

# Privacy Principles for Digital Watermarking

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Digital watermarking is a technology that embeds information, in machine-readable form, within the content of a digital media file. This paper offers principles to address privacy considerations that may arise when the information communicated by digital watermarks corresponds to individual consumers or users. CDT intends for the principles to provide guidance for those designing and deploying digital watermarking applications to take privacy into account.

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## ▣ Introduction

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Digital watermarking technology is a general-purpose technology with a wide variety of possible applications. The technology offers a means of conveying information inside a digital media file (for example, inside a photo, movie, or song). It frequently is used to signal basic identifying information about the specific media file in which it is contained, much like a file header does.

Digital watermarking does not inherently pose risks to privacy. Over the last decade, it has been widely deployed in numerous digital files for a range of purposes, and CDT is not aware of any cases where its use has contributed to significant privacy controversies or abuses. Like many technologies, however, it could raise privacy issues if deployed in ways that fail to take privacy questions into account. This paper seeks to offer a set of principles for addressing potential privacy consequences when deploying digital watermarking applications.

The first section below provides some basic background on how digital watermarking works and outlines the general elements of typical digital watermarking applications. The second section explains the intended scope of the principles that follow, distinguishing individualized watermarks (watermarks that correspond to an individual user, device, or transaction) from non-individualized watermarks and non-watermark metadata. The third section suggests specific privacy principles for digital watermarking applications. The principles fall into eight categories:

1. **Privacy by design** – address privacy considerations in the early design and planning phases of digital watermarking applications, not late in the process as an afterthought;

- 2. Avoid embedding independently useful identifying information directly in watermark** – so that even if unauthorized third parties learn how to read the watermarks, no meaningful information will be exposed;
- 3. Provide notice to end users** – disclose the existence and other key information about individualized watermarks, with a prominence appropriate to the extent and likelihood of any possible privacy impact;
- 4. Control access to reading capability** – so that members of the public who happen to obtain a watermarked file will not have easy access to the devices or software needed to read the watermarks;
- 5. Respond appropriately when algorithms are compromised** – reconsider how much reliance to place on watermarking systems whose workings have been exposed, particularly if there is a risk that watermarks could be altered or forged;
- 6. Provide security and access controls for back-end databases** – adopt rules and security safeguards to protect databases containing information about individuals from unauthorized access;
- 7. Limit uses for secondary purposes** – design watermarking applications to avoid “mission creep,” by collecting, retaining, and disclosing individualized information only as necessary for the application’s intended purpose; and
- 8. Provide reasonable access and correction procedures for personally identifiable information** – so that individuals have reasonable opportunity to correct inaccuracies in the data stored about them.

In developing the principles, CDT consulted with representatives of companies in the digital watermarking business and with interested privacy advocates. The principles themselves, however, were drafted by CDT and reflect its own views.

This paper focuses specifically and exclusively on privacy issues raised by digital watermarking. It does not attempt to assess any other policy considerations that may relate to digital watermarking, nor to examine policy implications of non-watermarking technologies. CDT has, however, previously developed privacy principles relating to Radio Frequency Identification (RFID)

technology,<sup>1</sup> online authentication,<sup>2</sup> and personal identification documents and systems.<sup>3</sup> CDT also has analyzed questions, not limited to privacy issues, raised by encryption-based digital rights management (DRM) technologies.<sup>4</sup>

## ▣ Basics of Digital Watermarking

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Digital watermarking is technology that embeds machine-readable information within the content of a digital media file (image, audio, or video). The information is encoded through subtle changes to the image, audio, or video. Much like watermarks on stationary, these changes typically would not be noticeable to a person viewing or listening to the content. Indeed, digital watermarks often are not perceptible by humans at all, but rather are designed to be detected and decoded only by machines specifically programmed to do so.

Digital watermarking can be used to embed various types of data, depending on the particular application and intended use. For example, a watermark in a digital movie file might simply identify the name or version of the movie. Alternatively, it might convey copyright or licensing information from the movie's creator. Or it might embed a customer or transaction number that could be used to identify individual payment or transaction data relating to that particular copy of the movie. But the number of bits that can be contained in a watermark itself today is typically modest – enough to provide some basic codes or identifiers, but not enough to include the equivalent of a full sentence of text.

The general elements of a digital watermarking system are as follows.

- **Embedding of watermark in content** – Every watermarking application starts by placing a watermark into digital content. This involves modifying the content using a special algorithm. The algorithm translates the data to be conveyed by the watermark into specific, subtle modifications to the content.
- **Subsequent reading of watermark by device/software** – Every watermarking application includes some capability for the embedded watermarks to be subsequently recognized. Recognizing the watermark

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<sup>1</sup> CDT Working Group on RFID: Privacy Best Practices for Deployment of RFID Technology

<http://www.cdt.org/privacy/20060501rfid-best-practices.php>

<sup>2</sup> Authentication Privacy Principles Working Group: Privacy Principles for Authentication Systems

<http://www.cdt.org/privacy/authentication/030513interim.shtml>

<sup>3</sup> Privacy Principles for Identity in the Digital Age

<http://www.cdt.org/security/identity/20080108idprinciples.pdf>

<sup>4</sup> Evaluating DRM: Building a Marketplace for the Convergent World

<http://www.cdt.org/copyright/20060907drm.pdf>

requires knowledge of the algorithm used to embed it, because the reader device or software needs to know what modifications to look for. Therefore, readers are system- or vendor-specific; there are no readers capable of recognizing and deciphering all watermarks from all watermarking vendors.

- **Back-end database for determining meaning of watermark** – Most watermarking applications involve maintaining a database for storing and looking up data associated with specific watermarks. For example, the information contained in a watermark itself might be simply a serial number, while the database would enable that serial number to be correlated with rights information or a specific consumer. Similarly, the information in a watermark might consist of some type of coded message, requiring access to the database to decode its meaning.
- **Actions triggered upon reading of watermark** – In many watermarking applications, the recognition or reading of a watermark triggers or enables some type of action. Some actions may occur automatically, via appropriately programmed hardware or software that looks for watermarks and responds in predetermined ways. Other actions may depend on the individualized decisions and responses of people to whom the information in the watermark has been communicated. Examples of actions that could be taken in response to reading a watermark include:
  - Reporting or recording certain information about how the watermarked media is being transmitted, accessed, or used.
    - EXAMPLE: Broadcast monitoring equipment in use today detects watermarks in broadcasts and uses them to generate automatic reports about when, where, and how often specific content is being aired.
    - EXAMPLE: Web crawlers or media player devices could look for watermarks in content they crawl or play, and then record information about where and when specific marked files are found or played.
  - Providing information to the individual user.
    - EXAMPLE: A media player device, upon reading a watermark in a file the user is accessing, could display additional information that might interest the user, such as metadata (information about the content), a special commercial offer, or confirmation that the content is genuine and has not been altered.
  - Enabling or disabling access to particular capabilities or content.

- EXAMPLE: An online service, software program, or device could refuse to display files containing certain watermarks; could refuse to permit copying of watermarked files; or could enable copying or other advanced features for watermarked files only.
- EXAMPLE: An online service, upon reading a watermark in content a user is trying to access, could provide the user with an updated or authorized version of the content.
- Triggering an investigation, complaint, or even legal measures concerning a particular user or distributor of watermarked content.
  - EXAMPLE: Watermarks embedded in infringing copies of copyrighted media content could enable copyright holders to trace the copies back to particular users or distributors, and potentially to launch legal action.

## ▣ Focus and Scope of Digital Watermarking Privacy Principles

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The principles below focus primarily on the use of individualized digital watermarks in digital media products.

### 1. INDIVIDUALIZED (TRANSACTIONAL) WATERMARKS VERSUS GENERIC (NON-TRANSACTIONAL) WATERMARKS

Many watermarking applications today embed data that can help identify a class of files – say, photos owned by a particular professional photographer, or songs distributed by a particular music store, or copies of a particular movie. In this kind of application, the watermarks do not identify or aid in identifying any individual transaction, consumer, or device. This kind of watermarking could be termed “generic” in the sense that identical watermarks (corresponding to, for example, the name of the photographer, music store, or movie) are embedded in many separate digital media files. The watermark signals that a file belongs to a general class, but does not distinguish the file from other members of that class.

Privacy questions surrounding digital watermarking, however, have been raised mainly with respect to applications in which the data contained in watermarks corresponds to individual transactions, consumers, or devices. In applications of this type, different copies of the same digital content (the same movie, for example) are likely to contain different watermarks. Accordingly, the

watermarks might signal something about the individual uses or users of the watermarked files.

- **EXAMPLE:** Copies of movies distributed to Academy Award voters are watermarked in order to discourage those voters from further distributing the movies they receive. Each copy contains watermarks that can be used to identify the individual voter who received that particular copy.

The principles below are aimed first and foremost at digital watermarking applications that embed such individualized information. This document will use the term “individualized” to describe this kind of watermarking.

The focus here on individualized watermarking is not intended to imply that “generic” or non-individualized watermarks can never under any circumstances raise privacy issues. For example, one could imagine that generic watermarks signaling the titles of movies could assist a person’s media player device or software in identifying the titles of the movies the person watches. The device or software then could track the person’s viewing habits, building a profile over time and perhaps even “phoning home” over the Internet to report that information to a third party.

Significantly, however, in this scenario the use of the digital watermark is almost entirely incidental. The information contained in the watermarks – the titles of the movies – is very likely written into file headers or similar non-watermark metadata as well. So the device or player seeking to “phone home” viewing data would not need to rely on the watermark to determine which movies users are viewing; it could get the same information from other metadata that is already common in digital media files.

In short, a privacy concern may arise whenever media players record or share information about users’ media consumption, but the use of generic digital watermarks does not significantly exacerbate that concern. CDT would urge makers of media player devices and software to consider privacy issues carefully before implementing usage-tracking capabilities. Some of the principles below – particularly notice to end users and limiting secondary uses – would be directly relevant and indeed crucial. But the principles set forth here are not directly aimed at issues of media player functionality in the absence of some link to individualized digital watermarks.

## **2. DIGITAL WATERMARKING VERSUS OTHER (NON-WATERMARK) METADATA**

The principles below focus on digital watermarking technology. Digital watermarking, however, is not the only means of recording or signaling

information about or associated with a digital media file. File headers are a particularly common example of an alternative means. Many digital media files include, in addition to the bits needed to render the particular image, audio, or video, some bits in the file's header that provide further information about (for example) the contents or source of the file. As with digital watermarks, file headers can in principle record and convey individualized information. Also like digital watermarks, the presence and content of the file header metadata may not be apparent to a person viewing or listening to the digital media file in question.

The main difference between digital watermarks and other types of metadata is that digital watermarks are embedded within the data constituting the image, audio, or video, rather than being appended to it. This can make the presence of digital watermarks more difficult to discern than other metadata, since the watermarks, unlike file headers or similar metadata, do not consist of separate bits that a person analyzing the media file could readily notice and try to read.

Most importantly, however, embedding the information in the media content itself tends to make the information more persistent. Because ordinary metadata is appended to the visual or auditory portions of a media file, it can be more readily stripped away while leaving the core content intact (though some reader or player devices could be programmed to reject content that has been stripped of particular metadata). Converting the content from one format to another – and in particular from digital to analog – often results in the loss of non-watermark metadata. Likewise, excerpting from media, such as taking a short clip from a longer video, could result in the excerpt and the metadata being separated.

Digital watermarks, at least in certain implementations, are intended to be more persistent. Providers of the technology claim it can survive format conversion, since format conversion does not aim to change the core perceptible characteristics of the media content. In addition, watermarks can be embedded at regular intervals throughout the content, so that even isolated excerpts (unless very short) would carry a readable watermark. This kind of persistence may have a variety of uses and benefits. But it also means that where privacy concerns arise, end users have little ability to respond by deleting or anonymizing the information in question. Any individualized information embedded in the file is likely in there for good.

Despite these differences, digital watermarking and other forms of metadata in some cases may provide similar functions from the perspective of end users of digital media. File header metadata, no less than digital watermarks, may be

used to carry individualized information within a file, and the files' owners may not realize the information is there.

- **EXAMPLE:** In mid-2007 it was revealed that the file headers of songs purchased on Apple's iTunes music store contain information identifying the purchaser's name and account e-mail. This raised concerns among privacy advocates, who pointed out that such data had previously been disguised by Apple's digital rights management (DRM) encryption but was now in cleartext form (i.e., readily understandable, not coded or disguised) in Apple's new DRM-free songs. Customers might not realize that their files carry such information.

Thus, many privacy questions raised by digital watermarks may apply to non-watermark metadata as well. Indeed, in some cases the privacy issues facing non-watermark metadata may be greater, as the data in watermarks often cannot be deciphered without access to specialized readers and a secure back-end database. Non-watermark metadata may be easier to decipher by parties for whom it was not intended.

In short, while non-watermark metadata is not the focus of this document, it can raise privacy issues when it involves the inclusion of individualized data in media files. The principles below focus on digital watermarking, but many principles may be applicable to other types of metadata as well.

## ▣ Privacy Principles for Digital Watermarking

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Individualized digital watermarking of media files – meaning, as discussed above, watermarking that can be used to associate a file with an individual transaction, consumer, or device -- may be useful for a variety of legitimate applications. It also can raise privacy questions.

Perhaps the most frequently raised privacy concern is the idea that watermarks could enable increased monitoring, recording, or disclosure of an individual's media purchases or usage. The fear, in other words, is that watermarking could compromise an individual's ability to use and enjoy lawfully acquired media on a private, anonymous basis. Particular media usage choices could be sensitive if exposed, or could contribute to the creation of profiles of individuals' overall media purchase and consumption habits, which might be used in ways that the individuals do not expect or understand. Other possible privacy concerns include the risk that watermarks could contain personal information that could be exposed to third parties, and the risk that errors in or manipulation of watermark data could paint a false picture of an individual's behavior and perhaps lead to adverse consequences, including potential legal liability.

The following principles are intended as guidelines for implementing digital watermarking applications in ways that minimize risks to privacy. The principles are not intended as a blueprint for legislation or regulation. Rather, similar to privacy principles CDT previously has developed for radio frequency identification (RFID) technology and identity authentication systems, CDT offers these principles in the spirit of “best practices,” in the hope that they will provide guidance for companies seeking to deploy digital watermarking technology without undermining consumer privacy. CDT believes that implementing and adhering to these principles in good faith should address the main potential privacy concerns relating to digital watermarking and promote consumer confidence in the current marketplace for digital media.

CDT’s suggested principles are as follows.

#### **1. PRIVACY BY DESIGN.**

Privacy considerations should be incorporated into the design of digital watermarking applications.

- Any company developing a digital watermarking application should consider and address privacy issues in the early design and planning phases. Privacy questions should not be raised as an afterthought only at the end of the process or when privacy advocates have started to raise concerns. This document is intended to provide guidance as to the types of issues that should be considered and addressed in advance of implementation.
- Where multiple parties will participate in or control different elements of a digital watermarking application, the application’s privacy design needs to include a plan for ensuring adherence by all relevant parties. Contracts establishing the parties’ roles in implementing the watermarking application should include appropriate privacy-related commitments for each.
  - **EXAMPLE:** A watermarking company is working with an online music store to design and implement a system to watermark songs with individual transaction information. The companies should think through in advance how to allocate responsibility for ensuring compliance with sound privacy principles, and include appropriate commitments in their contracts with each other and with any subcontractors. The watermarking company may commit not to embed independently identifiable information directly in watermarks; the music store may commit to provide notice to users; and a subcontractor used to operate the back-end database may commit to provide security and access controls.

Without such commitments, none of the parties would be in a position to say that the system as a whole incorporates privacy considerations into its design.

## **2. AVOID EMBEDDING INDEPENDENTLY USEFUL IDENTIFYING INFORMATION DIRECTLY IN WATERMARK.**

Companies deploying digital watermarking applications should seek to ensure that the watermarks themselves do not contain independently useful information about individuals. That way, even if the watermarking algorithm is hacked and unauthorized third parties gain the ability to read the watermarks, no meaningful information will be exposed.

- The data actually embedded in a watermark should not include any information that is personally identifiable (i.e., that identifies or is sufficient to enable the identification of a specific individual) or potentially sensitive. Rather, a watermark that contains individualized data should consist merely of a random serial number or other code, which can be correlated to more meaningful information via a back-end database. (An exception to this principle could arise in the uncommon case of a watermarking application affirmatively intended to make personal information generally readable – but clearly any such application would require the full understanding and express consent of individuals whose information is embedded in the watermarks.)
- Companies should avoid using a consistent serial number or code to identify multiple files associated with a particular user or device, unless permutating the codes would require significant additional tracking infrastructure. Specifically, in contexts where the provider of a product or service intends to record and store individual transaction or usage data on an ongoing basis in any event, watermarks need not and should not use a consistent code for each user. A consistent and recurring identity code effectively becomes a pseudonymous identifier for an individual. If exposed, it could raise privacy issues by, for example, enabling observers to link various media files as belonging to the same end user and to build a profile of that individual's media usage. On the other hand, constantly changing identity codes may not make sense for applications that otherwise require no ongoing collection and storage of transaction or usage data. Building additional communications and database infrastructure just to keep track of dynamically-assigned watermark codes would not be a net plus for privacy.
  - **EXAMPLE:** An online music download service embeds watermarks in each downloaded song file. The watermarks are intended to convey the identity of the customer. The service already maintains a database

tracking what songs each customer has purchased. Instead of using a consistent customer number in the watermarks for all of a particular user's song files, the service provider should vary the numbers. Since transaction data is already being tracked in the database, keeping records of the different numbers that correspond to each user should not have any additional privacy impact.

- **EXAMPLE:** A DVD burner device sold to consumers inserts watermarks each time it burns files to a disc. The information contained in each watermark is simply the serial number of the DVD burner. The manufacturer maintains a database of serial numbers for the devices it has sold, but the DVD burner has no capability to keep usage logs and "phone home" additional information to the database. It would not be advisable from a privacy perspective to build in such capabilities just to avoid using a consistent serial number in the watermarks; in this case, using a single serial number that does not need to be updated for each new transaction enables the watermarking application to be implemented with less tracking of individual behavior.

### **3. PROVIDE NOTICE TO END USERS.**

End users should be provided with notice concerning individualized digital watermarks embedded in their media files.

- In general, notice should explain the existence of the watermarks; what information the watermarks contain or convey; and the intended purpose for which the information will be used. Notice need not and indeed should not include technical details concerning how the watermarks work, such as the algorithms used to embed or read the watermarked information.
- Where digital watermarks will be used to track, record, or communicate information about an end user's media usage, that fact should be separately highlighted and communicated to users.
- Where digital watermarks will be used to trace and identify possible copyright infringers or otherwise provide accountability for illegal behavior, notice should include a warning to end users to secure their watermarked content against unauthorized access. This is important because if anyone with access to a file makes and circulates an illegal copy, that copy and all subsequent illegal copies will be traceable via the watermark back to the original owner and could expose the owner to legal claims.

- At a minimum, notice should be provided at the beginning of a relationship between an end user and a media distributor. For example, a user signing up for a music download service should be notified about the presence of watermarks at the time of signup. The prominence of the notice should be proportional to the extent and likelihood of any possible privacy impact. Disclosure of watermarks certainly should be included in the applicable terms of service, privacy policy, or similar user-facing policy, but more conspicuous methods of notice should be considered as well.
- In addition, media distributors should seek to include forms of notice that stay with the media file on an ongoing basis. Acceptable manners of doing this may vary depending on content type; a brief visual disclosure or URL at the beginning of a movie could be useful, but a brief disclosure at the beginning of a song would likely interfere substantially with the ongoing enjoyment of the song. On the other hand, disclosures or links relating to watermarking easily could be included in a song's file header metadata, where user-end software could recognize them and inform interested users (or not) based on the user's preferences.
- Responsibility for providing notice should lie with the entity that has the direct relationship with the end user. Other parties involved in deploying a digital watermarking application should use contractual provisions or other means to encourage the entity with the direct end user relationship to provide notice.

#### **4. CONTROL ACCESS TO READING CAPABILITY.**

Companies embedding individualized watermarks in digital media should carefully control access to devices or software capable of reading the watermarks. Generic or non-individualized watermarks – for example, watermarks identifying an image's creator or licensing policy for those who might want to use it – sometimes require widespread access to watermark reading capability. But applications involving individualized watermarks should not; for most purposes, there is no reason to expose information about individual end users, end user devices, or transactions to any member of the public who happens to obtain watermarked media files.

- Developers of watermarking applications should, in licensing others to make or operate reader devices or software, include strict contractual limitations on further or secondary dissemination of readers. Licensees or users of readers should not be allowed to subcontract watermark detection/reading functions without similar contractual restrictions or perhaps even express permission from the original licensor of the technology.

- Developers of watermarking applications should consider systems in which readers provided to customers or other authorized third parties have carefully limited capabilities. The third-party readers might be able to decipher a portion of the watermark only, not the entire watermark. The first portion might alert the reader's user that additional watermark data is present, but determining the contents of that data would require contacting the application provider. Alternatively, the readers might be able to decipher certain watermarks, while having no ability to read or even detect other watermarks that might be present in the same file.
  - EXAMPLE: An online movie store inserts watermarks identifying the name of the store and confirming the existence of additional watermark data with more detailed transactional information. Devices capable of reading these first-level watermarks are made available to copyright owners, who can then look for the marks in file copies they find on peer-to-peer networks or elsewhere. These devices are unable to read the second-level watermarks, however, so copyright owners with a valid reason for wanting to obtain the individualized information need to request that data from the movie store or the watermarking application provider. This arrangement permits the reading capability for the more sensitive portion of the watermark to be tightly controlled and limits the number of parties capable of reading the entire watermark.
- Developers of private-sector watermarking applications should not provide government or law enforcement authorities with reader devices or software to decipher individualized watermarks that private entities have deployed for their own, non-governmental purposes. When government authorities need access to such watermarked information in particular files, they can obtain that information through the company implementing the watermarking system (or other entity responsible for deploying the watermarks) using appropriate legal process.

##### **5. RESPOND APPROPRIATELY WHEN ALGORITHMS ARE COMPROMISED.**

Careful control of reader devices cannot guarantee that the techniques and algorithms behind a digital watermarking system will never be compromised. Whether through the determined efforts of hackers or through some kind of leak, there remains a risk that the inner workings of a digital watermarking system will be exposed. When this occurs, makers and users of applications involving individualized watermarks should carefully reconsider how much reliance they place on the potentially compromised system, as the watermarks potentially could be read, stripped, or even altered or forged by third parties.

- If the techniques behind certain watermarks have been exposed to the point that third parties may be able to forge or alter the contents of the watermarks, the parties who created or deployed the watermarking application should disclose this fact publicly via their Web sites. Media distributors that sold files containing the now-compromised watermarks should consider providing similar disclosure or linking to the disclosure of the watermarking provider. This factual information could be important in any court case or other proceeding in which a party seeks to rely on or contest the reliability of an individualized watermark.
- Parties who detect and use information in watermarks should be extremely cautious about continuing to use detection of the compromised watermarks to trigger actions with particularly serious consequences, such as filing lawsuits alleging copyright infringement.

#### **6. PROVIDE SECURITY AND ACCESS CONTROLS FOR BACK-END DATABASES.**

Creators of digital watermarking applications should carefully protect the security of and control access to any back-end database or databases containing information about individuals.

- There should be clear rules governing authorized use of the database. Rules should include limits on who may access the database and for what purposes.
- The entity operating the database should establish and maintain security safeguards to protect against unauthorized access. Safeguards should be appropriate to the amount and sensitivity of the information stored in the database. Information security standards established by the Federal Trade Commission for financial institutions (16 C.F.R. Part 314) pursuant to the Gramm-Leach-Bliley Act may provide a useful model.
- Government authorities should be provided access to information in the database only with appropriate legal process.

#### **7. LIMIT USES FOR SECONDARY PURPOSES.**

Digital watermarking has various uses, and each watermarking application needs to be designed to facilitate its particular use. But the design of a watermarking application and the policies governing its implementation should seek to limit, not facilitate, future use of individualized watermark information for purposes not related to the application's original mission.

- Digital watermarking applications should refrain from collecting, recording, or reporting back detailed information about individuals' media usage except where necessary for an application's core purpose and with the individuals' consent. For example, where watermarks are intended to provide accountability and deterrence for unauthorized file sharing or copying, there is no need to record or communicate details about each instance of authorized use.
  - EXAMPLE: An online movie store watermarks movies with individual transaction data. In the event that a customer makes and distributes infringing copies of a purchased movie, the watermarks enable investigators to trace those copies back to the customer. Given this purpose, there is no reason for the watermarking application to record or transmit information about how many times or on what devices the customer chooses to watch the movie in the customer's own home.
- Individualized data should not be retained indefinitely but rather should be deleted when the purpose behind its collection and storage has been fulfilled (or as soon thereafter as may be permitted, if the data is subject to data retention requirements prescribed by law).
- Parties involved in the implementation of a digital watermarking application should avoid unnecessary onward transfers of individualized information recorded in or collected via the watermarking application. Where individualized information is shared with or transferred to other parties, such sharing should be made subject to contractual provisions requiring those parties to provide an equivalent level of privacy protection and treatment consistent with these principles.
- Parties involved in the implementation of a digital watermarking application should avoid disclosing non-aggregated information about individuals' purchases or usage of specific media products without the individuals' express consent. U.S. federal statutes governing video rental and cable providers, which restrict disclosure of customers' viewing habits without their permission, may provide possible models.
- Back-end databases should be constructed in ways that minimize opportunities for centralizing all information about an individual in one place. For example, information linking specific serial numbers to particular individuals or transactions for forensic purposes may not need to be housed together with information about the individuals' payment or account history. Similarly, if a company provides watermarks for a number of different distributors of media, it should avoid creating a single back-end

database that houses all the information associated with all its watermarks. This kind of master database could be used to create an aggregate picture of an individual's media usage across multiple types and brands of media – resulting in a greater privacy impact than the watermarking application really requires and more serious concerns in the event of a security breach.

- Digital watermarks should not be used to “unmask” individuals engaging in anonymous commentary or criticism that lawfully incorporates excerpts of watermarked content. Companies deploying watermarking should have a policy of declining to provide information that would tend to identify anonymous speakers engaging in expressive activity with a plausible claim of legality. In short, requests to use watermarks to determine the identity of anonymous critics should be refused.
  - EXAMPLE: An anonymous Internet user posts a video criticizing a high-profile CEO. The video uses a variety of short clips of movie villains such as Darth Vader. The CEO approaches a watermarking company that makes individualized watermarking applications for movies and asks it to determine whether any of the movie clips in the video contain watermarks that could be used to identify the video's maker. The watermarking company should decline to assist in the unmasking of the anonymous speaker. (Of course, if the CEO pursues actual litigation and the court issues a subpoena, the watermarking company would be obliged to cooperate.)

#### **8. PROVIDE REASONABLE ACCESS AND CORRECTION PROCEDURES FOR PERSONALLY IDENTIFIABLE INFORMATION.**

Where a digital watermarking application results in personally identifiable information being collected and stored, individuals should have reasonable access to the information that pertains to them for purposes of contesting inaccuracies.

- Entities implementing watermarking applications involving personally identifiable information should seek to develop efficient and cost-effective ways to afford individuals reasonable opportunity to correct information that may be erroneous. As this concept is not unique to watermarking, access and correction principles developed in other contexts may provide useful guidance. For example, the Online Privacy Alliance's “Guidelines for Online Privacy Policies,” TRUSTe's license agreement for its Web Privacy Seal Program, the OECD's Fair Information Practices, and the “Privacy Best Practices for Deployment of RFID Technology” developed by CDT's Working Group on RFID all contain provisions on access and correction.

- At a minimum, access should be available whenever an individual receives an adverse decision based on specific information.

## ▣ Conclusion

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Digital watermarking is a technology with a variety of potential applications. It is difficult to anticipate what types of applications will be developed and which ones will prove most successful in the marketplace. But when digital watermarking applications are intended to communicate individualized information, it is important to consider the possible privacy consequences. The principles set forth in this document aim to provide guidance for those designing and deploying digital watermarking applications to take privacy into account.

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### FOR MORE INFORMATION

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