DVD COPY CONTROL ASSOCIATION
REQUEST FOR EXPRESSIONS OF INTEREST
OCTOBER 26, 2005

1 Introduction

This Request for Expressions of Interest ("Request") is issued by the DVD Copy Control Association ("DVD CCA") to evaluate technologies for the purpose of selecting a technology for use in marking audio-visual content to convey certain content control information ("CCI") and the detection thereof. The selected technology will be used to enhance the Content Scramble System ("CSS") copy protection system with respect to audio-visual content.

This Request was reviewed at a meeting of the DVD CCA Content Protection Advisory Council ("CPAC") and subsequently approved for issuance by the DVD CCA Board of Directors ("Board") on October 26, 2005. The Request is posted on DVD CCA's website (see www.dvdcca.org). The Request was also sent by e-mail to all CSS licensees and members of the Content Protection Technical Working Group. Parties that respond to this Request will hereinafter be referred to as "Respondents."

Interested parties are hereby notified that the realities and demands of the marketplace require a rigorous schedule to evaluate expressions of interest, subsequently issue Instructions to Bidders ("Instructions"), conduct tests necessary to evaluate the technologies submitted and review and evaluate the bids, including the terms and conditions on which the technologies may be offered. The schedule for this process is as follows:

January 6, 2006: Deadline for a completed response to this Request.

February 3, 2006 (expected): Instructions will be issued to those Respondents that are determined to have best met DVD CCA evaluation criteria based upon the review by CPAC and the Board. (Respondents that submit bids in response to the Instructions will hereinafter be referred to as "Bidders.") Such Instructions will likely require submission by Bidders of more detailed explanations of the technology and the terms and conditions on which the technology will be offered (including certain terms that the Bidder may be asked to specifically address), as well as require that submitted technologies be subject to testing of the technology by third parties. Bidders who respond to the Instructions will be responsible for funding the costs of technology testing.

March 24, 2006 (expected): Deadline for completed response to Instructions from Bidders.

Testing and other forms of evaluation would then be conducted on a schedule to be determined, with an expected completion date of May 19, 2006.

This Request sets forth a problem statement and various functional characteristics and other needs, all of which shall constitute criteria for evaluating the responses from Respondents. Although these criteria are not expected to be substantially changed, Respondent is advised that they might be, and that DVD CCA might also establish other criteria as it deems necessary to meet functional and business needs.

Respondent shall indicate in its response to this Request whether and to what extent its technology meets the functional needs and criteria described below. Respondent shall answer the questions posed in this Request and supply relevant information. Respondent is reminded that in addition to functional needs and capabilities, technical maturity, readiness for commercial implementation, duration and complexity of testing verification, costs (implementation and any fees) and legal suitability are all very important factors that will be considered in the evaluation and selection process.

It is required that responses to this Request not involve the disclosure of confidential information. Responses marked confidential or proprietary will not be considered and accordingly no confidential treatment shall be given such Responses. Respondents that receive Instructions from DVD CCA following evaluation of their responses to this Request (i.e., the Bidders) are hereby notified that responses to such Instructions will likely require the submission of detailed technical and licensing information. To the extent that a Bidder considers any such information to be confidential, appropriate non-disclosure arrangements will be available.

Respondents are advised that this is the third evaluation process conducted by the DVD CCA with respect to watermarking technology, the first beginning in 1999 and the second in 2001. These efforts were concluded without selection of a watermarking technology. Since the conclusion of the most recent evaluation process in July 2002, the DVD CCA has continued to consider means by which to achieve the goal of providing an enhanced content protection system for DVDs, consistent with the terms of the CSS License Agreement. Such an enhanced system could be expected to benefit consumers of DVDs by expanding the entertainment options available to them.

Based on DVD CCA's evaluation of current circumstances, it is anticipated that the optimal solution addressing the functional needs and criteria set forth below will be an audio watermarking technology. Accordingly, Respondents that submit another type of technology are advised to provide detailed descriptions as to how such technology satisfies the key requirements set forth below. In addition, Respondents need to provide evidence of maturity of the proposed technology and supply protocols or descriptions for testing processes that will demonstrate how such technology would meet the functional needs and criteria described herein.

Respondents are advised that DVD CCA may or may not make a technology selection at the conclusion of the current evaluation process. Similarly, DVD CCA may require implementation of some but not all of the requirements in this Request.

2 Problem statement

Attention is called to the CSS Procedural Specifications, Section 6.2.13.2., putting DVD CCA Licensees on notice that a system for content marking is expected to be adopted. A copy of that Section is attached hereto.

DVD CCA is currently engaged in the process of evaluating systems using technologies for marking audio-visual content to convey certain playback, use and content control information (hereinafter, the "Watermark States"). Such Watermark States are intended to act as persistent indicators of the attributes of such content and its intended use, even if the content is subject to format transformations.

Such transformations of the content's format might include, for example, from screen to camcorder, from scrambled to unscrambled, from compressed to uncompressed (or the reverse), from digital to analog, and from analog back to digital, as well as various other transformations which may be applied by an attacker. Such indicators are to be used by CSS licensed products in an active manner (as opposed to forensics) to reduce unauthorized usage.

The key requirement that the watermark technology must meet is that the mark persists if the CSS protection has been removed or circumvented and the marking technology must be readily detectable upon playback of copies made of the audio-visual content previously protected by CSS.

It is also a requirement that the mark survive capture by camcorder of audiovisual content acquired, edited and/or theatrically exhibited via traditional film or via digital technology, or combinations thereof, and the marking technology must be readily detectable upon playback or other use of such recording.

This evaluation will include an assessment in all respects of the suitability of the watermark technology, including robustness, imperceptibility, and implementation complexity of detectors.

3 Technological Extensibility

DVD CCA is aware that the technology it selects may have other applications as well. Therefore, the potential for the technologies offered to be used in other content protection contexts is of interest. DVD CCA has an interest in evaluating, to the extent reasonable and practicable, whether technologies it selects for CSS Procedural Specification purposes will work together with other uses of the same or similar technologies.

4 Functional Needs

The following summarizes the functional needs that the proposed technologies must address in order to be considered for adoption by DVD CCA:

4.1 Payload

The marking technology should provide for DVD CCA's use a minimum of two (2) bits of CCI data. The marking technology should accommodate, at a minimum, a Watermark State of Copy Never: Pre-Recorded Media. Respondents also should describe the suitability of the marking technology for accommodating

two additional Watermark States of No Home Use and Copy Never: Trusted Source.

4.2 Detection

a) It is anticipated that detection of the marks shall occur in the baseband (uncompressed) domain. Technologies that detect marks in the compressed domain should enumerate the codecs they respond to and explain how they will accommodate new and/or additional codecs.

b) There shall be highly reliable detection of the correct data values carried by the mark, within acceptably short detection time periods. (For example, detection within 15 seconds for typical content, and possibly longer for either low fidelity content or attacked content. Respondents should anticipate, however, that reaction to the mark might be set for periods greater than 15 seconds.) Respondents must describe their technology's performance.

c) Detectors should be capable of operating both in a continuous mode and an intermittent mode. An intermittent mode may be necessary in portable devices where battery life requires optimization. Respondent should describe how the detection process is not easily circumvented when the detector operates in an intermittent mode.

4.3 Robustness

a) The mark shall survive under combinations of processing operations that may occur in either authorized or unauthorized distribution and use of the audio-visual content, as well as surviving circumvention or hacking attacks. Such operations may include, for example, for an audio watermark, lossy coding, microphone capture (camcording), pitch-preserving speed changes, channel mixing, surround processing, equalization, analog reconversion, dynamic range compression, broadcast, wow and flutter effects, re-sampling, band limiting, noise addition, and combinations of these operations.

b) The mark shall be resistant to hacking attacks such that rendering the mark undetectable will substantially impair the user experience (e.g., for an audio watermark, the distortion of dialog, sound effects and other audio elements of the audio-visual content occur to such an extent that a reasonable person would attribute no, or *de minimis*, value to the auditory experience). Additionally, the detector shall be resistant to circumvention.

4.4 Transparency

The mark shall be imperceptible, even in sensitive content, as judged by expert professionals in a comparison between marked and original unmarked audio-visual content under professional conditions.

4.5 False Positives

The marking technology shall be statistically demonstrated to have an expected false positive error rate of less than 10^{-12}.

Note: In this context a "false positive" means that a content protection status indication is detected that prevents the content from being used as intended, when in fact the true status is to permit its intended use.

4.6   Implementation Simplicity

The marking technology shall have low implementation complexity in hardware, firmware, and/or software after tamper-resistance has been applied. All solutions need to be efficiently implemented, e.g., with low gate count (logic), low memory usage (RAM and ROM), and low processing requirements.

Note: The Instructions are likely to require that any implementation proposed as a solution shall be delivered in tamper-resistant form, to the extent tamper-resistance is needed to meet the robustness requirements of the CSS Procedural Specifications, and that any such implementations will likely be tested in such tamper-resistant form. Copies of the CSS Procedural Specifications are available through the DVD CCA website at www.dvdcca.org.

4.7   Content Preparation

Use of professional equipment during content preparation is acceptable, but the process of embedding the mark must be efficient, economical and compatible with current content production and post-production processes (for example, both real-time and faster than real-time embedding is needed). Embedding latency should not be larger than one-half second. For an audio watermark, the embedding process must be able to run simultaneously with up to eight audio channels.

5 System Architecture

In the event that the Respondent is selected to receive the future Instructions, the Bidder shall provide, when responding to such Instructions, sufficient information and support to enable the DVD CCA to make a full assessment of the Bidder's offer against the full range of functional needs and criteria. This future response is likely to include the requirement to submit equipment and marked material for testing, as well as the proposed overall system architecture, detailed technical descriptions, implementation plans, intellectual property statements, licensing terms and conditions, and other information, as might be requested by DVD CCA.

For purposes of responding to this Request, it is only necessary to supply a brief written description of Respondent's marking technology and system architecture. The description should include Respondent's proposed approach for applying such marking technology to commercial audio-visual works, the anticipated normal process flow during content preparation, and the implementation of the proposed technology in playback products in such a way that detection and response occur so as to meet the CCI functions and functional needs as stated above. The Respondent shall provide such description on a non-confidential basis.

Although only a brief description is requested at this time, at a minimum it should address the following items in a manner that demonstrates that the Respondent understands the issues, has the technology and system architecture readily available to

solve the problem as described above, and can deliver the technology in a form suitable for implementation into commercial products at short notice:

5.1 Basic principles and technical description of the proposed marking (embedding) process.

5.2 Overall basic system architecture and operation with respect to each of the types of defined Watermark States as mentioned in Section 4.1 above.

5.3 Basic system and procedure needed for content preparation.

5.4 Other system features and capabilities, including data payload. Describe the data payload capacity of the proposed technology and indicate if such capacity can be expanded or extended.

5.5 Basis on which the false positive error rate described in Section 4.5 can be verified.

5.6 Basis on which compliance with the CSS Procedural Specifications robustness rules can be achieved including:

a) Survivability under various processes (mentioning all the different processes that the mark survives),

b) Methods or properties of the proposed technology that resist attempts at defeating the mark, and

c) Approach taken to secure the implementations of the technology in future consumer and personal computer products, both hardware/firmware-based and in software (i.e., tamper-resistance).

5.7 Basic implementation cost factors in future consumer and personal computer products for detector modules in both hardware/firmware-based products and in software.

5.8 State protocols or descriptions for testing processes that will demonstrate how the technology meets the functional needs and criteria described herein.

6 Maturity of the Technology

It is critical that all submissions provide convincing evidence of technical maturity. Although for purposes of this solicitation submission of actual equipment for immediate testing is not requested, the Respondent shall provide the following information:

6.1 **Availability of the technology for testing purposes**

6.1.1 *Transparency*

a) If audio-visual samples are provided to you, the Respondent, can you embed them and return the samples to DVD CCA or designated representatives for perceptual testing of transparency within fifteen (15) calendar days?

b) If the answer to the question just above is **NO**, then by what date can you make such samples available?

Note: Content will need to be marked and provided in separate instances for the Watermark States as described in Section 4.1.

6.1.2 Marking (Embedding) and Functional Needs Assessment

a) Can you provide both a real-time and faster than real-time marker for embedding audio-visual content, to be delivered to DVD CCA or a party designated by it, for purposes of testing to determine the extent to which the technology and system architecture can meet the needs of DVD CCA (e.g., the extent to which the submission meets all the functional needs) by March 24, 2006, or sooner?

b) If the answer to the question just above is **NO**, then by what date can you make such equipment available?

6.2 Availability of the technology for product introduction

6.2.1 State the availability date of tamper-resistant detectors in hardware, firmware and/or software, suitable for consumer and personal computer products, that meet the CSS Procedural Specifications robustness rules (indicating type, support memory and other required resources).

6.2.2 State the availability date of the professional marker (embedder) for embedding marks in audio-visual content.

6.3 Additional evidence of technological maturity

6.3.1. Provide a description of any current commercial application of the technology and a description of any commercial product that incorporates the technology.

6.3.2. Provide information concerning any previous independent testing of the technology (including, by way of example only, robustness, false positives, transparency, tamper-resistance, etc.), where such testing procedures and results can be made available to, and can be verified by, the DVD CCA. Although submission of independent test results is not required at this time, Respondents may do so at their option.

6.4 Legal Suitability

6.4.1. Provide a basic description of the intellectual property that underlies the technology, indicating how Respondent owns, controls or has licenses for such intellectual property rights and their duration.

6.4.2. a) Can the Respondent provide a complete set of license documents by March 24, 2006?

b) If the answer to the question just above is **NO**, and if it is acceptable to the DVD CCA to submit these documents after March 24, 2006, by what date can you make a complete set of license documents available?

6.4.3 Does the Respondent propose to license or sublicense the technology to DVD CCA on an exclusive or non-exclusive basis? Describe the parameters of such proposal. Respondents are cautioned that DVD CCA may or may not require

exclusive control over embedding and/or detecting of the selected marking bits and/or Watermark States.

6.4.4. a) Has the technology been licensed by Respondent to any third parties?

b) If the answer to the question just above is **YES**, provide a description as to what purposes and functions and in what contexts the technology has been licensed.

6.4.5 Has the Respondent received or is the Respondent aware of any claims of intellectual property rights infringement, or any other type of claim, that has been made, is likely to be made, or has been threatened with respect to the technology? If so, describe.

6.4.6 Do any import/export technology controls exist that interfere with the easy commercial use of the technology worldwide? If so, describe.

7 Expressions of Interest Submission Process

7.1 Submission of Responses

Deliver responses to this Request by the January 6, 2006, deadline *(5:00 PM Pacific Time)* to the following:

> DVD Copy Control Association
> Response Department
> 225 B Cochrane Circle
> Morgan Hill, CA 95037
> +1-408-776-2014 ext. 126 (phone)
> +1-408-779-9291 (facsimile)
> <dvdcca-response@dvdcca.org>

Electronic submissions via e-mail are required. It is recommended that submissions also be faxed or mailed for comparison to the electronic version.

Respondents, or their representatives, may be required to attend and make a presentation on their response to this Request at the January 10, 2006, meeting of the DVD CCA in Los Angeles, California, USA.

7.2 Submission Format

Responses need to clearly indicate the section number or question in this Request that is being addressed.

The file formats accepted for the submission of documents are .doc in Microsoft® Word 2002 or later for PC and Microsoft® Word X or later for Mac®. Adobe® Acrobat® .pdf files are not acceptable. Contributions should be formatted for 8 1/2" x 11" paper in portrait mode with 1" margins.

6.2.13.2. A system for marking content is expected to be adopted so as to identify in a secure manner the fact that the content was originally protected using CSS and/or the fact that the content is prohibited from being copied, or is restricted in the manner of copying and/or number of copies that are authorized, by the content owner ("Content Marking System"). Licensee is hereby notified of the following:

(a) evaluation and adoption of such a Content Marking System is a matter of very high priority by Licensor, work to finalize the evaluation and adoption of such a system will be pursued vigorously and expeditiously by Licensor, and such evaluation process may be a subject of the Licensee's obligations as described in Section 5.6 of the CSS License document;

(b) once a Content Marking System is adopted, and after a suitable transition period (expected, but not guaranteed, to be twenty-four (24) months from the date on which such a Content Marking System is finally selected), Licensor will adopt necessary and appropriate requirements for the use of such a system, such requirements to include the following (subject to modification or adaptation, as appropriate, based on the particular Content Marking System adopted): in order to be CSS Compliant, all DVD Players and/or DVD Drives will be required to:

(i)   Recognize content marks on discs containing unencrypted content where such marks indicate that the content was originally encrypted using CSS;

(ii)   Respond to such content marks by refusing to play recordable (whether write once or rewritable) DVD discs containing such marks indicating that the content was never to be copied.

(iii)   To the extent such DVD Player or DVD Drive incorporates a digital recording capability, when such digital recording capability is being used, recognize the information concerning CSS Data in such Content Marking System indicating that the CSS Data are not to be copied, and respond to such information by refusing to copy such CSS Data, and

(iv)   With respect to DVD Drives, perform the functions described in (i), (ii), and (iii), above, in the DVD Drive itself, unless an alternative means of performing these functions is authorized based on Licensor's finding that such alternative is both subject to legal requirements of this CSS License Agreement and subject to functional requirements that make such performance as secure as performance of such requirement in the DVD Drive itself.