

To: EDCF distribution.
From: Peter Walford
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Subject: Summary of June-August ISDCF and ISDCF/KDM meetings

The Inter-Society Digital Cinema Forum (ISDCF) is an open cinema industry group that meets once a month in Los Angeles, with a telephone bridge for out of area participants. Participants include representatives from studios, mastering houses, distribution companies, technology suppliers and theater owners. ISDCF provides a cross-industry information exchange for issues affecting the Digital Cinema rollout. It also provides a forum where representatives from different parts of the industry (including competitors) can share experiences, discuss common problems and consider best practices to recommend to the industry. ISDCF also has a very active KDM working group with two meetings per month, one face-to-face meeting in Los Angeles and one via conference call.

This report, which I have prepared for the EDCF community, summarizes some of the most important topics of the June-August meetings; for additional details and information please check the meeting notes and other documents at the ISDCF website (<http://www.isdcf.com>). Any interested party can also sign up at the website for the ISDCF e-mail reflector [a yahoo account is required first to use the Yahoo groups facility]. ISDCF would welcome additional contribution from the European digital cinema industry.

Please contact me with any suggestions or comments on this report. I would like to thank David Reisner for his constructive suggestions on an earlier version. Any errors are naturally my own, and if reported to me I will issue a correction in a subsequent report.

Correction to previous report

In my last report of 04/06/07, it was incorrectly reported that Sony and Dolby had achieved FIPS-140-2 level 3 compliance. An independent testing laboratory has recommended to US National Institute of Standards and Technology (NIST) that Dolby receive compliance certification; that recommendation is currently under review by NIST. Interested parties should contact their projector supplier or manufacturer for the current FIPS status of their projectors. Please see section 7 below for more FIPS information.

1. Training

Although a variety of training issues are always discussed at ISDCF, I believe the most interesting news is that SMPTE may organize a new digital cinema training session and is also considering making the training material portable. SMPTE has recently hired Joel Welch, who has extensive training experience in the cable industry, as Director of Professional Development. There are discussions planned regarding this training at the SMPTE October conference in New York. Walt Ordway, who was previously CTO for DCI, is organizing this effort.

2. Upgrade path

As Digital Cinema specifications are still evolving and SMPTE has not yet released a full specification set, a group of implementor companies have been working closely together to coordinate upgrades and achieve maximum interoperability during the transition to SMPTE compliance. This JPEG-2000 "Interop" group issues status reports at ISDCF meetings; at the August meeting this involved the coordinated rollout of support for SMPTE format KDM and certificates.

AccessIT reported that they are deploying new software to upgrade their entire installed base within the next several months. Technicolor has similar plans.

The actual encryption key used to encrypt the DCP is not affected by this upgrade, and the earlier interop format certificates and KDMs will still work. However, the certificate formats are incompatible, so a device supporting both versions must have both an interop format certificate and a SMPTE certificate.

It was noted that Sony projectors only support the SMPTE certificate.

The SMPTE DCP specification is still in the final stages of SMPTE standardization and can be used for testing. To minimize requirements for multiple DCPs, this should not be used for any other purposes until all installed equipment can support it.

3. Flat lens versus electronic resizing.

There has been little forward motion in ISDCF on this controversial issue and it has presently been relegated to the inactive issue "parking lot". The comparison test arranged by Technicolor in March was instructive, and it has been suggested that a second very carefully engineered side-by-side demo be organized. In this proposal, particularly interested parties could have private viewing timeslots where they would be assisted in understanding the testing methodology by the organizing engineers. However, other than Schneider Optix, there have been no volunteers to set this up.

DCI as an organization has provided no update to the information in section 8.2.2.7 in DCI specification version 1.1. When approached separately, representatives from individual DCI Studios have contrasting opinions on the subject.

[Editor's note: Schneider Optix has introduced a dual lens system with automatic lens change, which would eliminate the manual step of changing lenses but still incur an additional cost relative to electronic resizing by the projector].

4. Intermission marker.

Mid-show intermission pauses are popular with some European exhibitors. Digital cinema CPLs allow the content provider to set a marker indicating when a pause should occur to minimize continuity disruption or for other creative considerations. At playback, the exhibitor can choose to use this marker or ignore it (the exhibitor can also choose to pause at some different point). [It should be noted that in general content creators do not consider interrupting a motion picture to be an acceptable action, while recognizing that in some markets it may be traditional/unavoidable].

There has been little interoperability testing of this feature, but Deluxe is now testing it and will report the results to ISDCF.

5. Forensic marking.

[Editor's note: this section is technically quite detailed and readers that are less interested in FM may wish to skip ahead to the next section. On the other hand, extremely interested readers may wish to examine the "Draft Forensic Recommendations" on the ISDCF website].

A detailed discussion of FM issues was kicked off by server manufacturer concern regarding uniqueness of location information in forensic marks. The DCI specification requires that a media block (MB) insert forensic marks during real time playback of encrypted content (this can be disabled in a KDM). The specification also requires that every five minutes a forensic mark must contain at least 35 bits of payload including a 16 bit timestamp field and a 19 bit "location...

information" field. In the ISDCF discussions, the 19 bit location information is referred to as a FID (forensic ID). The intention is to be able to identify a specific unit by the FID.

There are presently 3 FM technology vendors (Thomson, Philips, and Sony) supplying the industry. The industry strongly desires that each technology vendor assure that classes of unique FID codes are assigned to each server manufacturer. However, the same FID value may be assigned by different technology vendors because their technologies are different enough that the specific technology vendor can be identified during initial examination of a forensic mark.

ISDCF is approaching the issue by analyzing one possible approach that a detective possessing a piece of stolen content would have to do to identify when and where the theft occurred. This approach is summarized below:

1. Detective extracts forensic ID and timestamp from a mark in the stolen content. As the FID can only be extracted using the extraction system of the technology vendor that inserted the forensic mark, detective also determines which FM technology vendor was used.
2. Based on the FID, FM technology vendor informs detective which [server] manufacturer had the MB that generated the FID. The vendor can not identify the specific server because the vendor only allocates one or more ranges of FID values to the server manufacturer. The server manufacturer in turn assigns a unique FID from within its allocation to a specific server.
3. The detective then asks the server manufacturer which customer purchased the server that generated the FID. Ideally, the server manufacturer maintains a registry of FID codes and matching server certificates.
4. The detective must now identify the location of the server. This should be known by the server manufacturer's customer or some other knowledgeable party such as an installer, integrator, or the KDM generator. Based on the FID and/or certificate, the customer informs the detective of the server delivery location (it may not be possible to identify the specific screen as the exhibitor may choose not to share this information).
5. The detective must now examine the KDMs generated for the authorized exhibitions of the content. Through the forensic mark timestamp knowledge of the server certificate matching the FID, the specific KDM can be identified. This should be enough information to identify the time and theater location where the theft occurred.

This analysis raised a number of questions and proposals on the ISDCF discussions; which include:

- A. The different parties above (FM technology vendors, server manufacturers, server customers/integrators, KDM generators) would have to agree to maintain the necessary registration databases and make them accessible to properly authorized parties. Much of this should be automated to keep costs down and make sure that the databases are up to date as the digital cinema deployment scales up.
- B. To guarantee that the identification of a particular server through the FID holds up in court, the studios have a legal requirement that the correspondence between FID and server cannot change [in other words, for each supported FM technology the FID in forensic marks generated by a particular server cannot change unless the server certificate changes]. However, the specifications do not mandate any specific implementation of this guarantee. One implementation currently being delivered was described by Thomson and Doremi. Thomson uses 4 bits of the 19 bit FID to identify the server manufacturer. The manufacturer can then use the remaining 15 bits to identify individual units. The four bits identifying the server manufacturer are programmed into a hardware unit supplied by Thomson, so the server using this unit cannot generate a different 4 bits value. Doremi encodes a server's entire FID value in the epoxy protected section of their MB board, so the server cannot generate a different FID value unless the MB board's security is physically compromised.

- C. Different proposals for allocating FID ranges to different server manufacturers are being discussed. The four bit manufacturer ID used by Thomson is one such mechanism. It has been suggested ranges be allocated in units of 512 or 1024 to avoid address space depletion (otherwise large ranges may be allocated that are never completely used); manufacturers producing lots of servers then request additional ranges as they need them. In the absence of industry agreement, some server manufacturers are announcing the ranges they intend to use to make sure other manufacturers do not assign FID values within those ranges.

6. KDM delivery methods.

The KDM working group of ISDCF has been very active in the past three months. The group has been collectively analyzing different delivery methods with the goal of recommending KDM delivery methods while ensuring that related business requirements are met. As there are vastly divergent opinions on this topic, the working group is now working through a set of building blocks that can be used to support a number of different high-level delivery methods without trying to rank them as better or worse. Hopefully consensus on a small number of methods sharing common components will emerge.

A number of companies have responded to an ISDCF RFI on the subject; their responses can be found on the working group's website <http://www.isdcf.com/files/KDM.htm>.

The studios/distributors have the legal requirement that they be able to demonstrate that the KDM reached the theater (this is essentially the equivalent of a delivery receipt stating that the reels of 35mm film were delivered to the theater). US exhibitors have the requirement that a KDM be generated and delivered within 15 minutes of a request. KDM Distributors in the US are currently sending KDMs for all screens in a complex, which makes it easier for exhibitors to show a film in multiple screens or move it from screen to screen.

Some simplified examples of high-level KDM delivery methods are:

- A. Delivery through dial-up modem(s) at theater complex (*push* model); with dial-up protocol providing acknowledgment of KDM receipt.
- B. Delivery through TCP/IP-based VPN (also a *push* model) frequently over ADSL connection to the theater. This approach is common with systems integrators who also distribute KDMs, as the VPN can also be used to monitor equipment, deliver software upgrades, etc.
- C. KDM distributors deliver KDMs to a website, where they are available for later exhibitor initiated transfer (*push* followed by *pull*). The exhibitor is then responsible for sending a delivery receipt to the KDM distributor. Two flavors of this have been discussed:
 - Website is available (with proper access control and/or authentication) over the Internet, where KDMs can be downloaded by individual theaters.
 - Website on intranet of cinema chain, where the chain's operations is responsible for transferring the KDM further to the individual theaters.
- D. E-mail delivery of KDMs to the theater, with e-mail protocols providing delivery acknowledgment and retransmission if necessary. Note that this method does not require use of USB sticks; ideally the KDMs are delivered to the appropriate server over the intra-theater network. A firewall can protect the intra-theater network from any other traffic over the Internet.

Processing and distribution of log files have not yet been discussed.

7. FIPS compliance

Although the DCI specification requires FIPS 140-2 level 3 certification for certain components (MBs, FM units, link encryption and decryption units,...), no manufacturers have yet received that certification from the NIST (the US government which provides the actual certification). Products must first be tested by a NIST-approved independent testing lab, which then recommends the product for certification. Some digital cinema products (e.g. Dolby, Doremi) have been recommended for certification and the recommendations are under review in NIST.

However, no projectors have been certified, and exhibitors at ISDCF have expressed particular concern about the potential cost of upgrading the installed base of DLP-based projectors. This would be especially costly if units cannot be upgraded in the field and must be swapped out. TI is working on mechanisms to meet the FIPS requirements that would not require swapping out the projectors, and a proposal is expected to be announced soon.

The FIPS certification process may also be delayed by a few ambiguities regarding FIPS requirements in the DCI environment; it is expected that consensus will be reached on this soon as well.