracom will give access to RTS representatives to the measures that are done on a regular basis on the ingest channels/ATRs that are used for the project. That way, Vectracom guarantee to RTS the quality of its digitisation channels.

As usual, as we digitise the tapes that may be used for the last time, we also scan their boxes and any paper or tape sheet that may be included in their boxes. Delivered files are pdf/A.

Use case 4 : Multiformat high end digitisation

From 1970, all Montreux Jazz festivals have been recorded with the best possible quality. To avoid losing this invaluable heritage, the Montreux Jazz festival foundation worked with EPFL (Ecole Polytechnique fédérale de Lausanne) and together, they decided contracting with Vectracom to digitise their media with the best possible quality.

Today, the total archive has been digitised and a selection of content can be purchased on CDs/DVDs and seen at the Montreux Jazz Cafés that exist in many places including Montreux, Geneva, Abu Dhabi, Paris, London and Zurich.

At Vectracom, the mission started in 2009. To have the best possible quality, each digitisation was treated separately. The Montreux Jazz foundation and EPFL engineers invested a lot of time to qualify each process, each equipment used by Vectracom and finally to verify each delivery. We can affirm today that this project has been the most interesting and the most demanding ever.

All digitisations were done without any compression and files were delivered on LTO cartridges as they were huge. To finalise the job, Vectracom had to put in place new systems to digitise or transfer original audio multi-tracks from original recording of prestigious people like “The Stones”, “Deep Purple”, “Ray Charles”, etc.

The completion of the preservation of the collections of the Montreux Jazz festival is now under finalisation with currently the digitisation of some VCR cassettes (the consumer format that was in used in the 70’s, before VHS).

Main formats digitised from 2009 to 2015:

- 2 Inch (#500 hrs)
- 1 Inch (#700 hrs)
- U-Matic & BVU (#800 hrs)
- Betacam (>1000 hrs)
- D2 and D5 (>700 hrs)
- 1 Inch HD Sony & HDCAM (>1300 hrs)
- Audio 1/4 & 1 Inch 24 tracks (#14000 hrs)
- VCRs (200 cassettes)

Valorisation of Audiovisual Heritage

Depending on your organisation, valorisation may have various meanings but usually, you'll expect the largest possible use and spreading of your content.

Value of audiovisual heritage

A basic definition of the value could be the potential that resides in the audiovisual content. Such a definition helps to start but the value is somewhat difficult to evaluate for audiovisual archives.

It is a complex mix between their monetisation that can be made immediately and in the future, other attached services and products that they can help selling, other advantages like visibility or notoriety that content can bring or improve and also the impact that each asset has on the life of people.

Uses of audiovisual heritage

Let's think about it. An audiovisual heritage will not be used the same way by a museum, a national archive, a town hall, a newspaper or a TV broadcaster. And the way that each of these organisations may estimate the value differ. There are a large number of uses for audiovisual archives and each organisation will have several.

Some archives would expect to spread their assets as much as they can simply to favor their use and reuse and stimulate people and their creativity. Some others like local, regional or national archives could expect to increase their visibility and attract more visitors. Some others will just keep their archives for their use and reuse in news bulletins when others will offer them for reuse in exchange of a fee.

A categorisation of all these cases would be welcome with a formalisation of how to measure the values of such assets and how to capture it.

Provide access

In all cases, the goal is to maximise the use of audiovisual archives. There are quite often issues with copyrights and they must be addressed but globally, the content must be able to be accessible by the larger possible audience.

To do so, IT technology is the first enabler allowing to better and faster reach your goals. Without a correct IT infrastructure, maximisation of use is a utopia. But IT is not enough. You need more. You need good metadata.

If content is king, metadata is key. It provides information allowing to search and find media and navigate through content and around.

Depending your goals and the future uses expected for your content, the metadata that's the description of your content may be different and more or less detailed. A broadcaster does not index its NEWS assets the same way it catalogues its featured films. A national archive will also work a different way for the assets they collect. In fact, it depends on what is required. But it would be nice to have all these entities collecting a minimum of information about the content including the classical, when, where, who but also how, why and more.

All content owners want their content to be reachable on multiple devices

Content is king, metadata is key.

Easy exchange of metadata between systems is the goal and more standards together with their good adoption is still expected to reach the Holy Grail. Nevertheless, no doubt that it will happen in the next 10 years. Technologies like Semantic web or web 3.0 are full of promises.

Engage people

When your content is widely accessible, you have done a good part of the valorisation job but it is still not enough. As you are competing with a lot of other content providers, you need to market your content, just like any other product. You need to attract attention, arouse interest and convince. It is marketing and communication and it has to be done properly, exactly as it is done for any other product or service. You need to understand who are your customers, what they are looking for and you need to adapt your offer to make it more attractive. Of course, you need to deliver and for that, you need to have the right logistic platform. In fact, it is exactly like any other business with marketing, sales, communication, production and logistics.

And this is true even if you are not in the commercial domain. If you are an administration and work with public money, you have also your goals and objectives. You have to maximise the use and the transmission of the content you collect and have in charge to your community or to the general public.

It is quite obvious that archivists who take care of preservation are not really prepared to market their treasures. This is expected to be done by other types of people more skilled for marketing, communication and sales. But the role of new archivist goes probably beyond what they have done so far.

Copyrights

Any use relies on access to the media. While maximising potential involves facilitating access, there is a duty to ensure appropriate security of access, for users, owners and rights holders.

This is usually where things become complicated, because while technological advances have solved the problems of how to disseminate audiovisual content, legislators have not really simplified rights management. Depending on the country and type of content, things change enormously. You need to have in mind that having a digital copy of audiovisual content does not give you the right to use it, much less to sell it. Rights must be acquired, and current legislation makes this a necessary step. It is the duty of every professional involved in the audiovisual industry to respect copyright and ensure copyright is respected in the fight against audiovisual piracy.

Valorisation of audiovisual heritage

New issues to solve

Archivists have been educated to respect and protect all kinds of heritages. They are generally skilled in that regard and in any organisation they are respected for what they do. This is the preservation side of archives. The digital technology brought a lot to preserve and to catalogue assets. And today, this side of the archives seems to be well understood and managed. People have been able to organise all the tasks required by the preservation process. There are specialists, consultants, and service companies that you can call for help.

“ If you think you are too small to make a difference, try sleeping with a mosquito. ”
Dalai Lama

The valorisation side of archives however is not at the same level of understanding. And today, it is not well optimised. As a result, content disappears. If a content is not used, its preservation doesn’t make sense. Preservation and valorisation are the 2 sides of the archives and they both need to be managed properly. And it is quite clear that there are less skilled people and less school or service companies that you can call for help. But in fact, the domain is different. It is all about marketing and communication and obviously, there are schools and experts of this domain but nothing that’s really specialised in audiovisual media and archives.

You can be sure that the domain is going to evolve a lot during the next years. New technology allows the transformation of the dream into reality. Of course, digital technology is not going to do everything, and people, methods and schools are required to learn and better manage the valorisation side of the coin but with the digital enabler that’s the digital technology, the dream is going to become reality.

Remarkable progress

When we speak about IT technology progress, we include inside a lot of things like larger bandwidths, inexpensive storage, powerful search engines, recognition software, semantic web and others.

In the past, any transmission of audiovisual media was controlled by network access providers. Today, internet and OTT technology allow streaming any media from anyone to everyone without having to pay a special fee for the transport.

Also, on the legal side, there’s some progress. Creative commons licenses allow media to be spread faster in a legal framework.

On top of that, it is easier today to collect the stories with the media to enrich them because a lot is done automatically at capture.

Need for a strategy

Whatever your size and your position are, you probably think that you are small and alone compared to major companies providing already a lot of audiovisual media on the web. You are right. But, ‘‘if you think you are too small to make a difference, try sleeping with a mosquito’’ (proverb from Dalai Lama). In fact, what you need is to develop a strategy. And you need to put it into action. If you know what you are looking for, you’ll be able to identify experts and service companies to help along your approach. ‘‘ Your idea may seem to be utopia at the beginning but it will be transformed into reality if it is a great one» (adaptation from a quote from Richard N. Coudenhove-Kalergi about Europe).

New curriculum

To have the valorisation done properly, you’ll need to create new roles and to imagine what kind of curriculum best fits with you requirement and find the corresponding persons. Archivists and Marketing people are good candidates as they already have a large set of required skills. The careers of some may fit perfectly with what you want.

Choosing a MAM

Essential and fundamental

While not all collections require the same treatment, they all deserve to be managed. Without any management, exploitation is impossible.

A collection of audiovisual data consists of content called assets. Managing such collections requires a computer solution known as MAM (Media Asset Management). It is extremely difficult to maximise the potential of archive data and extract commercial value from it without using MAM.

Choice of MAM

Choosing a MAM is difficult, given the wide and varied range of products on offer. To make the right choice, goals, objectives and requirements must be carefully assessed. It is easy to miscalculate what will be needed at the outset.

People often turn to professional systems with high global costs. It is therefore appropriate to show restraint and be inventive. The budget usually depends on the value of content, which itself depends on how interesting and rare it is.

Your MAM will probably need additional features above and beyond the traditional basics.

Vectracom platform «browsing» GUI

Basics of MAM

- Acquisition
- Indexing
- Consultation
- Visualisation
- Management
- Delivery

Basic MAM features

- Ingestion
- Indexing
- Search
- Browsing
- Curation
- Dissemination

It will need to connect with your other systems to supports the processes that are required by the new dematerialised digital economy. Efficient management of workflows is key in the delivery of the content in an expanding range of formats.

MAM as a service

You must consider not only the cost of software but also the cost of equipment and maintenance. And of course, you need staff capable of supporting the system you opt for. All of this is very expensive. But there is an alternative.

Rather than buying your MAM, you can enjoy this type of product as a service. Outsourcing MAM goes hand in hand with outsourcing the preservation of your audiovisual archives. Unless you work in the audiovisual industry and can manage your archive by yourself, it would a preferable choice to outsource. And, even if your business is about content production or distribution, preservation requires investments you may want to avoid.

CAPEX or OPEX

Technology gives you a choice. You can invest (CAPEX) or outsource (OPEX) the technical management of your audiovisual heritage and have only to pay a regular fee.

In the modern economy, companies focus on whatever produces value. Unless the preservation of archive data is your key business, you are better off outsourcing.

Only secret and confidential archive data warrants internal management.

Vectracom services

- Storage platform with integrated MAM
- Secure access with no need to buy or install equipment
- OPEX exclusively for the owner
- No charge for media transfers
- Remote indexing
- Delivery of any package to any type of organisation
- Secure storage for the price of a rental
- Advice on the choice of MAM, should you opt for a service outside of Vectracom offers
- Possibility to add any number of users

Metadata collection

Without metadata, an audiovisual content has less value as it is difficult to find and use it.

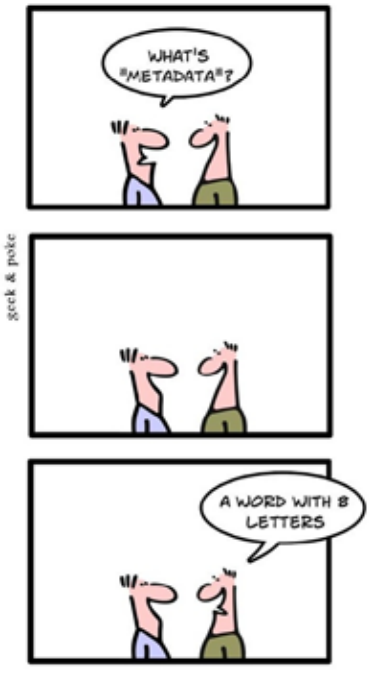
The full value of audiovisual assets is only achieved thanks to the mastering of metadata.

What is metadata

In the audiovisual domain, metadata is information relating to audiovisual content. There are several sorts of metadata:

Technical metadata describes the technical part of contents and their containers. It is a lot of information to collect and it may be very complex to do. From video and audio components to the duration of contents, a lot of values are required. And when a content is transferred from one carrier/container to another one, it is recommended to log transfer metadata. They include all information describing the initial carrier/container and the way the transfer is carried-out.

Editorial metadata describes the content. A title is the minimum required but a large volume of descriptive information is welcome. It may include abstracts, scripts, dialogues, the list of people involved in their genesis and more. Additional links to other documents like “making of” may also be part of the metadata. The more you have, the best it will be to use, value and monetize the content.



Simply explained metadata

Metadata collection

The creation of comprehensive metadata sets must be part of any audiovisual collection preservation project.

1) All information in the existing management system(s) must be extracted, and analysed. There is always at least one database and usually, you’ll find that there are several database available taking care of the same contents. They may be old proprietary databases (i.e. D-Base, FileMaker, Access,). They may be commercial tools. They may also be simple books or collections of cards.

2) Employees knowing things that are not recorded or registered must be identified. Such things are of interest and they will need to be captured at some moment.

3) All possible information should be captured during digitisation.
   a. Information about the type and the status of the initial carrier are captured first.
   b. Treatments of tapes are logged.
   c. Operations are tracked and time stamped together with references of the people and equipment involved by operations.
   d. During content ingest, audio and video signals are analysed to check that the transfer is done properly. Issues are logged. They are valuable technical metadata registered for later use at the quality control level and during the restoration phase.
4) Stickers on tapes and boxes as well as cut sheets, programs sheets and any other papers are scanned. The goal is to not lose any information as we transfer the content from the analogue to the digital world.

Metadata consolidation

In order to be able to properly valorise the contents, a clean and reliable data base is first required. To build it, all retrieved metadata is gathered, aggregated and cleaned. This is not an easy task and it may be very complex.

1) A database must be set with proper structure to ingest and use all available information
2) All metadata must be imported in the new repository.
3) Then, the fields of the database must be cleaned. At this point, each non controlled field should be turned into a controlled field in which the same information is always shown the same way. We should have only one way to write the dates, the locations and the name of people and objects.
4) Veracity of data should also be checked-out. Durations and dates are part of data that are quite easy to verify.

Metadata enhancement

Depending the use of contents, the granularity of required metadata may be different. But in all cases, more metadata is always welcome.

Such information can be found in external databases like TV guides or catalogues available on the web. But most of this information resides in the content itself and it just has to be extracted.

Generally, it is good to have profusion of metadata as search engines use such information to characterise and also to value your assets.

Until recently, extraction of metadata from contents was a completely manual task. New technologies have changed the game by automating a number of metadata creation tasks and also by limiting the need for accurate research.

To enrich the metadata, the programs are sometimes segmented. This is an obligation when NEWS are concerned as subjects must be separated. Also, dialogs are extracted and keywords are created as well as abstracts.

Documentation evolution

Before our digital era, contents were recorded on magnetic tapes, not on files. Browsing content required a lot of energy. The master tape had to be removed from storage. A browsing copy was created and sent to the requester who had to play it on a special device (ATR, VTR, VCR). Obviously, it was a long and expensive process.

Today, any content can be browsed immediately wherever it is in the world if it is available online.

Thanks to this huge improvement, searches don't need to be precise and reliable as it was in the past. More content can be browsed as it is easy, quick and cheap. As a consequence, indexing can be less precise than it was required to be in the past.

Metadata are delivered according to standards and customer's requests

Vectracom services

- Capture of metadata from legacy management systems
- Scan and OCR of papers attached to media
- Delivery of all technical metadata
- Metadata enhancement
- Speech To Text
- Parrot transcription
- Assisted segmentation
- Manual indexing

Use of "Speech to Text"

Speech to Text (STT) technology has improved a lot during the last decade. It is now possible to take advantage of it to create usable metadata.

If you use it to recognise dialogs on a movie, the result will certainly be below your expectations. But it will be good if you work on NEWS programs as the vocabulary and the diction are better controlled. In all cases, results can be good enough to automatically generate keywords. STT systems do a good job. Semantic analysis does a better job. They can also produce amazing abstracts when the recognition rate of the STT is high.

To have a high recognition rate, the parrot method is classically used. A trained operator just repeats what needs to be recognised. The 99% rate that's reached is enough feed a semantic analysis system and get relevant keywords and abstracts.

Better recognition rate thanks to parrots

Other recognition tools

Other advanced tools like face, logo, voice and Optical Characters Recognition (OCR) starts to be good enough to be used in some particular cases.

Embedded metadata

Metadata sets are housed by asset management systems in charge of audiovisual contents. Issues arrive when content is transferred as minimum set metadata may not be transferred together with the content. To avoid that, wrappers like MXF have been created to include the audiovisual content and a minimum set of metadata. Transferring an MXF file, audiovisual content and its related metadata are transferred simultaneously.

Digital restoration of content

Color grading on Nucoda workstation

Color grading

The colours of scanned content are usually not the original colours as film stock ages. If an old film copy has to be used for broadcast in a modern environment, its colorimetry must be adjusted. This operation can either be carried out at the moment of transfer or at a later date. Technology is evolving and post treatment is more and more favoured as the required equipment is increasingly rapid and attractively priced. The fact remains that the scanner or telecine must be correctly set for transfer to maximise recovery of dynamics in both image and sound.

Restoration of moving images

Images deteriorate with time. The apparent artifacts vary according to the original medium. In the case of film, the problem is vertical scratches, various traces of glue, dust and cracks. In the case of magnetic recordings, the issue is horizontal dropouts, problems linked to brightness levels and colorimetry. Restoring an image involves removing the defects accumulated over time. Once the content is available in digital form, restoration is carried out with the aid of digital tools. Take care, though to keep a copy of the digital content in its original state, prior to any restoration work. Restoration changes the original copy and in a sense degrades it. It would be a shame to lose an original version that could be better restored in near future.

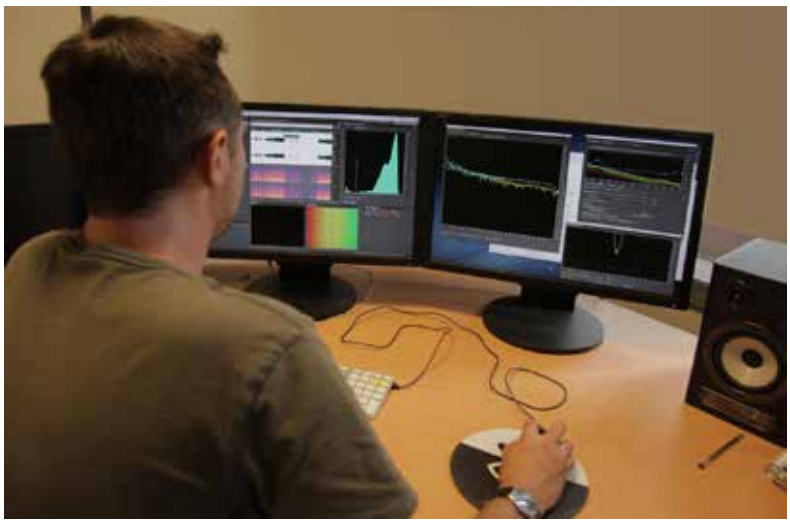
Restoration is always carried out with a definite purpose, most often to create a master which will be used for a TV broadcast, the creation of a DVD or Blu-Ray, VOD, etc. Restoration is not usually carried out for the purposes of archive work. Files are archived in their original state.

Restoration of image is computationally demanding and takes time. To speed the process up and obtain remarkable results at a very attractive cost, restoration can also be carried out in real time with special electronic processors in the case of SD and HD.

Restoration of sound

Audio restoration is a delicate process. While equipment is available that allows work to be carried out quickly, and will legitimately improve old recordings, it is difficult to quantify the work required to clean up sound.

Software is traditionally used to eliminate pops, clicks, crackling, buzzing and hiss.



Sound restoration for video programs

Vectracom services

- Digital colour grading on DigitalVision “Nucoda” or Black Magic Design “Resolve” equipment
- Digital Restoration of images using Nucoda or DaVinci “Revival”
- Real time image restoration with Snell “ArchAngel” HD
- Sound restoration using Protools systems with Sonnox plug-in

Accessibility enhancement for content

The goal here is to improve access to content for people in a different language or people with disabilities.

Subtitles

Subtitling (closed captioning) allows the deaf and hard of hearing to follow and understand audiovisual broadcasts, notably films. Originally used in the cinema, the technology was then adopted by television and is now used for all types of programming, such as series, documentaries, and news. It now applies to all broadcast media, such as the internet and DVD.

It can be a simple transcription of dialogue, with some adaptation to make it more legible, or a translation. Subtitles are often produced from recorded programs but live subtitling is becoming more and more prevalent, forced along by the need for information to be transmitted correctly.

Subtitles are perfect for better indexing.

They are used advantageously by the web 3.0 search engines.

Voice Over

This is used to regionalise audiovisual content and use it in countries where the main language is different from the original one. In practice, it is for documentaries all over the world. The original sound is mixed down and one or several voices are added to describe the scenes or to translate text actors. It comes in place the lip synchronisation that's a more complex and expensive technique.

Audio description

This is a technology that makes video content available to the blind and visually impaired thanks to a voice-over describing the visual elements of content. The descriptive voice, placed between dialogue or sound elements, does not harm the original work. It is usually broadcast on specific audio channels and used on headphones so as not to bother other viewers.

Sign Language

A sign language is a language using hand shapes as well as movements of hands, arms and body together with facial expressions to communicate. This is used most of time to translate what speakers say. Sign languages are local languages. Hundreds of sign languages are in use around the world and are at the cores of local deaf cultures. The sign specialist appears on a small part of the screen. This is used for some documentaries but also in live situations.

Auditorium for voice-over and audio description

Vectracom services

- Subtitling, transcription and translation, services
- Production of subtitles and standardised subtitle media
- Audio description services, from narration through to delivery of media
- Voice-over
- French sign language

Operations on a closed captioning workstation

Commercial uses of heritage content

Content can be used in its original form, usually after some cleaning up and reformatting, or in new content productions.

TV broadcasts

For TV purposes, materials must comply with the requirements of the broadcaster. On one hand, good quality sound and picture is required, on the other hand, the broadcaster needs a formatted version of the programme in the right format.

Broadcasting an old film with a scratched and blotchy picture is unthinkable nowadays. Every broadcaster has their own criteria and they will refuse any programme they regard as unsuitable either for editorial reasons, or because it fails to meet technical specifications or because the quality of picture and sound do not comply with required or wished-for standards.

VOD

With VOD, entertainment programmes are offered for viewing on demand, in general on home television sets. This is a booming market because media can now be viewed on portable equipment such as tablets or smartphones, as well as on very high definition TV sets.

Content is available anywhere and anytime

The term «cinema on demand» is now often used as the pictures offered have resolutions that are equal - if not superior - to those used in cinemas. Different viewing terminals require different formats. Indeed, increasingly large numbers of AV files are being hosted on VOD platforms.

They are also becoming more and more complex, being veritable packages including the programme together with trailers, multilingual versions, subtitles, publicity posters, digital rights, and other information relevant to the transmission. With every platform having its own formats and quality requirements, the manufacture of packages has become a business in itself.

Legacy content is used for entertaiment

Internet sites of companies, associations and institutions

All businesses tend to have audiovisual content on their internet site to improve communications and to better convey their message to prospective buyers, customers and the general public. Although not really archives as such, that's what these images are rapidly becoming, and they need to be managed.

Likewise, organisations such as territorial institutions and associations have an audiovisual heritage and they would like their fellow countrymen, followers or even the general public to be able to benefit from their media. Such media, then, must be organised into collections and formatted with all the relevant information so that they can be found, viewed and their potential maximised.

Technological evolution has led to better quality and greater reactivity. But the media must be updated regularly so that it appears in its best form. It is the price to pay in order to remain attractive and generate interest, website hits, followers and clients.

Use of archives in NEWS

Archives are increasingly used in the televised news. They allow journalists words to be documented, and often act as justification in political explanations. It is estimated that 30% of images used by broadcasters for their news bulletins are coming from archives, but in general, they use quite recent footage, not old ones. Nevertheless, no valuable newscast can exist without archives. As a consequence, the sale of archive material to broadcasters editorial staff is becoming a real lucrative activity. It is an increasing business as a lot of NEWS broadcasters are new and they don't have their own archive. But the problem is to bring footage to these potential users. To do so, images need to be online such a way that they can be easily found and purchased by journalists.

Nowadays, you need to get closer to large archive sites and to market properly your assets to have a chance to sell them. communicate with potential customers to have a chance to sell them. But technology evolves and in the near future, Semantic Web 3.0 will allow internet users to more easily find archive images.

The semantic will be able to better understand what you propose and to connect your footage if it has value. But this is not fully magic and metadata will remain a requirement.

Also, the better the assets will be indexed and highlighted, the better you'll be able to reuse and sell and the better their technical quality is, the more prospects you'll be able to contract with.

But there's no doubt that technology is going to offer new opportunities for maximising the potential of audiovisual archives but will there be a market for everyone? Probably not as such footage is often redundant. So, it is clear that a proper strategy is required to be positioned at the right moment. And that moment is named ASAP (as soon as possible).

Archive-based films

In the case of feature films, archive footage required by producers is reworked to ensure it meets the quality of new productions. The choice of footage is thoroughly researched beforehand. Images that are not available online, at least in low resolution, have no chance of being used.

Apollo missions documentary

Online media availability

Of course, material must be made available online to maximise its potential. By making content accessible, you can materialise services for professionals and the general public. This is how museums stimulate interest and attract visitors to their exhibitions. Similarly, a possessor of archive data will offer a glimpse of what is available in order to create a need and ultimately sell complete versions in formats that can be used in cinema, television and web communication. Heritage elements of enterprises are also put online so they can be consulted and reused by all members of a group. Whatever the case is, access to the media has to be secured. It would be irresponsible to allow free access to confidential or classified documents. But their online availability remains perfectly feasible if managed well, with the appropriate protection mechanisms in place. Legislation changes rapidly. Modern methods allow access for browsing to a large audience and restrict re-use for proper rights holders. The concept is progressing, and in future it should be easier to disseminate audiovisual archive material.

Vectracom services

- Creation of media versions with guaranteed approval from broadcasters
- Creation of packages that meet standards for all multimedia platforms (including VOD)
- Online availability of audiovisual heritage with access restricted to classified rights holders
- Collection, storage and management of media
- Creation and migration of media files
- Automatic transmission of content to communication channels

Services platform for audiovisual content

When it comes to important matters like the preservation and valorisation of digital content or its promotion, investments are required but it is difficult to estimate the return on investment (ROI).

One reason is that technology evolves, creating business opportunities and equipment obsolescence. To limit the risk, a good idea is to work with specialised service companies.

There are several advantages you can benefit from such companies. Main ones are the limitation of capital expenditures, the reduction of time to market and the multiplication of opportunities that you bring to your assets.

Also, new technologies are not so easy to manipulate and it is easier to work with a company (a platform) providing all the services you need at the best possible price.

In the past, we used mails and couriers. Today, it is all about e-mails and secured files transfers. So media labs are now platforms and you can achieve most of the operations that you expect, directly over the web.

The Vectracom platform is such a complete infrastructure allowing you to better preserve and value your assets. It includes all the features that you would expect to have at home to protect, modify, deliver and globally manage your audiovisual assets, whatever they are.

It starts with the provision of online audiovisual assets and resources to who needs it, anywhere, anytime. Contracts are available to just put on line proxies and work with them. But extensions include the preservation of master files, the ingestion and control of assets, the creation of abstracts, the enhancement of attached metadata and the delivery of versions in various formats.

Apart from the preservation, all services are available on demand. It means that you can use them whenever you need them and just pay what you use. No need to anticipate which technology will be required next year. It is implemented on the platform and you can benefit from it.

Services platform for audiovisual content

Creating an archive

The minimum service you expect from such a platform is the reliable preservation of your assets. Master files are backed up on LTO cartridges and one copy is returned to you. Thanks to this copy, you'll feel more comfortable as you keep one physical copy of your asset, just in case.

If you have tapes or films instead of files, you can just provide these items and master files will be created by the Vectracom Services Platform. To avoid unpleasant surprises, a quote is always provided in advance, so you can decide on what is the best for you.

In all cases, a browsing copy is created and put online according to your requirements.

You can start reviewing, indexing and sharing your media immediately after its ingestion.

Upload new media

With the time, the Service Platform will become a repository that you trust for the security it offers to your assets. Naturally, you'll expect to add all these new media that you record, produce or acquire. You'll be able to do that by yourself if you want but you'll also have the possibility to request that to be done by the platform itself.

For example, if you have contributors who must provide new content, the platform will be able to contact them on behalf of you, take the media, verify its quality, ingest it in the right format and include it in the general preservation plan.

More tasks can also be done by the platform like basic indexing and metadata enhancement.

Cataloguing your content

To facilitate the use of your assets, you'll probably like to categorise their content and to organise them in collections. To improve your visibility and create marketing campaigns, on a regular basis, you may want to create selections and to promote them to your network, customers or audience. All these tasks are made straightforward thanks to a platform.

You can do all these things by yourself, subcontract them to the platform provider or ask to a third party specialist to do the job.

It is all up to you.

Delivery of assets

There are various cases where you need a special rendition of an asset. You may sell it, just require a copy for editing or a copy for distribution. In all cases, you'll probably need to convert the master file to obtain what you need.

All cases are different.

When you sell an asset, you expect to be able to be sure that the purchaser is going to use this asset according to the contract you signed with him. There's no complete security but you may expect to mark your asset with some kind of watermarking. On demand, you can ask your media to be marked and the platform will do it automatically.

Also, your customer will request from you the delivery of a file with some special format or characteristics. As technology evolves, broadcasters and VOD platforms tend to request perfect files with the right containers and metadata included. Creating them is not always simple. It requests a lot of skills and tests and sometimes discussions with the platforms administrators. The Vectracom platform makes it easy and immediate for you and your customers.

A secure storage and computing system

When you need to edit an asset, you need the right format to work on your dedicated workstation. If you have DPX master files (24 images/s), you may prefer to deliver a mezzanine file (25 images/s) for easier delivery to the editor. Such transformation requires high quality transcoding tools that you probably not have. The Vectracom platform operates this task for you.

If you need to deliver your asset to a distribution platform like i-Tunes or Amazon you'll be asked to deliver your media with the right format and with the right embedded and attached metadata. There are tens of such platforms and all will request different characteristics. It is really a job and you may spend weeks to finalise the right file. Thanks to the Vectracom platform, this is easy for you.

Another typical use of assets is the creation of film extracts and their diffusion

Home page of the Vectracom platform portal

over social networks. Thanks to the platform, you can define an extract, transcode it and use it very quickly. If you are able to edit rules to create such extract on a collection of asset, the platform can do it for you and make all the extracts available in a few minutes or hours depending on the volume that needs to be managed.

The Vectracom platform supports most of the possible ways to deliver audiovisual content. Upload (and download) using FTP transfers or Smartjog transfers are possible as well as physical transfer using data cartridge, hard drive, tape, or DVD.

Metadata enhancement

The existence of enhanced metadata may be very important in some cases. If you have a large catalog of NEWS or feature films, you may need enhanced metadata to provide information to search engines. Without enhanced metadata, it may very well be impossible to find your media.

And it is a pity when you expect to sell it. Also, when you sell your media, you may need to provide editorial information to the purchaser for him to understand what you provide and what he's buying. Such information can be used by TV magazines or also to create extracts or promotion clips and reports.

The Vectracom platform provides several automatic processes and manually improved tasks to create enhanced metadata.

The Vectracom platform provides several automatic processes and manually improved tasks to create enhanced metadata. The most known technic is the "Speech To Text" that can be of various types, depending on the final use.

Management of media and metadata generation

Vectracom can provide fully automatic recognition at a very attractive cost using the best technology in the world or enhanced recognition using the parrot processes.

In addition, segmentation and abstracts creation are other metadata enhancement possibility that the platform can provide. In fact, as soon as the media is online, a lot of services are available.

Content through the ages

There are two things that must be considered.

The existence of the media itself has to be considered first. A disaster can destroy the master file. So, it must be stored in various locations and the various copies must be readable. To ensure that, on a regular basis, the master files are verified and migrated from one carrier to another one. For example, during the 25 first years of the 21st century, we will copy files from one type of LTO cartridge to a most recent one. After 2030, we will definitely use another technology but it is still impossible to predict which one as it doesn't exist today. The platform does that for you. It is included in your preservation contract.

The second thing is to ensure that the media can be seen online by everybody. As technology evolves, new compression techniques bring new formats showing a better quality even when using low bitrate. Migration is required for the online versions to ensure that all the browsers and players can access to the media with the best possible quality.

Quality control

Quality control should be part of any process. But it is obvious that everybody cannot assess correctly the quality of an asset. It requires measures that are not always obvious, even for specialised technicians. A media can work well on your computer but on your computer only. To avoid such problems and guarantee that the files you create and deliver include the right content and the right container, it is recommended to

control them. A platform will provide such service if you request it. It is a MUST and you shouldn't do without.

Platform use is trivial

You can share access to these assets with whoever you want. Each user (collaborator, partner, customer, provider, etc.) has user rights that are limited. A provider will be only able to do a deposit. A customer can download a master file that he paid. Collaborators can manage information, create catalogues and share content with others. Nobody needs special OS, software, or browser. Everybody can connect from its computer, its tablet, its smartphone or any other IT device.

Users rights management

As your platform can be used by hundreds of users simultaneously, it makes sense to know who does what and to restrict the access to whoever has value when connected.

Access to the platform is controlled by login and password and you can give limited rights to who you want.

You can run the administration by yourself or you can subcontract it to the platform administrators.

In any case, your platform is your platform. When you connect, you are in your environment. You see your logo and your home page. The platform uses your vocabulary. All information fields are customised to your need. And you can access only to your media. Vectracom is managing dedicated servers instead of shared systems to simplify global management and improve the security of your content.

Online assistance

Help all along the way

From the beginning, our services are designed to limit your involvement. Vectracom teams can take care of everything for you including logistics and the management of your partners. But you can do quite everything by yourself on our platform.

If you decided to do so, we will still be there to assist you when you have questions or if you need any training or support.

And when you have any new request from your customers, we are here to help you find a solution and moving to the next step. Usually it is already available.

Also, if you need an extra service for a short period of time of even for one shot, we will be happy to provide it. Vectracom is a service company and we are always happy to respond to new challenges, keeping things easy for you.

Vectracom services

- Yearly contract (OPEX only)
- Master files are secured on several media (servers and cartridges)
- Viewing versions are on line
- All standard audio and video formats are supported
- Just a login and a password are required
- Secure upload of masters
- Download of all versions
- Additional services are proposed to add metada or improve indexing as well as
  - Quality control
  - Custom deliveries
  - Speech to text
  - Manual indexing
- Detailed users rights management
- No hidden cost

Vectracom's references

Preservation

Series Subtitling, VOD, DVD, Blu-ray, Audio-description, Live subtitling, Indexing

Vectracom is member of the following organisations:

FIAT IFTA Fédération Internationale des Archives de Télévision International Federation of Television Archives

http://fiatifta.org

International Association of Sound and Audiovisual Archives
Internationale Vereinigung der Schall- und audiovisuellen Archive
Association Internationale d'Archives Sonores et Audiovisuelles
Asociacion Internacional de Archivos Sonoros y Audiovisuales

iasa

http://www.iasa-web.org

ICCROM

Vectracom supports SOIMA, the international programme of ACCROM for sound and image collections conservation.

> http://www.iccrom.org/priority-areas/soima/

AMIA The Association of Moving Image Archivists

Vectracom supports AMIA.

> http://www.amianet.org/

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Notes

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