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Integrating Media Fingerprinting in Production and Delivery Workflows

Whitepaper

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Abstract

When it comes to preserving, manipulating, and distributing digital media assets, the content owner faces a series of complex, overlapping challenges and intertwining business initiatives that require the business planning and production organizations to creatively design closed-loop processes that ensure the longevity and relevancy of the final production.

These challenges are universal in the industry, regardless whether the entity is a studio, broadcaster, video streaming portal, corporation, university, or government archive – they all have the capacity to create, and the need to preserve and identify multimedia footage, specifically video.

This paper will summarize some of the common problems facing such companies, introduce the concept of media fingerprinting and describe how this highly valuable yet non-intrusive technology is a key component to any digital media strategy and can immediately benefit all operations across the organization.

Finally we will provide an overview of iPharro Adaptive Video Fingerprinting™ technology and share a brief overview of how the technology is currently used by a sampling of iPharro customers.

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The Industry's Current Realities

In the Media and Entertainment industry, there remains tens of thousands of film titles and historical broadcasts still in analogue form – film, tape, cells, etc. Many of these studios own over 100 years of content!

Studios, broadcasters and agencies universally agree that physical tapes and reels are fragile, actual storage space requirements are burgeoning, maintenance costs are sharply rising, and physical degradation of these tapes is unavoidable. All are huge issues that threaten their business's ability to be financially responsible to their shareholders.

This has spawned a rush to "digitize" everything. Digital files not only provide more flexibility in terms of handling and delivery, but also make it easier to catalog through tools like digital asset management systems (DAM) while simultaneously reducing many of the operational expense costs associated with physical media. Unfortunately, merely digitizing assets is not enough. Companies then find themselves grappling with new challenges and new threats.

Some of these new challenges are shared across industries and are discussed below.

Reality #1 – Asset management efficiency and metadata conformance

Any digital asset needs to be organized and stored in adherence within an overall database schema that will make the DAM system run effectively. Serving as the librarian function, the DAM's value is maximized only if assets can be located quickly and accurately. All DAM systems permit some sort of "search" functionality – most commonly by "keyword." The keyword is simply an alphanumeric string that describes the asset. Keywords, frame rate, shot location, duration, keyframes etc. are all attributes that can be used to describe the media, and the bundle of information that is attached to any individual asset is collectively known as "metadata." The key to asset identification is ensuring that the metadata is uniformly consistent and applied equally across all assets in the library, regardless of project, age, media format, producer, etc. However, if any attribute is inconsistent, it adversely affects the searchability of the asset and hence the value of the library. Providing metadata that is accurate, relevant and consistently formatted across all of the different asset logging projects is the primary need of any successful metadata conformance initiative.

Solution - iPharro MediaSeeker Core Platform's unique fingerprinting technology can be used to create a unique, permanent, representation for the media asset. This string is always consistent and is stored in the video fingerprints database so that it may always be found, regardless of the overall quality of the rest of the metadata representation. Fingerprinting is an extremely cost-effective and timely tool to supplement metadata conformance initiatives.

Reality #2 – Proliferation of downstream production versions

Unlike analogue formats, digital files are easily duplicated, manipulated, and stored. As a

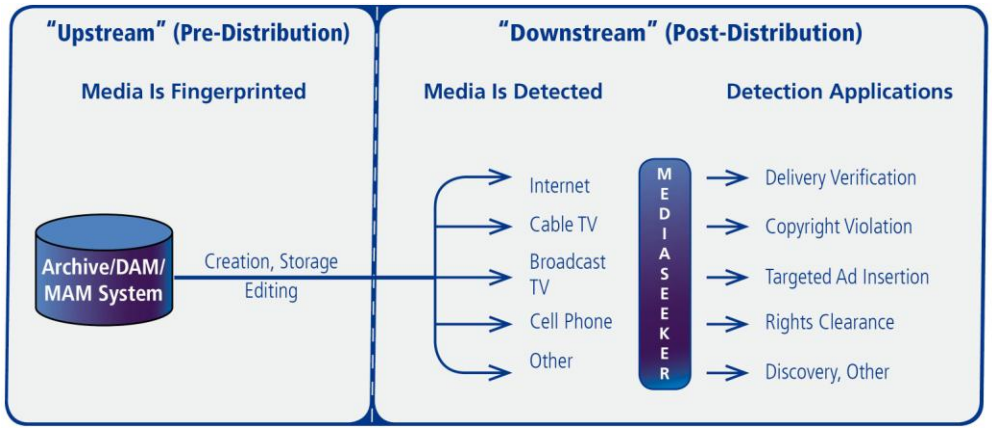

Figure 1: The Digital Media Delivery Dilemma

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result, each stage of media production may create multiple versions of the same basic sequence. Each version may have a slightly different special effect, rendering, or perspective, but the essence data is largely the same.

A sampling of multi-format distribution challenges is described above in Figure 1.

For example, television shows are distributed all around the world where they are further edited or converted to regional standards. Subtitled, these region-specific versions are eventually sent back to the originating studio for contractual purposes where every version is received and checked-in, manually reanalyzed, cataloged and then saved in the studio archives. Although the changes are relatively minor and may be small in scope, each review cycle incurs substantial labor and duplicative (digital) storage costs.

In the commercial news space, stock footage (or past footage) from a previous news story is often reused or rebroadcast for different news programs in the future. Again, the entire new broadcast will be shot-listed and stored in the archive. This manual cataloging process often fails to describe the asset properly, causing whatever minimal or incomplete metadata to be the sole organizational index for this new asset.

Moreover, university, government and industry film archives often face the monumental task of reassembling complete versions of old films based on multiple versions, some of which are missing or contain *additional frames.* Completing an accurate restoration has enormous significance for the archivist – their job is to preserve a cultural or historical legacy.

Solution – By creating fingerprints for each news story, broadcast, or studio master, iPharro MediaSeeker Core Platform's analysis engine can be used to *instantly locate all varieties* of the source footage - *regardless* of the age, edits, language, small differences in graphic overlays, subtitles, or overall completeness of the broader metadata representation. This enables much faster production and more accurate decision-making for the news director, archive manager, and editors. Improved accuracy and more timely productions lead to the availability of a higher value piece.

Reality #3 – Need to optimize sales opportunities / revenues - proliferation of multiple consumption (distribution) file formats

Companies everywhere are under increased pressure to grow sales and the "top line." As traditional broadcast and cable viewership stagnates, companies rush to embrace "new media:" internet, IP streaming, mobile streaming, etc. The proliferation of new consumption venues introduces a stark new reality – that of "unauthorized content" from "unauthorized distributors."

Several high profile legal cases pitting Hollywood studios against video sharing portals (e.g. Viacom vs. YouTube, 2007) are clear examples of how critical this topic has become. The studios blame these sites for copyright infringement leading to lost revenue. The video sites deny wrongdoing, claiming they are not responsible for the copyrighted material that users post. And so the debate ensues about the definition of compliance to the Digital Millennium Copyright Act (DMCA).

However, the real issue is: "How does a studio implement a comprehensive distribution strategy that includes the commercial requirements for accelerating the availability of down-converted broadcasts to authorized distribution partners?"

The market demands stories that are relevant, new, or compelling. If there is demand, there is value. The "freshness" of the story directly impacts the willingness of a user to pay or an advertiser to tie in to the asset – leading to sales opportunities. Unhappy with the lack of availability, creative consumers have taken matters into their own hands and use consumer-grade video capture tools and their arbitrary production values to rip-down traditional on air or cable broadcasts and make them available on the video sharing sites to "provide a service" for others with similar interests.

But beyond lost revenue opportunities, these copies are of substandard quality and negatively impact the studio's brand. This is potentially a much larger issue.

Solution – By integrating the iPharro MediaSeeker into the production workflow, finished stories and programs can be

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fingerprinted automatically. The fingerprints are stored in a central database/metadata archive. This fingerprint remains constant even as the media is sent downstream for transcoding and metadata reconformed for the requirements of the specific video sharing or platform provider (fingerprints for identical videos, regardless of format, remain identical and identifiable). Regardless of whether this "quality" media arrives at a sanctioned partner or if a consumer rips an on-air broadcast and uploads to an unauthorized video-sharing site, the iPharro MediaSeeker analysis engine can be employed to scan a library of properties and determine where a copy of the footage is present, be it the entire copy or merely a few frames.

Rather than manually scanning a list of exception sites, MediaSeeker's APIs will allow integration into a business intelligence system to permit automated comparisons to the company's official partner list. Once exceptions to this list are flagged, the business development or legal department can then decide whether to proceed with legal action or engage in a broader business discussion to sanction a new partner – possibly opening more sales potential and more advertising opportunities.

Reality #4 – Unexpected/under-anticipated operating expenses with maintaining digital storage archives

As mentioned earlier, DAM systems will catalog and maintain insight to the whereabouts of all titles and projects being worked on. Additionally, archive systems keep copies of all titles for historical and compliance purposes.

While they are easier to find in digital form, duplicate digital files have a much higher proliferation potential than if the media remained in analogue form. Across the industry, it has been estimated that up to 97% of files in a digital library may be duplicate material**. Obviously, this adds to the cost of provisioning and maintaining the SAN/NAS hardware -- rack space is increasingly at a premium, while power and HVAC costs are also rising. Additionally, bloated disk libraries can make the performance of the overall system slower, impacting productivity. Having too many copies of the same thing makes it harder for users to distinguish which copy they actually want to use.

Conversely, there may be corporate requirements to find or "rebuild" asset libraries with missing or lost clips that can be reintegrated into the overall library.

Solution – By integrating the iPharro MediaSeeker into the production and archive workflow, finished stories and programs can be fingerprinted automatically. The fingerprints are stored in a central database/metadata archive. This fingerprint remains constant regardless of the media's archive format, thus allowing the archivist the opportunity to more confidently purge intermediary / working copies of media that are no longer required, saving disk space and allowing the DAM to run more efficiently; or identifying unique clips that have not already been ingested and stored in the archive.

Reality #5 – Expectations of production workflow integration and scaling difficulties

Asset Management systems are trying to extend their basic "librarian" capability and are competing with broadcast automation systems to become a "workflow" management tool.

For both, we find that in the increasingly distributed (WAN-based) production model, DAMs are ill-suited to properly handle the networking, protocol and hardware interface requirements, and most lack robust integration points, making it very difficult to integrate third-party technologies in order to provide a holistic solution. Additionally, the computational requirements necessary to support the various functions require multiple server nodes to be tied together in order to provide a reasonable QoS (Quality of Service) to the personnel who are connected to the system. Many legacy implementations have been very expensive, highly customized, time consuming, and unstable. As a result of a less than optimal experience, management is reluctant to try new technologies regardless of their potential value since they fear "disrupting the apple cart."

Solution – The iPharro MediaSeeker Core Platform makes an extremely rich and robust library of API function calls available which permit custom integration into any DAM, automation, archive, playout, or business intelligence system. Custom statistics, report views, conditional execution of fingerprinting tasks, fingerprinting analysis, and searches are

**Digital Storage for Media and Entertainment Report, Coughlin Associates, 2008

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all possible manually through a UI, *and* programmatically through these APIs. Additionally, custom queries and features may be developed by the customer's development staff with knowledge of basic scripting technologies supported in the SOAP standard, such as C#, Java, and PERL.

The iPharro fingerprinting and comparison engines are robust and inherently multi-core enabled. Per iPharro's benchmark implementation, a single core, Pentium-based PC running MediaSeeker can ingest, fingerprint, and catalog between 2000 and 10,000 hours of content within a single catalog.

If rack space is at a premium, the MediaSeeker APIs can be passed across the internet and to an iPharro SaaS service, where computational throughput is highly elastic, yet customer security is ensured. The secure fingerprinting database remains property of the customer, and may be kept in the cloud, in house, or a combination thereof. This ensures the maximum deployment flexibility for the organization.

Reality #6 – Dissatisfaction with current security technologies like DRM and watermarking

Many companies have already experimented with DRM technologies and watermarking and have had mixed results. More often, they are disappointed that watermarking technology merely provides a purely forensic capability to possibly recover where a production leak has occurred, but neither piracy prevention nor supplemental searchability in a library. Additionally, creating watermarks is computationally intensive and may be removed or obfuscated through any number of file editing techniques. This makes watermarking of limited value when implemented in a vacuum.

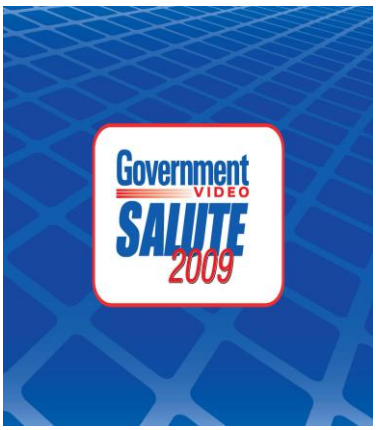
Digital Rights Management was heralded as a panacea against piracy and copyright infringement when first introduced in the last 1990s. Individual or group access rights basically "tethered" the asset to be manipulated or viewed by specific individuals or groups. Useful in a closed production environment, this concept was rapidly circumvented as the industry's production schedules were compressed requiring 'round-the-clock access to the required files, and pressure on production cost controls forced the outsourcing of many functions like rendering, colorization, compositing, etc. Such requirements made using DRM across the wide-area network, very hard to set up and manage, and hence increasingly easier to bypass.

There is a misconception in the industry that fingerprinting may become yet another technological fad.

Solution – It is important to remember that fingerprinting is a completely orthogonal technology to DRM and watermarking. In fact, when used in conjunction with the previous, a comprehensive media security strategy may be formed.

However, by itself, fingerprinting is not a security tool. It should be considered a production and distribution tool. When used specifically from these perspectives, it is important to understand that the iPharro MediaSeeker fingerprint is unique to a complete media asset, or set of frames. The fingerprint is permanent and stored in a database, does not travel with the asset itself, and hence cannot be altered or removed.

From a distribution perspective, consumer access rights may be served from the content aggregator, or embedded in a programmable chip or software applet that runs at the various points of consumption. Since the fingerprint is static, it can be used as a baseline to perform web-based comparisons against media assets at any number of video sharing or streaming sites.



*iPharro was awarded the prestigious **"Government VIDEO Salute"** Award for state-of-the-art products and technologies in the video content space that empower government entities with efficient and innovative solutions.*

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Customer Use Cases

Sample #1 - Operating margin improvement - television content monitoring

Customer: Medianet, a Division of MCA

Business Problem: How to scale a broadcast monitoring operation to sustain rapid business growth
iPharro Solution: iPharro MediaSeeker Core Platform with iPharro AdMon Option
Results: 75% reduction in monitoring staff

Medianet is a media monitoring firm that offers advertising effectiveness analysis. The company employs 6 people for every 4 channels to be monitored. This represents a disproportionate percentage of their operating costs.

To sustain the growth of the service offering, Medianet could not ramp hiring fast enough, and the quality of reports and data suffered. Additionally, staff suffered from fatigue and turnover due to the monotony of the required tasks.

By implementing the iPharro MediaSeeker solution, the monotonous monitoring and logging process could be automated. Technicians now handle only exceptions, leaving over 99.9% of the video sequences to be handled in real time by iPharro.

Sample #2 - Production optimization through version control

Customer: The Media Development Authority of Singapore (MDA)
Business Problem: Ensuring legal compliance of imported movie and television titles
iPharro Solution: iPharro MediaSeeker Solution with MoPiCCS Option
Results: Automated comparison process

The Media Development Authority (MDA) of Singapore faced a unique challenge: to ensure all imported DVD materials adhere to the country's violence, language and maturity rating standards – which vary greatly from those of the United States, China, Hong Kong and India.

The MDA employed an extremely labor-intensive process to detect and log differences in ***every*** commercially imported video by manually viewing ***each*** title from ***each*** importer and comparing it to an original MPAA-supplied version. With the number of titles sharply increasing from the studios, from increased demand from broadcasters and streaming sites, "throwing bodies at the problem" was prohibitively expensive.

The MDA used iPharro MediaSeeker with MoPiCCS option to simplify this regulatory process. The iPharro MediaSeeker™ technology automatically identified differences in key scenes, allowing multiple DVDs to be ingested simultaneously and specific frames to be compared against a central fingerprinting database. Differences were detected and highlighted for further analysis by the responsible technician.

Using iPharro technology, the MDA was able to analyze video material more quickly and accurately, saving money and other valuable resources, while maintaining future-proofing and upside volume protection through the MediaSeeker's scalable architecture.

Sample #3 - Sales optimization through multi-geography advertising monitoring

Customer: The Nielsen Company
Business Problem: Analyzing advertisement effectiveness across broadcast channels
iPharro Solution: iPharro MediaSeeker Core Platform with TVCM Option
Results: Monitor cable, satellite, and terrestrial channels across Europe

Nielsen, the undisputed leader in television ratings systems, required a faster and more efficient method to scale its advertisement monitoring service. With increased customer demand for the monitoring and analysis of an increasing number of television channels, the company challenge was to design a new scalable operation to capitalize on this demand.

After reviewing the available technologies and performing a prolonged, rigorous, comparative test, Nielsen concluded that iPharro's technology was best suited to meet its needs.

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Utilizing iPharro MediaSeeker™, Nielsen is now able to simultaneously monitor all desired channels where commercials are broadcast, regardless of source and in real time.

Nielsen currently logs such attributes as: advertisement title, channel, airtime, duration, and modified attributes, including split-screen commercials.

As a result of their partnership with iPharro, Nielsen can now offer their customers unprecedented options and levels of service, permitting their customers a clearer and more accurate picture of advertising effectiveness.

Sample #4 - Workflow flexibility through SaaS monitoring deployment

Customer: Confidential
Business Problem: Rapid start up of advertisement monitoring service with limited technical staff
iPharro Solution: iPharro MediaSeeker SaaS with AdMon option
Results: Anywhere-access to iPharro MediaSeeker Admon as a subscription-based hosted service, with no initial capital investment and no internal infrastructure maintenance

This iPharro customer is a European-based cross-platform media and advertising monitoring service. Their business requirement is to offer a comprehensive broadcast and cable monitoring service to complement monitoring of other media platforms.

Their challenge was twofold – 1. how to allow PR agencies and brand holders to monitor broadcast playout and to provide automated validation to the playout contracts and 2. how to compare those results across multiple broadcaster platforms and services, without having technical staff to perform custom integration into those platforms.

iPharro MediaSeeker Admon SaaS was the most logical choice, as through a cloud-based deployment, this customer is able to leverage all the power of iPharro technology, allowing automated monitoring of desired channels and creation of customized reports based upon this data. As a cloud-based SaaS, the computational requirements and catalog storage requirements remain flexible as demand grows and ebbs. Additionally, the customer's clients are provided with a high level of self-service since they are offered secure logins, enabling them to review data wherever they are located, at whatever time of day.

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Conclusion - The Value of iPharro *Adaptive Video Fingerprinting*™

The iPharro MediaSeeker core platform is a scalable, robust and most importantly, flexible fingerprinting engine. The core architecture, based on iPharro's Adapative Video Fingerprinting™ technology, was designed to apply variable fingerprinting density across multiple use cases and provide fully parameterized controls for the content owner.

Figure 2: iPharro MediaSeeker's broad, value-based applicability and integration points

Thus, as shown above in Figure 2, the same system can be used by multiple organizations requiring consistent content identification methodologies. iPharro MediaSeeker supports multiple fingerprinting densities in order to be customizable as required at each stage of production. This minimizes the costs of producing and maintaining the asset while maximizing the revenue that can ultimately be derived from distributing that asset in a timely manner, regardless where it is stored, produced, or distributed.

The iPharro MediaSeeker solution offers value to the organization by providing content owners the ability to organize and identify their content anywhere. iPharro offers a completely flexible, non-invasive fingerprinting technology that enables content to be identified and organized at any point along its value chain, at any time, providing a future-proof record that can be repurposed as new production methods and distribution techniques arise.

Find out more

If you are challenged with having to identify, manage and control growing volumes of digital media assets, why not benefit from our experience and learn how iPharro MediaSeeker with Adaptive Video Fingerprinting™ could help your organization to:

- Protect and fully monetize the value of your media assets
- Achieve unprecedented visibility and control over your proprietary assets wherever they might be used
- Simplify your workflow by enabling content identification and versioning at any stage in the production process
- Save time and money by eliminating the need for manual video searches or content comparison exercises

Why not join us on stand N6229 at this year's NAB in Las Vegas on April 12 – 15th, 2010 for a demonstration - or we can arrange a discovery session at a time and place convenient to you.

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