MOTION PICTURE ASSOCIATION

ASIA PACIFIC TECHNOLOGY INITIATIVES 2: THE FUTURE OF DIGITAL

MOTION PICTURE ASSOCIATION OF AMERICA

MPA

the future of digital

preface

Today only 16% of movie revenues come from the cinema. The remaining whopping 84% stems from the home environment – via DVD and VCD, pay-TV and free-to-air TV.

In Asia, as in other parts of the world, consumers are actively exploring digital and Internet platforms to watch TV and movies. Consumers want content delivery to be fast, secure and reliable. They want quality content they can control and some ability to network it within their homes, to their cars, mobile phones, or portable devices.

Content providers have an opportunity to deliver what consumers want. As such the effective distribution of digital content in Asia is critical for the entire industry. MPA and our member companies have been at the forefront promoting new standards, devices and platforms.

The MPA has historically been pro-active in technology, starting with the conversion of still to moving pictures. Now, we transform ourselves again with fast and secure digital Internet delivery. We participate in standards organizations worldwide to improve digital platforms. Many would argue that our movies drive technological change.

However, we must at the same time realize this is only possible when content is protected. Piracy is a significant factor which impacts our industry. The industry segments affected include producers, distributors, theaters, video stores and pay-per-view providers in the US and around the world.

Content protection is about delivering content safely, securely and according to the needs of the consumer. It is about the ability to bridge the interests of content producers and consumers with new and innovative usage models. For example, some people might like to watch content only once, others might wish to download it and burn into a disk, while another would prefer to watch periodically over the course of a month. Content protection facilitates this.

We hope this publication will be helpful to you as we continue to map out the progress of the digital transition in Asia-Pacific.

Thank you.

MIKE ELLIS
President and Regional Director, Asia-Pacific
Motion Picture Association

contents

2009 TECHNOLOGY Q&A

It is important that consumers and content owners realize a sustainable digital business model into the future.

2009 Q&A

Q1. WHAT IS DRM AND WHY IS IT HELPFUL?

DRM refers to Digital Rights Management. It is a system which protects content so that only authorized users may access and view the content. It also enforces rules that help consumers view content when they want, how they want and on whichever device.

The reality is we need to enable consumers to view movies and TV according to their needs. This is only possible with DRM systems that manage access and copyright of content. For example, DRM systems would manage Internet Protocol (IP) offers such as pay-per-view, per-hour, or per-day. DRM enables these business offers so that consumers may watch content according to their personal preferences. Consumers appreciate low-cost and piece-meal purchases. Why not allow them basic consumer conveniences like customised viewing models? On the other end of the spectrum, content can never be free.

It is important that consumers and content owners realize a balanced and sustainable digital business model into the future. This can be better enabled with DRMs.

Q2. WHAT IS THE TREATMENT OF DRM IN MOVIES AND IN OTHER INDUSTRIES?

The business models of each content industry differ. On the average, each motion picture, inclusive of advertising, costs US$100 million-$150 million to produce, while a one-hour TV program may cost up to a $1 million to produce. Music, however, may be produced and promoted for much less capital investment. This goes to show the difference in capital requirements of the two largely disparate industries.

DRM is very much alive in the music industry. One excellent example of a DRM at work is Apple's iTunes online music store, which is quite successful in a number of countries, despite its very strict DRM implementation.

When a movie is released illegally on the Internet, it immediately loses the ability to sell in markets beyond its own. If content pirates have their way, producers will sell one digital copy while everyone else will get it for free. Hence, each digital movie may only sell one digital copy! How will this work for content owners?

Pirates quickly pick up digital source files, produce DVDs and make illegal profit. This affects entire legitimate industries, populations employed, and the perception of quality of valuable content. Movies will also have problems being sold as Free-to-Air (FTA) TV content.

DRM enables new and interesting business offers so that consumers may watch content according to their needs and preferences.

Finally, it is not that "music can forego DRM". DRM is very much alive in the music industry, whether being used by specific distributors or as part of other technology platforms.

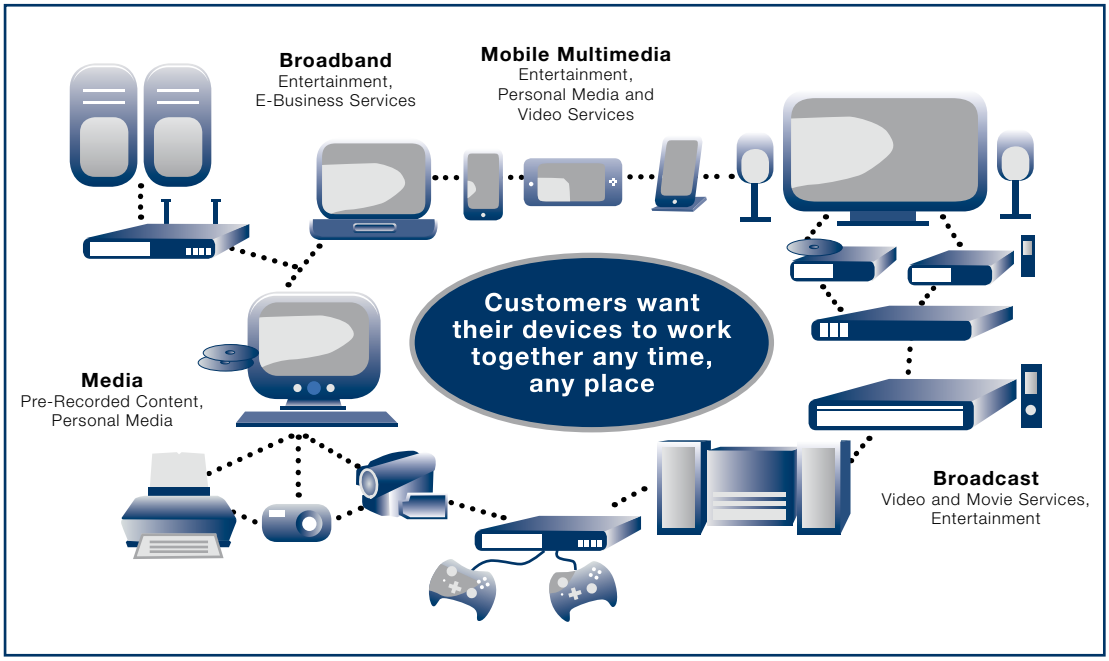
Q3. WHAT IS "FORMAT SHIFTING" AND WHY IT DOESN'T WORK?

Governments should not promote exceptions to copyright and technological measures on account of serving consumer needs.

"Format shifting" is a misnomer because, first, media formats are subject to market forces that drive innovation. If the consumer needs it in certain formats, movie companies will inevitably want to provide these conveniences to consumers.

Moreover, and importantly, formats are already being made interoperable to one another today. This work is being done in many international forums such as CORAL Consortium, Digital Entertainment Content Ecosystem (DECE), Digital Video Broadcast (DVB) and the Digital Living Network Alliance (DLNA).

THE DLNA IS WORKING TO MAKE VARIOUS CONTENT FORMATS INTEROPERABLE.



Interoperability of devices is a significant issue for rights to be protected at all junctures of the distribution chain.

Much is being done to ensure formats and devices are interoperable and according to consumer needs. The point is there is no need for governments to create laws specifically to allow "format shifting" with all these new developments.

More portable devices like Apple's iPod player can copy content and provide "format-shifting" capability to the audio-visual content.

Today, we find many legitimate consumer conveniences in the market that allow consumers to copy content onto their portable devices, such as Apple's iPod and PSP (PlayStation Portable). These commercially available conveniences provide "format shifting" capability for the audio-visual content.

Consumers can now purchase a "second session" of a DVD, which is meant for a mobile or PC device. This "second copy" is saved onto a CD ROM and distributed along with the DVD copy.

Content owners have been actively pursuing new, technological, legal and interesting ways for devices to be interoperable. As for DVDs, the industry is working on solutions that allow the "managed copy" of DVD content. Similarly, such conveniences are already available for Blu-ray and HD DVD devices.

More and more consumers have the ability to purchase a "second session" of a DVD, which is meant for a mobile or PC device. This "second copy" is saved onto a CD ROM and distributed along with the DVD copy. This is an example of the industry responding to format requirements.

Technological Protection Measures (TPMs) are central to the provision of flexible ways which consumers may enjoy quality content. There is no need for governments to legislate to allow consumers to "break technological protection measures" in order to allow copying. For more information, please see chapter on the Ubiquitious Deployment of TPM.

Q4. WHAT IS GRADUATED RESPONSE PROGRAMME (GRP)?

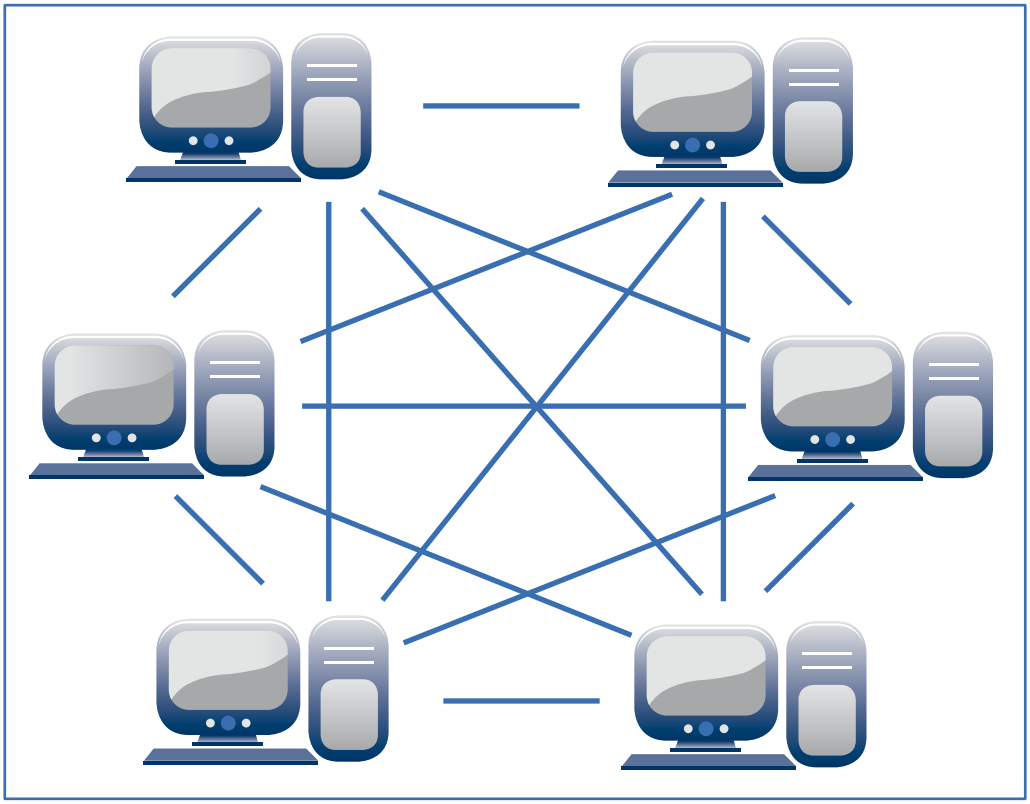
Content owners are never suggesting the "blocking" of content from the mass public. Content owners ideally want as much as possible content to be distributed to consumers around the globe – except that legal content should be distributed.

A Graduated Response Program (GRP) incorporates a warning system to a potential copyright infringer. It is a phased program to warn consumers, Online Service Providers (OSPs) and Internet Service Providers (ISPs) about potentially illegal or infringing activity. It gradually warns repeat offenders that they are uploading or downloading infringing content.

Some cost is involved in the deployment of technology and the solutions to adopt the GRP. There is no "standard" cost structure out there. However, primarily, costs of protracted legal risks can be alleviated for operators. Other "costs savings" may include decreasing labor costs from take-down and put-up notices.

National Internet capacity may be improved and made available for legitimate uses. For the consumer, this method alleviates risk of falling into criminal activity.

PEER-TO-PEER NETWORKS ARE USED TO SHARE CONTENT LIKE AUDIO, PICTURES OR DATA, IN DIGITAL FORMAT.



Q5. WHY IS THE TERM FILTERING SOMETIMES USED?

At the most basic level, content recognition is a process by which content is automatically identified online. Content Recognition Technology (CRT) refers to the use of cues such as the title, size of file, sources of data and visual information to identify the content. This is usually augmented with a policy-based response model, where suitable action regarding copyright infringement is taken based on the identity of the content and other factors.

"Filtering" does not curtail ones' views or free speech. There is a distinction between communicating one's political views and the communication of copyrighted entertainment products. When the term "filtering" is used, some content owners are referring to ways by which websites may weed out illegal content and the prevention of copyright theft of entertainment content.

There is also no particular application to intrude on individual privacy. The key objective is to ensure content is protected and people do not break the law.

Q6. HOW DO WE IMPROVE CONSUMER TAKE-UP OF DIGITAL TV?

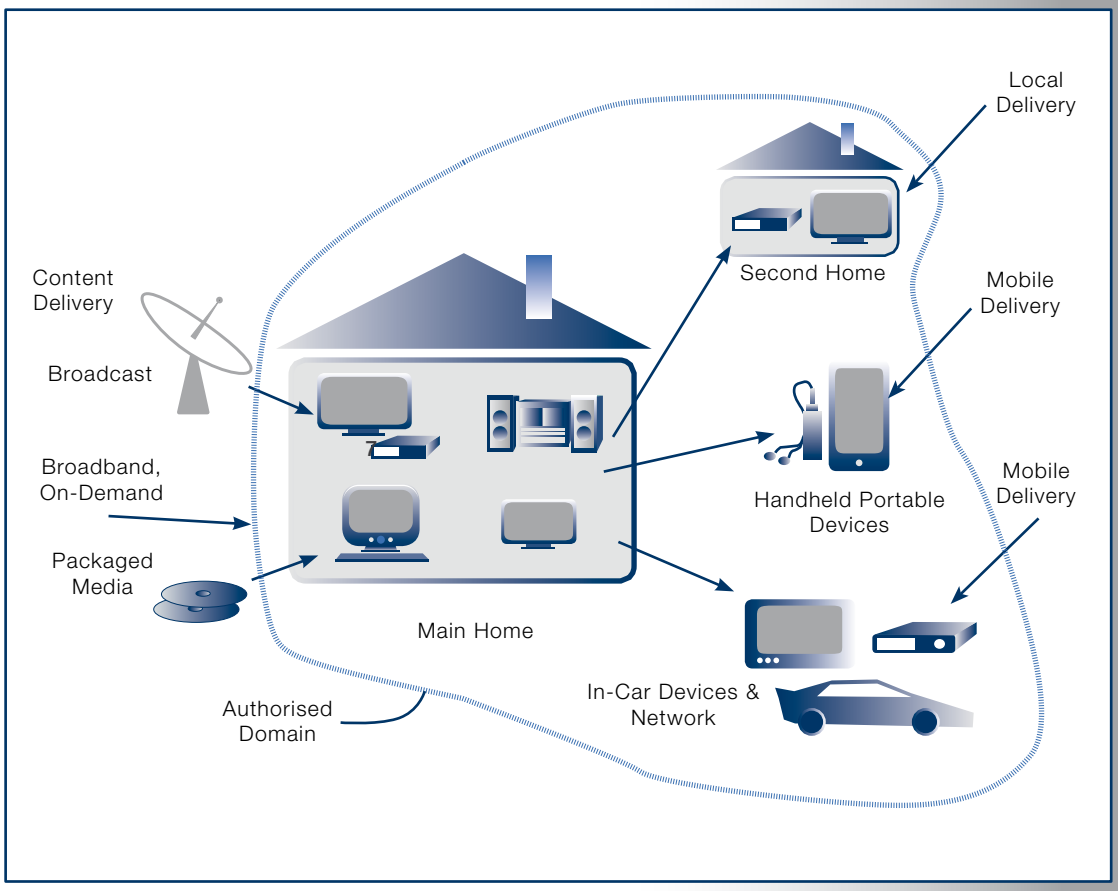
Digital take-up is vastly improved when high-value content such as high-definition (HD) is available on free-to-air (FTA) TV. HD improves the quality and take-up of digital TV. Increased adoption is possible when content is not pirated or redistributed without permission. Moreover, it is not uncommon that redirected content has its advertisements stripped out. Quality may also be significantly discernable from the original. The digital TV transition depends on the availability of high-value content, particularly HD.

Q7. WHY CAN'T CONSUMERS DO WHAT THEY LIKE WITH FTA DIGITAL TV?

FTA TV is also known as Over-the-Air TV. It is not "free" as advertisers pay for the content. When content is abundantly pirated, FTA TV runs a risk of moving to more secure channels such as pay-TV. Ultimately, consumers lose out when high-value content moves away from broadcast TV. For more information, see *Technology Initiatives Booklet 2007.*

More information on FTA and digital TV can be found in MPAA's Technology Initiatives Booklet 2007.

THE DVB-CPCM AUTHORISED DOMAIN



There are many home networking technical standards. The DVB-CPCM is only one such helpful standard among others. This standard includes technical elements that protect free-to-air (FTA) TV.

Q8. WHAT IS DVB-CPCM AND WHY IS THAT HELPFUL TO CONSUMERS?

Digital Video Broadcast-Content Protection Copy Management (DVB-CPCM) is a home-networking standard which allows devices and content to interact in the home environment. This way, one can copy or move content from one device to another in legal ways, and consumers may do many interesting things with content in the future.

The purpose of the system is to enable consumers to manage content (and accompanying rights). For example, the consumer may wish to set up remote access equipment to watch TV while traveling (and to watch TV as in their own physical home set-up.)

DVB-CPCM particularly addresses new technological issues such as place shifting, space shifting, and other older conveniences such as time shifting. Content and accompanying rights can be managed according to each business offer. Over time, it will be important to enable new and interesting consumer conveniences.

There are many home-networking technical standards. The DVB-CPCM is only one such standard among others. However, it is a ready-made model for regions such as ASEAN that have picked up DVB as its terrestrial broadcast standard. The standard has a signaling element which protects free-to-air (FTA) content from being illegally redistributed.

The CPCM was designed by the DVB Group, which has a membership of over 300 members from various sectors, including government, industry and academic. It is a truly neutral standard belonging to the global community.

Q9. WHAT CAN GOVERNMENTS DO TO PROTECT FREE-TO-AIR (FTA) TV?

As a start, standards organizations for digital broadcast should incorporate basic signaling incorporated into the Service Information (SI) for terrestrial digital broadcast. Such signaling (also known as a Redistribution Control Trigger) will alert set-top boxes to recognize that content may not be redistributed over the Internet[1]. This basic recognition for FTA rights over the broadcast will better prepare devices to respond to rights information and new services in future.

[1] For DVB, please refer to details in the DVB Service Information specification - ETSI EN 300 468 version 1.9.1 The FTA content management descriptor provides a means of defining the content management policy for an item of content delivered as part of a free-to-air (FTA) DVB Service. The signaling conveyed by this descriptor has been designed for use in the context of the DVB's Content Protection Copy Management (CPCM) solution. However, the descriptor may also be used in a non-CPCM context. The FTA flags are intended to signal to a receiving device (not limited to a DVB CPCM implementation) the configuration of internal states that affect the means by which content might be redistributed. It reflects the broadcaster's intention for content usage and shall result in a similar user experience across implementations.

In addition, simple solutions such as outputs of devices can be given due recognition. Outputs of such set-top boxes should be protected at the same time that rights information is signaled. All high-resolution content may be served by digital outputs with accompanying protections. For more information, please see MPAA Technical Recommendations (TR). Simple solutions exist, for example:

More information of various content protection standards is available at www.contentprotection.net.

- All digital output of devices shall have High-bandwidth Digital Content Protection (HDCP).
- All analog output of devices shall carry Standard Definition (SD) only.

The above may apply to set-top boxes, TVs, digital video recorders, DVD players, and so on.

For other such standards, see www.contentprotection.net website.

Q10. WHAT IS THE STATUS OF BLU-RAY AND HD DVD?

Recently some companies adopted Blu-ray internationally as the main packaged media standard. This fact does not preclude the viability of HD DVD for certain film producers, companies, markets or uses. Similarly, it does not preclude the use of any other standard with relevant content protection, to be adopted elsewhere. It is certainly not the end of the format war, especially since newer formats will continue to arise in future.

Content owners prefer standards that have content protection in place. In fact, in any standard, content protection and a license document should be in place. For example, the Advanced Access Content System (AACS) content-protection technology is accompanied by a license document.

For organizations seeking ways to distribute content via some packaged media, the most important aspect is that content protection needs to be in that mix. Often that will include a license document governing the rights of parties.

UBIQUITOUS DEPLOYMENT OF TECHNOLOGICAL PROTECTION MEASURES (TPMs)

There are a number of marketplace initiatives across the world that aim to provide consumers with access to content across multiple devices and formats — thus the need to deploy TPMs.

With the arrival of the digital age, it is possible for consumers to make numerous copies of copyrighted materials, without a discernable loss of quality, unlike analog.

Furthermore, pirated digital copies can last forever in perfect state as opposed to analog or magnetic "tape" infringing copies.

This leads to the possibility that copyright protection could be overridden by uncontrolled copying, especially since such illegal actions would be difficult to trace.

Technological protection measures, or TPMs, are defined as being any technology, component or device designed to prevent or restrict acts with respect to works or other subject matter that are not authorized by the rights holder of any copyright-related right. TPM is the part of the law which recognises and protects DRM.

In response, technology enabling copyright owners to control access to (and copying of) copyrighted works, such as encryption software and copy-controlling mechanisms, were developed and their importance have become more apparent in the digital age.

There is, however, the problem that protection measures can be circumvented (like any technology). In order to prevent this, Art. 11 of the 1996 WIPO Copyright Treaty was enacted, to require the contracting states to provide adequate and effective legal remedies against the circumvention of effective technological measures.

WHERE AND HOW TPMs ARE IMPLEMENTED

A DRM is recognised as "Technological Protection Measure" under the law.

TPMs may be implemented for broadcast content, packaged media content and within electronic devices. TPM maybe software-driven or hardware-based. Taken together, the TPMs implemented provide fairly comprehensive protection to the copyright owner as a piece of copyrighted work, for example, a movie, is often distributed and may be reproduced at any one of the three junctures cited above.

Broadcast

TPMs may be implemented at the source of broadcast, to restrict the reproduction or further transmission of copyrighted works. Thus, for example, a cable-TV operator may scramble the signals sent out to its users, to prevent the unauthorized reception of its signals by other users who are not subscribers to its services. This type of system is similar to a pay-TV system.

For free-to-air (FTA) TV a Redistribution Control Trigger is a sequence of digital bits embedded in a TV program which signals that the program must be protected from unauthorized reproduction. It is envisaged that the implementation of the broadcast flag

will allow consumers to make personal copies of the programs, which are broadcasted, without allowing the unauthorized retransmission of such programs over the Internet. The Digital Video Broadcast Content Protection Copy Management (DVB CPCM) has similar signaling to indicate to the receiver devices the copy-control information of the content.

Packaged Media

In respect of the different storage media, TPMs protect the scrambling of the content on the media (such as DVDs or CD ROMS) such that the byte-for-byte copying of the copyrighted material is not possible.

When movies and TV are distributed via packaged media such as DVDs and HD DVD optical disks, content may be protected by both the encryption and a license document. For HD DVD and Blu-ray, the relevant license document and protective technology are embodied in the Advanced Access Content System (AACS) agreement. AACS uses cryptography to control the use and access to digital media by encrypting content stored on the storage media.

Connectors

High-bandwidth Digital Content Protection (HDCP) restricts connections to video displays through Digital Visual Interface (DVI) (including High-Definition Multimedia Interface, or HDMI) digital outputs, while Digital Transmission Content Protection (DTCP) restricts sending over FireWire or USB connections.

TPMs may also be implemented as software or hardware protection for Internet-based distribution of content.

Interoperability

A particular problem cited by many observers is the importance of interoperability between different devices and between platforms of delivery (such as IPTV, broadcast and satellite).

There are significant developments in this area.

LEGALIZING 'FORMAT SHIFTING'

Today, we find many consumer conveniences available in the market that allows consumers to copy content onto their portable devices such as iPods. These commercially available conveniences provide "format shifting" capability for the content. Content owners have been actively pursuing new, technological, and legal and interesting ways for devices to be interoperable.

There are a number of marketplace initiatives across the world that aim to provide consumers with access to content across multiple devices and formats.

These initiatives use multiple approaches and business models (such as copies bundled with product or service purchase and paid copies) to provide consumers with access to content in different formats.

Studios such as Warner Bros and Fox allow consumers who buy select DVDs from the studio to transfer a free digital copy of the film from the disc to PCs and portable media players such as Microsoft's WMDRM PlaysForSure-certified devices.

Deployed commercial approaches include, but are not limited to:

- **Digital copies from DVDs**
  - Second Session digital versions of titles present on the DVD, usually protected using a Digital Rights Management (DRM) such as Windows Media DRM or Fairplay
  - Potential for managed copy services authorized by the DVD Copy Control Association (CCA)
- **Managed copies from AACS-protected Blu-ray discs**
  - Authorized managed copy mechanism that allows consumers to acquire digital copies of high-definition physical media
- **Digital download stores that support multiple formats**
  - Consumers rent, subscribe or purchase content that can be copied onto multiple devices in multiple formats
- **Download to burn**
  - Technologies that allow consumers or professional retailers to download digital copies and then burn them onto physical media
- **Downloaded digital copies with physical DVDs**
  - Consumers buy the physical DVD, and receive a coupon to download a free digital copy from an affiliated service
- **Pay-TV broadcast and digital downloads**
  - Consumers have a pay-TV subscription, and get digital copies of the content on their PCs and other devices

The following section provides deployed examples for each of the approaches listed above.

Digital copies from DVDs

There are two possible approaches to delivering digital copies directly from DVDs. The first approach is by including a Second Session with DRM protected digital copies on the DVD. The second potential approach, which is not currently enabled, is contingent on the approval of managed copy services by the DVD CCA.

Second Session
A few studios, such as Warner Bros and Fox, allow consumers who buy select DVDs from the studio to transfer a free digital copy of the film from the disc to PCs and portable media players such as video iPods, iPhones, Apple TVs and Microsoft WMDRM PlaysForSure-certified devices. Consumers who buy these DVDs can follow a simple process on their PCs to transfer the digital copy from the DVD to the portable device of their choice. The physical DVD package includes a unique code that allows the studio to control the number of digital copies that are made from a single physical DVD.

Potential for Managed Copy
It has been widely reported in the media that the DVD CCA is discussing amendments to the Content Scrambling System (CSS) specifications and license that would authorize managed copy services. If these amendments are approved, they would pave the way for applications and services that allow consumers to create digital copies of the content from their DVDs as an alternative to the Second Session approach.

Managed copies from AACS-protected Blu-ray discs

Managed copy is a mandatory part of the final AACS specification for next-generation Blu-ray discs. This will allow consumers to make digital copies of purchased Blu-ray discs for viewing on a home-media center, streaming throughout the house, or even transferring to a portable player. Note that "mandatory" refers to the content owners having to offer this capability (for free or as a paid-for feature); each hardware manufacturer can decide if they want to support this feature.

Digital Download Stores

There are a number of digital download services, including Apple iTunes Video, Microsoft's Xbox Live marketplace, CinemaNow, Movielink, Guba and Amazon Unbox, which allow consumers to rent, subscribe or purchase content digitally. Most of these services allow the consumer to access their content on multiple devices such as PCs and portable media players, and some of these services also support multiple formats.

- Apple iTunes — Consumers can rent or purchase television episodes and movies from the Apple's iTunes store. Apple's Steve Jobs announced at Macworld that by the end of February 2008 iTunes Video in the US would offer films for rent from all Motion Picture Association of America (MPAA) studios 30 days after the DVD release. Once rented, a consumer will have up to 30 days to start watching it and 24 hours to finish it.

- Amazon Unbox — Consumers are allowed to watch content rented or purchased from the service on their PCs as well as their TiVo DVRs. Consumers can also access the service directly from their TiVo and rent or purchase content without using a PC.

• Microsoft Xbox — Its film-download service has been rolled out to the US, France, Germany and the UK. Owners of Xbox 360 systems in these countries can now rent or purchase films online to watch on their game system. Content is provided in both SD and HD quality.

In France, TF1VISION, an online video-on-demand (VoD) site provided by the country's largest private television network (TF1), is providing original, subtitled episodes of the current season of *Lost* (Disney-ABC) as VoD, for streaming or download-to-rent, 24 hours after each episode's initial US broadcast. This follows a successful similar service begun last September for episodes from season two of *Heroes* (NBC Universal), and is part of an effort to bring television episodes to international viewers more quickly (a la day-and-date) and in more flexible ways, particularly transactional and on-demand, due in part to availability of pirate versions of shows online.

Download to Burn

In 2007, the DVD Copy Control Association (CCA) approved "CSS Managed Recording" which allows users to burn copy-protected content to a special type of DVD-R disc for use in DVD players. Sonic Solutions, which owns the Roxio DVD creation products and high-end DVD authoring systems, has announced Qflix, a certification and licensing program, which will enable users to burn downloaded, Hollywood studio video to DVDs protected with Content Scrambling System (CSS) encryption. Qflix is made up of four key components: Qflix-enabled DVD recorders; Qflix-enabled DVD recordable media; Qflix-enabled software for PC or CE devices; and Qflix secure key servers.

Each of these works together to enable premium content to be written to secure CSS-encrypted DVD media on demand.

Microsoft Xbox has rolled out its film download service to select countries. Owners of Xbox 360 systems in those countries can now rent or purchase films online to watch on their game system.

DIGITISED CONTENT ENABLES THESE PROVIDERS TO OFFER CONTENT TO BE DEPLOYED IN VARIOUS PLATFORMS LIKE DTV OR ONLINE

SAMPLE OF SERVICES

Type of Service	Example
Streaming On Demand (Advertising-supported)	Wowow (Japan), In2TV (US), Movieflix (US), Joost (US), Veoh (US)
Subscription	Starz! Vongo (US), SkyByBroadband (UK)
Download-to-Own & Rental	Reel Time Media, Telstra BigPond (Australia), Free Record Shop (Benelux), Glowria, TF1 Vision (France), Film2Home (Nordic countries), Telefonica Pixbox (Spain), Vizumi, LoveFilm (UK), AOL Video, CinemaNow, iTunes Videos, Movielink, Wal-Mart (US)
Additional Technologies	
P2P-based	In2Movies (Germany), Peer Impact (Wurldmedia) (US)
Participatory sites	YouTube, MySpace, Guba (US)

** This is not a complete list.*

US-based pharmacy Walgreen's launched a burn-on-demand kiosk at some of its retail locations. Consumers can choose from a large catalog of titles; CSS-protected files are digitally downloaded to the kiosk and burned to a DVD while the consumer waits. This frees up valuable shelf space at the store.

CinemaNow, on ther other hand, offers a digital download service where users can purchase, subscribe or rent television episodes and movies that are protected using Microsoft's WMDRM.

In addition, consumers can also create physical copies of their purchases using CinemaNow's free software application and standard DVD-R or DVD+R discs which are playable in a majority of existing DVD players.

The first copy is free; consumers have to pay for additional copies. CinemaNow also provides cover art and DVD labels for free with the download. This allows consumers to burn downloaded video to DVD with the same protection and ubiquitous playability of packaged DVDs.

Downloaded Digital Copies with Physical DVDs

Wal-Mart, a US-based retail chain store giant, which also orovides a music downloads service, provides a service where customers who purchase physical DVDs can also download a digital copy for a small additional fee.

Online entertainment subscription service provider Netflix offers a popular DVD subscription service, where consumers pay a monthly fee to rent movies.

Pay-TV Broadcast and Digital Downloads

Cablevision, a large cable-TV network in the US, has launched Popcorn DVDs-on-Demand, a service where consumers can purchase a physical DVD through their set-top-box (STB) to receive in the mail, as well as receive the right to watch it over their cable system immediately.

HBO has launched a service called HBO on Broadband, which allows consumers who subscribe to its pay service HBO-on-Demand and to broadband services from the same company to view HBO streamed online, and to download films and television shows to PC for free. Downloaded content will be available for a certain period of time (four-12 weeks) and then automatically be deleted from the PC.

Cable-TV company Comcast, which also provides Internet services, has launched a site called Fancast where Internet users — not just Comcast subscribers — can stream full episodes from CBS, Fox, NBC and others. Comcast intends to evolve Fancast into a catch-all entertainment site where viewers manage all their entertainment choices, including their

DVRs. Comcast is also predicting a "wide-band" Internet video-on-demand service by the end of the year.

Korean telecom leaders Korea Telecom (KT) and HANARO each has IPTV services that recently added MPAA studio content. KT has also launched MegaTV for the PlayStation 3 (an IPTV service), which uses the Playstation3 gaming console as an IPTV STB.

As you can see in the above, there are numerous examples to cite in terms of real-world examples of "format shifting". To "legalize format shifting" would mean curbing on new services and possibilities. More importantly, it would render the worldwide content-protection system unworkable if laws allowed the "breaking" of TPMs.

US retail chain Wal-Mart provides a service allowing customers who purchase physical DVDs to also download a digital copy for a small fee.

CONTENT RECOGNITION AND FILTERING: WATERMARKING AND FINGERPRINTING

Digital fingerprinting and watermarking are particularly relevant technical methods for content recognition as they can robustly identify content.

content recognition

Content Recognition Technology (CRT) can be used in various deployment scenarios to combat piracy. CRT also enables the proliferation of legitimate channels that provide consumers with better choices and options to consume content.

Content recognition uses cues such as the title, size of file, sources of data and visual information for content owners to identify the content being transmitted over digital or Internet platforms. Cues such as textual metadata, hashes, fingerprints and watermarks are typical automated ways to identify content online. Typically, content recognition is then augmented with a policy-based response model where content owners, Internet Service Providers (ISPs) or Online Service Providers (OSPs) can choose their method of response to online copyright infringement.

There are many issues in relation to the deployment of CRT such as those that are technology- and policy-related, and deployment scenarios. We explore some of them and highlight developments in Asia and around the world.

FINGERPRINTING AND WATERMARKING

Digital fingerprinting and watermarking are particularly relevant technical methods for content recognition as they can robustly identify content even if characteristics have changed (for example, if the content has been transformed into a lower-resolution file in a different format). These methodologies can be used to identify digital information of TV or movie content being transmitted over Internet or broadcast.

Watermarking has existed for thousands of years in cases where humans needed to identify authentic works on paper. With modern digital watermarking, a signal is embedded directly into the content; it is imperceptible to humans but detectable by machines. Common applications of watermarking even exist in the Blu-ray standard and most movie content.

Fingerprinting, on the other hand, often involves a methodology that extracts the audio-visual data so that information can be referenced. Fingerprinting may be described as using a mathematical imprint or "understanding" of the audiovisual data. This information is then compared with known databases to confirm if the copy is legitimate.

Content fingerprinting technologies, in particular, represent a nascent but rapidly advancing technology with many applications. It is an extremely exciting field with many new applications and potential deployment in the Asia-Pacific region. It is currently deployed most rapidly for online content.

By these methods, content owners can efficiently and accurately identify their content.

The impact of fingerprinting and watermarking technology is exciting because it points towards the monetization of content over the Internet. It would also curb users from illegally uploading copyrighted material to websites. ISPs and OSPs can make an effort to prevent illegal content from being uploaded and downloaded. Where applied effectively,

content recognition may help to decrease the instances of infringement and prevent inexperienced users from breaking the law.

Follow-on Policy Actions from Recognition Process

Where content identification or recognition has completed successfully and infringing works found, content owners can then decide on a policy action. One method increasingly used in the industry is the "graduated response programme" which educates users and addresses repeat infringers.

DIFFERENCES BETWEEN FINGERPRINTING AND WATERMARKING

DIGITAL WATERMARKS	DIGITAL FINGERPRINTING
Watermarks are inserted into the content.	Fingerprints are extracted from the content.
Can identify specific copies of digital content. For example a different serial number can be put into each copy.	Cannot usually differentiate between two digital copies of the same audiovisual file (as no information is embedded).
Updating is necessary if technology advances.	No updating necessary as extraction depends on sound or images already there.
May be identified and attacked/ erased by pirates with varying levels of success depending on the robustness of the watermark.	Less likely to be attacked.

CONCLUSION

Content recognition technologies show great promise as commerce-enabling tools. Only two forms are discussed briefly above. These technologies can be used in various deployment scenarios to combat piracy and enable the proliferation of legitimate channels that provide consumers with better choices and options to consume content. This technology is nascent but when it is fully deployed could be impactful for content distribution worldwide.

ANNEX I: CONTENT RECOGNITION DEVELOPMENTS IN THE WORLD

Australia

While the primary effort is really to combat online porn, Australian Federal Government has embarked on the next step of its Internet filtering strategy declared in 2008. Senator Stephen Conroy already released the findings of a recently concluded ISP-level Internet filtering trial conducted in Tasmania.

South Korea

Following the changes to the Korean Copyright Act implemented via the Presidential Decree on 29 June 2007, rights holders are now better empowered to enforce their rights, particularly with respect to online infringements. Relevant changes to the law include:

- Requirements for Special Online Service Providers (SOSPs), that is, not ISPs but networks whose primary purpose is to enable file sharing of copyright works (such as web disk sites and cyber lockers), to send warning messages to users of their services demanding takedown of infringing files; and
- Requirements for SOSPs to "take preventive measures" to ensure infringing material is not made available on their networks, when requested by rights holders.

Shortly thereafter, the South Korean Government advised SOSPs that they must now take the following five filtering steps to comply with their new responsibilities under the Act:

- Keyword filtering on actual titles;
- Keyword filtering for folder names and variations of titles;
- Extension filtering; hash code filtering; and
- Content filtering.

Belgium

In June 2004, the country's royalty collections agency SABAM asked for an injunction against Scarlet, a small Belgian ISP, requiring it to prevent infringement by subscribers who were using P2P systems such as KaZaA. In November 2004, the Belgian Court granted SABAM's claim in principle and appointed an expert to determine the practicality and cost of preventing such infringements using technical means. On 28 June 2007, the Belgian Court ordered Scarlet to implement within six months a filtering solution to address peer-to-peer piracy, or pay a penalty of €2,500 per day of default. The case is currently under appeal.

Denmark

In January 2006, an injunction by the Danish Supreme Court required ISP Tele-Denmark Communiclations (TDC) to take steps to prevent copyright infringement on servers hosted on its networks.

Europe

The European Union telecommunications package includes draft language that would require ISP cooperation.

France

Under French President Nicolas Sarkozy, an agreement was signed on 23 November 2007 between French ISPs and the music and movie representatives in order to act directly against the big illegal file-sharers.

The Netherlands

A series of decisions in 2007 hold that hosting providers have an obligation to address the piracy taking place on their network and must disclose the operators of infringing sites.

United Kingdom

The UK government wants the industry to adopt a voluntary solution. However, it has stated on numerous occasions that it is prepared to legislate if such an agreement cannot be reached.

United States

Between November 2007 and February 2008, submissions were made to the Federal Communications Commission (FCC) from National Cable & Telecommunications Association (NCTA), P2P network operator Vuze (November 2007), P2P industry association Distributed Computing Industry Association (DCIA) (February 2008), and the MPAA (February 2008) regarding the use of tools to manage networks.

■ COUNTRIES WHERE SIGNIFICANT CONTENT RECOGNITION DEVELOPMENTS ARE OCCURRING

ADVANCED ACCESS CONTENT SYSTEM (AACS)

The Advanced Access Content System (AACS) is the accompanying license and digital rights management which will allow access to and copying of next generation High Density Digital Versatile Disk (HD DVD) and Blu-ray systems. AACS includes the following key attributes that makes it a reliable system:

- AES-128 content scrambling
- Media Key Block based revocation
- Software renewability
- Enhanced authentication for PC-based implementations
- Support for managed copying and download-to-burn usage models

ANALOG HOLE

The gap in digital content protection technology afforded by digital-to-analog-to-digital conversion. Protected digital content can be limited to devices that respect copy protection controls, but if the digital content is converted to an analog form by a compliant device, another device can be used to convert that analog signal back into a digital form that lacks the copy protections of the original digital material. This creates an analog hole where all copy protections disappear.

BLU-RAY

A next-generation DVD standard, principally developed by Sony, that supports high definition (HD) video and the larger storage capacity that HD material requires. BD uses a 405-nanometer wavelength blue-violet laser instead of the traditional DVD 650-nanometer red laser. The smaller laser wavelength allows the disc to use smaller pits and tighter tracks. It also uses a thinner cover layer (0.1 mm) than a standard DVD. This moves the data closer to the reading lens. All of these factors combine to fit more data on the same size disc. Blu-ray supports 25 GB in a single-layer configuration or 50 GB in a double-layer. Four-layer and eight-layer disc in development can store 100 GB and 200 GB, respectively. This capacity is sufficient for two to four hours of HDTV content on single- and double-layer discs. BD also support MPEG-2, MPEG-4, AVC, and VC-1 format video.

BROADCAST FLAG

A signal embedded in a terrestrial (as opposed to satellite) digital television broadcast that identifies whether the surrounding content can be copied or redistributed by the receiving party. Broadcast flag-compliant digital television equipment would recognize and respect the broadcast flag, preventing any unauthorized actions.

CONTENT SCRAMBLE SYSTEM (CSS)

Content Scramble System (CSS) is the accompanying license and digital rights management which will allow access and copying of traditional Digital Versatile Disks (DVD). CSS prevents movies from being illegally duplicated, protecting the intellectual property of content owners, producers and writers from theft. While the CSS keys and secrets have been exposed for some time, the license is sound and able to support the continued importance of DVDs as a key distribution mechanism. The CSS is undergoing supplementary changes and will allow improved functions for consumers in future.

DIGITAL RIGHTS MANAGEMENT (DRM)

A system that protects content so that only authorized users may access or view it; a technology that enables the secure distribution, promotion, and sale of digital content, especially on the Internet. A DRM usually encrypts a file to prevent unauthorized use and enforces usage parameters such as the period of time the file is viewable and whether or not it may be copied or streamed to another device.

DIGITAL TELEVISION

Television broadcasts and supporting equipment (including television receivers) that use a digital signal rather than the traditional analog form common to NTSC, PAL, and SECAM. Digital television provides better image and sound fidelity than analog television and generally has higher image resolution and multi-channel stereo sound.

DIGITAL VERSATILE DISK (DVD)

A 4¾" (12 cm) high-capacity optical disc standard, introduced in April 1997 as a video delivery format to replace the ubiquitous VHS tape. DVDs commonly carry digital video compressed with the MPEG-2 codec. Even with the occasional digital compression artifact taken into account, a DVD provides a better motion picture recording format than its predecessors: a DVD can hold far more material than a CD or VCD (from 4.7 GB to 17 GB); DVD movies are recorded with more lines of image resolution (480) than videodiscs (˜425)

or VHS tapes (˜250); and DVD audio (sampled at 96 kHz with 24-bits of data per sample) is superior to CD audio (44.1 kHz/16-bits).

- DVD-5: A single-sided, single-layer (SS/SL) DVD capable of holding 4.7 GB. The most common type of DVD.
- DVD-9: A single-sided, dual-layer (SS/DL) DVD capable of holding 8.5 GB.
- DVD-10: A double-sided, single-layer (DS/SL) DVD capable of holding 8.4 GB. The second most common type of DVD. (One must generally flip the DVD over to read the second side.)
- DVD-18: A double-sided, dual-layer (DS/DL) DVD capable of holding 17 GB.

DIGITAL VIDEO BROADCAST (DVB)

Digital Video Broadcast(ing), a European standard for digital television technology and the body that regulates the standard. The DVB Web site is www.dvb.org.

HIGH-DEFINITION TELEVISION (HDTV)

The high definition portion of the DTV (digital television) standard, including 1080i and 720p formats with a 16:9 aspect ratio and multi-channel CD-quality sound. The lower DTV resolutions (480i and 480p) are part of SDTV (standard definition television). Compared to standard NTSC television, the HDTV image has twice the luminance definition – both vertically and horizontally – and is twenty-five percent wider. All told, an HDTV picture contains five times more information than does the standard television picture.

HIGH DENSITY DIGITAL VERSATILE DISC (HD DVD)

HD-DVD (for High-Density Digital Versatile Disc) is a digital optical media format which is being developed as one standard for high-definition DVD. HD-DVD is similar to the competing Blu-ray Disc, which also uses the same CD sized (120 mm diameter) optical data storage media and 405 nm wavelength blue laser. HD-DVD is promoted by Toshiba, NEC, and Sanyo, and backed by four major film studios. (Wikipedia).

P2P (PEER-TO-PEER)

A decentralized system of interconnected computers where each participant can act as a client by downloading material from other systems and act as a server by allowing others to download material stored on the local machine. This contrasts with the traditional client/server architecture, such as is used with FTP, where the client and server roles are separated and each computer generally performs only one of them at a time. P2P is the primary source of Internet-based piracy and copyright infringement. The most famous example was the original version of Napster, which closed down after the courts ruled it contributed to widespread music piracy. Other networks have arisen, sometimes with multiple client programs that allow users to view, find and swap files being shared on the network by others, and to make their own offerings available. Common P2P systems include eDonkey (running on the Overnet peer-to-peer network); Kazaa, Grokster, and iMesh (running on the FastTrack peer-to-peer network); Gnucleus, LimeWire, Mutella, and Phex (running on the Gnutella peer-to-peer network); and Morpheus (running on multiple peer-to-peer networks).

SET-TOP BOX

A television receiver (often with an integrated decoder/descrambler and more recently with an integrated digital-to-analog converter) provided as a self-contained unit. Cable and satellite television systems often use set-top boxes to convert the provided signal into a form that can be viewed on the customer's television, VCR, etc.

UNAUTHORIZED REDISTRIBUTION

"Unauthorized Redistribution" is re-broadcast or retransmission of content without permission of the content owner or broadcaster. Traditionally, this has been through large or moderate scale unauthorized transmission sites that can be addressed through business-to-business negotiations or manageable law enforcement efforts. With the advent of advanced digital technologies, high-speed Internet access and digital broadcast TV, more and more consumers have the ability to become a broadcaster with the touch of a button.

Kroon, Richard. (2006). "Hollywords" See also http://www.hollyword.org and Williams, Jim C. (2005). "Preserving the Viability of Broadcast TV" Asia Pacific Technical Review Journal. Jul-Aug. Asia-Pacific Broadcasting Union (ABU).

notes

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Established in Singapore in 2007, the Centre for Content Protection (CCP) is a consortium committed to advancing innovative technologies that allow consumers to enjoy anywhere, anytime access to their favorite movies and television programs. Regionally-based organizations find the CCP's fortnightly updates on the hottest trends in Hollywood particularly valuable, while companies outside of Asia Pacific gain insights into this complex market that help them to align their strategies to meet customer demand.

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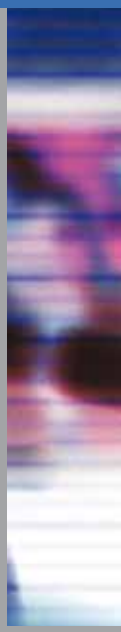

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