

## Technique to Prevent Piracy of Softwares

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### ABSTRACT

Companies suffer heavy losses due to the piracy of their softwares; some techniques are available in the market but none of them still gives us full protection from piracy. This paper will discuss in brief the problems associated with piracy of software and how to implement the Cinavia technology (which is currently used in blue ray players which prevent pirated disks to run on the players) in our computer software so as to protect them from piracy, so that the companies or individuals benefit from it.

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**Keywords:** Cinavia Technology, Software Piracy

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### Introduction

Software Piracy has been a great issue that has been discussed over the past few years. A lot of big companies and software developers have lost a lot of money due to the abundance of software piracy. There have been several laws regarding piracy but only a few people are caught compared to the millions of people who pirate software every day. There have also been different measures that were implemented to lessen the piracy of software.

Some tips are to prevent software piracy such as Code Key, Open source, Hardware Key, Anti-Piracy Software. These are some of the measures that have been implemented or created to stop and prevent software piracy. With the improvement of technology, there are a lot of things people can use to bypass these piracy measures but there are always new and effective things to use against piracy.(1)

There are different types of anti-piracy software that are available for free. Anti-piracy software is used to prevent illegal duplication or illegal use of copyrighted software. There is also an anti-piracy software that prevents hackers from getting into the software and copying it without consent from the copyright owner. Some of them are also already integrated on the disks of the software that contains the program. This may also be for piracy music. The anti-piracy association is also looking for other ways to prevent software piracy. Reporting anti-piracy may

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prevent it from happening. The Cinavia anti-piracy system relies on a special type of watermarking which enables it to stay resident in a recording despite re-recording in the digital or analog domain, transcoding, compression, or other type of transfer. Since 2012 the ability to detect Cinavia signals has been a mandatory feature of all Blu-ray players. (2)

In the Blu-ray environment Cinavia can recognize whether a disc being played has a “theatrical release” watermark. If it does then it knows that the audio was recorded illegally. It can also recognize if a disc has been copied from an original Blu-ray.

The end result is that playing or copying of an unauthorized disc is eventually disabled by the player, be it a hardware Blu-ray player such as the one present in a PlayStation 3 for example, or a software based player commonly loaded onto a PC.(3)

Cinavia, originally called Verance Copy Management System for Audiovisual Content (VCMS/AV), is an analog watermarking and steganography system under development by Verance since 1999, and released in 2010. In conjunction with the existing Advanced Access Content System (AACs) digital rights management (DRM) inclusion of Cinavia watermarking detection support became mandatory for all consumer Blu-ray players from 2012. The watermarking and steganography facility provided by Cinavia is designed to stay within the audio signal and to survive all common forms of audio transfer, including lossy data compression using discrete cosine transform, MP3, DTS, or Ogg Vorbis. It is designed to survive digital and analogue sound recording and reproduction via microphones, direct audio connections and broadcasting, and does so by using audio frequencies within the hearing range. It is monaural and not a multichannel codec. Cinavia's in-band signaling introduces intentional spread spectrum phase distortion in the frequency domain of each individual audio channel separately, giving a per-channel digital signal that can yield up to around 0.2 bits per second—depending on the quantization level available, and the desired trade-off between the required robustness and acceptable levels of psychoacoustic visibility. It is intended to survive analogue distortions such as the wow and flutter and amplitude modulation from magnetic tape sound recording. On playback no additional audio filters are used to cover up the distortions and discontinuities introduced. The signal survives temporal masking and sub-band coding by operating on the fundamental frequency and its sub harmonic overtones, and by dealigning the phase relationship between the strongest signal and its sub harmonics. Each phase discontinuity introduced by the encoder will result in a corresponding pulse of wideband white noise, so a

further range of additional distortions are introduced as a noise mitigation strategy to compensate. The desired hidden digital data signal is combined in the distortion step using a pre-determined pseudorandom binary sequence for audio frame synchronization and large amounts of forward error correction for the hidden data to be embedded. The watermark is only embedded when certain signal-to-noise ratio thresholds are met and is not available as a continuous signal—the signal must be monitored for a period of time before the embedded data can be detected and recovered. Extraction of the hidden signal is not exact but is based on recovering the convolutional codes through statistical cross-correlation. The Blu-ray implementation of Cinavia is designed to cover two use-cases: the first is the provision of a Cinavia watermark on all movie theater soundtracks released via film distribution networks; the second use-case is for the provision of a Cinavia watermark on all Blu-ray releases that points to the presence of an accompanying AACS key. If a "theatrical release" watermark is detected in a consumer Blu-ray audio track, the accompanying video is deemed to have been sourced from a "cam" recording. If the "AACS watermark" is present in the audio tracks, but no accompanying and matching AACS key is found on the disc, then it is deemed to have been a "rip" made by copying to a second blank Blu-ray disc. As of March 2012 known hardware players which can detect Cinavia watermarks include the PlayStation 3 (began with v3.10 System Software), as well as newer Blu-ray players. (3)

### **Use of Cinavia Technology**

Some releases of movies, television shows and other professionally produced video (such as those shown in movie theatres, on commercial airliners, and in hotels' "on-demand" movie services) are intended for duplication and playback on professional equipment only.

Other releases (such as most Blu-ray Disc, DVD, and authorized downloads over the Internet) are meant for use on consumers' in-home and mobile devices, but are not meant for copying by consumers, or are only permitted to be copied in limited ways (for example, to a limited number of computers, recordable discs, or devices). Cinavia technology is used in Blu-ray Disc players to identify and limit the use of copies of these movies, television shows, and other professionally produced videos that have been made without the permission of the copyright owner. (4)

### **Working of Cinavia Technology**

Movies protected by Cinavia technology carry inaudible codes embedded by the copyright owner in their audio tracks that indicate where and how they are allowed to be used.

For example, movies that are being released to theaters can carry a Cinavia code that indicates that they are supposed to be duplicated by professional replicators and played back on professional projection equipment only.

Movies that are released on Blu-ray Disc, DVD, or by authorized download services, can carry a different Cinavia code, indicating that these movies are intended for use by consumers, but with limitations regarding whether or how they can be copied.

The Cinavia codes are designed to stay in the audio tracks wherever they appear, including after they are copied, converted to different formats, or captured by a camcorder.

Blu-ray Disc players read Cinavia codes from the audio track of video that they are playing or copying and may limit the use of the video when certain unauthorized uses are identified. Playback or copying of unauthorized copies may be stopped or audio may be muted, depending on which Cinavia code is found and what operation is being performed. This may include limiting the unauthorized use of the audio tracks that accompany professionally produced videos in home movies and other personal recordings. Whenever the use of content is limited due to a Cinavia code, an explanatory message is provided on the video screen or on the front panel of the Blu-ray Disc player.

In any case, you can rest assured that Cinavia technology is not “watching” what you are watching. By design, it cannot collect or transmit information about you, your viewing habits or media selections. Cinavia codes are not individualized to you, the media, or the devices that you own and never contain any personal or personally identifiable information. Cinavia technology is a kind of new protection for movies from theaters and disc releases in DVD & Blu-ray, aiming to limit the use of copies of movies, television shows, and other professionally produced videos that have been made without the permission of the copyright owner. It requires two parts to work: a proprietary imperceptible audio watermark, and a piece of hardware which is able to detect that watermark. When media with the watermark embedded in the audio track is played back on a system with Cinavia detection, its firmware will detect the watermark and check that the device on which it is being played is authorized for that watermark. If the device is not authorized, a message is displayed stating that the media is not authorized for playback on the device and that users should visit the Cinavia web page for more information. Depending on the device and firmware, once the message is triggered, the audio may be muted, or playback may stop entirely. This is the place where you can find all the relevant

info on the new protection for audio-video called Cinavia. It is reported to be used for protection of movie from theaters and disc releases on DVD & Blu-ray. It consists of a multi-level watermark that is embedded in the audio track and, while being theoretically transparent (not-audible) for the listener, it is supposed to resist transformations of the audio stream like re-compression, analog playback & record, re-sampling, pitch shift, etc. The base levels are analog, but on the top level there's the watermark payload that contains some restrictions regarding the playback environment. (4)

### **Elements of Cinavia Technology**

The protection has two elements (one cannot work without the other).

1. The watermark embedded in audio- video content.
2. Cinavia enabled player that will refuse to play the content if it does not match the restrictions.

#### *Examples*

1. A movie copy made with a camcorder in a theater that contains Cinavia (THEATRICAL\_NO\_HOME\_USE) watermark will stop playing within about 1 minute on a PlayStation 3 and display a Message 1.
2. An unprotected (no AACS) Blu-ray backup of "The Losers" (US release) will mute the audio after about 20 minutes with Message 3 (for not coming from a TRUSTED\_SOURCE). We consider that it is useful for the users to know about discs that contain Cinavia protection and about players that have detectors for it. The bad news is Cinavia technology from Verance Corporation will become mandatory for all Blu-ray Disc players as of February 1, 2012. There have been identified a couple of workarounds (listed in the order of usability): Use the audio track from the DVD release of the same movie, particularly handy if it was a Blu & DVD Combo release. (5)

#### *Advantages*

1. Good quality (DVD audio track is probably an AC3, cannot compare to the lossless of a BD but still good, 5.1 channels)
2. Works on any Cinavia-enabled player, because the audio has no watermark (future proof).
3. So far, there are rather few movies with Cinavia on DVD.
4. Some Blu-ray releases are combo BD/DVD(6)

#### *Disadvantages*

1. Needs the DVD version as well (may be hard to source a 'clean', matching DVD).

2. Needs remixing skills.
3. The DVD version may be a different mix, so the whole track may not be 100% in sync with Blu-ray release.
4. Some movies, such as Takers, has Cinavia watermark on both Blu-ray and DVD, making this workaround not applicable.

Embed DTS core in a PCM track, like in the DTS CDs. There is a special way in which DTS compressed can be stored in a WAV file, for example, and eventually written on a CD-audio. A player such as VLC will see there is a DTS track inside and decode it correctly; others may not know that and will produce a hissing noise (static). So apart from embedding DTS sound in a PCM track, one absolutely needs an external AV-receiver to decode it. (5)

#### *Advantages*

1. Very good quality, the bitrate of the DTS track is higher than of an AC3 one, from a DVD.
2. No detectable by the Cinavia enabled player if it is set to pass-through the audio to an external decoder. This way the information about the source of content is lost and the external decoder has no reason not to decode the audio.

#### *Disadvantages*

Well, there could be a reason: if it does not know how to extract DTS from PCM. We tried this a while ago, but could not find an AV-receiver to cope with the DTS-in-PCM track, so we only mentioned it now to present you all the possibilities, even theoretical ones. This is more like: what a nice idea, too bad I cannot use it". Apparently there is another trick to be tried on a PS3 (only) and it needs you to select optical cable as output in Sound settings and checking all the sound formats (weird and dangerous! See the warning PS3 will display there), then also select the multiple output option. (7)

#### *Advantages*

1. We could not manage to replicate it on our PS3.
2. Seems more like a bug in the Cinavia detector of PS3 and it has been reported that it has been patched in recent firmwares.

The first solution to disable Cinavia came from DVDFab. It is a way of creating backups so they don't trigger Cinavia. This solution is useful for PS3 users who are the most affected by Cinavia so far. What makes it a great solution is that the disc is much like the original (with menus), a protected backup so the Cinavia-enabled player will see it as trusted source and will play it back

just like the original. People have made protected (isos) backups in the past, but those had the disadvantage that they only worked with the programs that made them; well, these protected backups are supposed to work on standalone players too.(8)

Technical details: the discs created are called BDMV-REC as they are AACS protected recordable BDMV. Another solution would be AACS protected BDAV, like the ones produced by Japanese BD recorders.

#### *Requirements*

1. A PlayStation 3 console with a firmware version smaller or equal to 4.00!
2. Original Blu-ray disc with Cinavia watermark. DVDFab and DVDFab Passkey will tell if you have such a disc
3. a BD-RE (recommended for initial tests) or BD-R disc to store the protected backup
4. a BD writer
5. DVDFab and updated writing software. DVDFab checks for it anyway

#### *Advantages*

1. It is a solution to disable Cinavia, exactly as it is disabled for the original disc, due to (AACS) protection layer being active.
2. DVDFab does all the tricks involved to create such a protected backup at a push of a button.
3. The disc can preserve all the original features like menus, interactivity, BD-Live.
4. Broad firmware support: PS3 users with firmware from 1.60 and up to 4.00 can use BDMV-REC discs.
5. At any time, DVDFab or DVDFab Passkey can be used to remove the protection, if you need to.
6. This is kind of an official solution, because it involves support from AACS standards, the same standards that force adoption of Cinavia

#### *Disadvantages*

1. Due to the change in AACS LA licensing, starting with firmware 4.10, PlayStation 3 have degraded the status of Protected Backups (BDMV-REC) to regular copies without the power to disable Cinavia. They are no more in the Trusted Source list.
2. BDMV-REC is not implemented by all players. BD Players implemented Blu-ray standards as they saw fit to market their products. Not all of them have implemented the standard that

BDMV-REC is based on, AACS Recordable BDMV, fully. PS3, being one of the best players, did.

3. If not on PS3, we encourage users to check the playback support for “AACS protected recordable BDMV” either with BD Player support or with a BD-RE.
4. PC players support protected BDAV, but not BDMV-REC.
5. Cinavia is not removed, just disabled. Well, whatever works we tried to provide you with a solution ASAP and this was the quickest.

Rant: While there was no technical need, we implemented this solution so only original discs could be backed up with this method. Unfortunately, AACS LA didn't seem to notice that or they were set not to allow people to back up their own, purchased, discs at any cost, including the change of licensing in the last minute, before the “big launch”, plus the change in code of PS3 and other players that have Cinavia implemented already. Too bad, that makes us even more determined to remove the watermark. We were planning to add support for the above-mentioned protected BDAV which would give a much broader adoption among BD Players, without having all the features: no menu, no interactivity, no BD-live, simply a Movie-only format. But since all AACS-protected Recordable have been degraded it does not make much sense now.

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