



Using ASC CDL in a Digital Cinema workflow

Cédric Lejeune, Workflows
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Introduction

Metadata can be defined as “data about other data”. In the film industry, metadata is information about images and sounds. It can enclose everything needed, from detailed artistic descriptions to technical specifications. In the digital world, different kinds of metadata are being generated and used, in various formats, that cover projects, LUT, subtitles etc.

More recently a new metadata called ASC-CDL (American Society of Cinematographers, Color Decision List) has been introduced in order to exchange basic primary colour grading information. By definition this format enables the communication of a look attached a scene thus keeping control in the digital world of what is photographed. But does this new metadata define everything required for a consistent colour managed workflow?

Problematics of Digital Cinema Workflow

In the old days of film production, the Director of Photography and the colorist were deciding how images should look, and the film lab was handling conversion of the film to print. Everything was part of a rational process in which the final look of the film was predictable. Plus, nobody had monitored the negative on set and video tap was considered as bad enough not to be trust as a colour reference.

Digital cameras, along with digital intermediate, are replacing traditional workflows. While clients and users have been thrilled with the convenience of digital capture, especially the immediacy of the preview and the capability to actually monitor what is recorded.

Some operators have started using “Look Up Tables” (LUT) on-set. A LUT could combine pre-processing, artistic and calibration properties and consequently can be used for a lot of different purpose, with potential incompatibility problems on top. The results can quickly get out of control.

One of the main problems in a digital workflow is the communication between the Director of Photography and the colorist. But how can any creative talent, whether they are Directors or Cinematographers, pre-visualize their ideas and make sure that the image of the scene they photographed stays the same throughout the production and post-production processes? How can film footage, which goes through so many steps and passes through so many hands, keep its original artistic intention?

The definition of an ASC-CDL

The ASC-CDL was designed by the ASC Technology Committee in order to simplify such workflows. It intends to make a translation of the primary colour grading information between any colour correction systems. Therefore, with the usage of ASC-CDL in digital camera workflow, on-set colour correction systems can communicate with any other CDL-compliant colour correction systems on another location.

The CDL data are exchanged within a XML format that describes varieties of colour corrections using ten channel parameters that include slope, offset and power, the tenth parameter being saturation.

```
<ColorDecisionList xmlns='urn:ASC:CDL:v1.01'>
  <ColorDecision>
    <ColorCorrection>
      <SOPNode>
        <Description>WF_CD</Description>
        <Slope>1.27 1.18 1</Slope>
        <Offset>-0.009 -0.002 0.003</Offset>
        <Power>1 1 1.08</Power>
      </SOPNode>
      <SatNode>
        <Saturation>1.08</Saturation>
      </SatNode>
    </ColorCorrection>
  </ColorDecision>
</ColorDecisionList>
```

Usages of an ASC-CDL workflow

Onset:

ASC-CDL allows the Director of Photography to create pre-defined looks during pre-production or even on-set. Once created, the CDL can be saved and sent onto any storage device or via any electronic delivery systems, allowing the colour corrections created on-set to be used in any other CDL-compliant colour correction system at a different location. As a result, the ASC-CDL becomes a powerful communication tool for the Cinematographer with all the people that will have to manipulate his or her footage.

For dailies:

Once the CDL has been created on-set, it can then be sent to dailies facilities, thus allowing accurate primary colour correction for digital cinema cameras. Eventually, thanks to the usage of CDLs, dailies' processes could be automated.

On traditional telecine film dailies some products such as DFT Bones or Pogle Evolution, can also insert the CDL information within existing FLEX or ALE files before they are sent to the editorial facility. After editorial, that same CDL information

is attached in the EDL file as a note which gives the artistic intention of the Director of Photography to the colorist and can be used as the base grading.

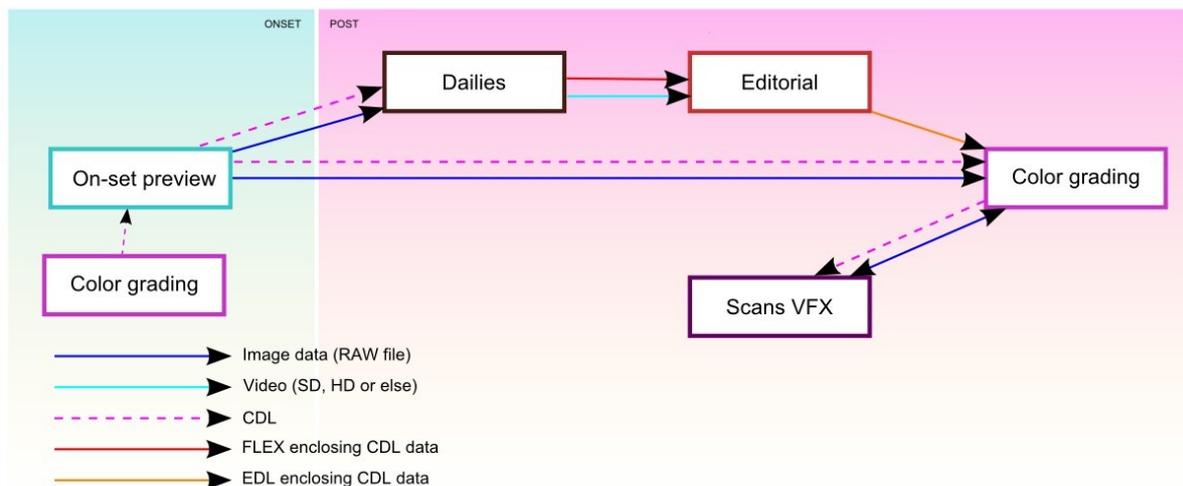
For VFX scans:

The other advantage of a CDL workflow is that it is a non-destructive process. Indeed, the colorist can choose to "bake in" the colour correction or simply keep the metadata and the images separate during the post-production process. This is an interesting feature for the post-production facilities as it allows better data management and saves render processing and data transfer. For example the CDL data can be attached with the original VFX scan that allows the Compositors to display the colour corrected image or the original signal without any rendering or image degradation, while only having one sequence on its storage.

For colour grading:

As explained above, the Director of Photography creates the CDLs during pre-production with the colorist or on-set. Instructions and previews of the primary colour correction are then sent to the colorist, thus allowing an accurate communication.

Consequently the ASC CDL workflow aims to resolve some colour correction obstacles we have faced over this past decade. However the ASC CDL format also includes a couple of weaknesses.



Weaknesses of ASC CDL

The first disadvantage is that nothing allows us to apprehend what comes before and after CDL in the processing pipe. For example, we'd like to know the input LUT and the white point adaptation before the CDL workflow. This information can

have dramatic impact on camera working in RAW formats. As to what results from the workflow, we'd like to have more information about the calibration of the final display. Indeed, none of this colour management workflow works if the calibration from on-set to final colour correction is not done by the book.

The second inconvenience is that the ASC CDL implementation in tools can be sufficiently different to be incompatible, which defies the purpose of interoperability you want to reach in building a workflow. Probably a broader use would fix this

Also, an ASC CDL workflow works well in a HD workflow where the colour space could be considered (or simplified) to be Rec 709 all along. Indeed there are still some constraints when the digital camera is not HD and the mastering is not a HD video signal.

The limitations of the format on the artistic side can also be a problem. Some proprietary formats (.look from IRIDAS, used in the SI-2K or RSX from RED) offer more functionalities but are not standard enough and force you to adopt certain tools to be implemented in the pipeline.

Propositions

To get more useful in complex workflows CDL could include basic informations about the actual processing and context:

- white point correction and colorspace
- color matrixing
- input LUT
- viewing colourspace and viewing colourspace target (for example if a film emulation has been used)

Then to have more controls it might be interesting to introduce more control points, as in the RSX format.

Conclusion

ASC CDL is a good starting point for improving digital cinema workflows and a first approach to integrate artistic input in the colour management. However for better inter-system communication and calibration, ASC CDL standard could be augmented to integrate additional information.

References:

ASC articles about CDL metadata:

http://www.theasc.com/magazine_dynamic/December2006/TomorrowTechnology/page2.php

http://www.theasc.com/magazine_dynamic/October2008/PostFocus/page1.php

Wikipedia article on ASC-CDL:

http://en.wikipedia.org/wiki/ASC_CDL

Workflows WF_x plugins for Lustre:

<http://workflows.net/html/plugins.html>