

HDCP 2.2 Facts and Fiction

By Mike Tsinberg - 10.3.2014

Recently, upon the demand of content creators, HDCP instituted a new copy protection format. This new format, HDCP 2.2, is designed to protect 4K UHD baseband signals from copyright infringements. Similar to previous HDCP versions, this new standard increases barriers for pirates to break 4K UHD copy protection and create illegal copies of the content for distribution. However, unlike previous versions, HDCP 2.2 has a very significant difference; it is not backward compatible with any previous HDCP versions. This fact by itself creates unique dynamics in the introduction of the new format.

Backward incompatibility means that 4K UHD TVs and sources that are equipped with HDCP 1.X cannot play HDCP 2.2 content. It's also means TV equipped with HDCP 1.X cannot accept HDCP 2.2 sources.

Facts, as known:

1. Native Content: HDCP 2.2 is only to be used with 4K UHD native content. The term native has not yet been clearly defined. Native may apply to 4K content that has never been processed through up or down scaling. For example, 1080p content that has been up converted to 4K UHD is certainly falling into this category. Current signal extension methods as well as bandwidth availability may play a role in the need to scale the content. More on this below.

A large question remains if 4:2:0/8 bit broadcasting, streaming or recording will be considered native. Many 4K UHD cameras, broadcast encoders, and media storage devices may compress and de-compress content to and from 4:2:0/8 to 4:2:2/12 without changing picture resolution. This will inevitably create one of the largest obstacles in the native question, as ALL broadcast or streaming encoding is always done in 4:2:0/8.

2. Baseband Bandwidth: 4K UHD (3840x2160) is a very bandwidth-intensive format in baseband as well as compressed domains. In baseband, it requires 6Gb/s data rate for a 60 FPS, 4:2:0/8-bit format, which is the most common format before encoding. Storing two hours of content would require 21Tb of storage. This number increases to 12Gb/s or 42 Tb of storage for 60 FPS, 4:2:2/12-bit format.

3. Compressed Bandwidth: Some experiments show that state of the art broadcast encoders can compress 4K UHD content to 15 Mb/s. In that case, storing two hours of content would require 54Gb.

4. Current Internet Bandwidth in the US: The internet speed for most of the US population is below 9 Mb/s. Only two states (Virginia and Washington) can claim averaging around 13Mb/s.

Source: <http://www.cnet.com/news/what-us-state-has-the-fastest-internet-speed-virginia/>

5. Cable and Satellite Set Top Box Devices: There are approximately 160 million cable and satellite STBs deployed in the US. None of them are able to generate signals with resolutions greater than 1080p.

6. Streaming Media Players: Current Apple TV and Roku players do not yet support 4K.

7. Blu-ray Standards: Manufacturers are still negotiating the next Blu-ray disc and player standards to include 4K UHD and HDCP 2.2. At the current rate, it is unclear if Blu-ray players with 4K UHD and HDCP 2.2 support will be available before 2018.

8. Smart TVs: The Latest 4K UHD Smart TVs featuring streaming service apps such as Netflix and Hulu would not require HDMI input with HDCP 2.2 support because the TV set itself is the source for the

content. All content delivered via streaming will still be 4:2:0/8-bit, which leads us back to our need for clarification of what is and is not native.

9. A/V Receivers: A key device in home theater systems is the A/V receiver. Only one brand today (2014) provides HDCP 2.2 compatibility. AV receivers typically have a longer life than TV sets in residential installations. Therefore, most A/V receivers installed in and before 2014 will need to be replaced in the future.

Pirating 4K UHD content encrypted by HDCP 2.2 seems to be a daunting task in itself. Jail-breaking baseband signals of 6Gb/s (or more) would require extremely expensive high quality UHD encoders for distribution or storage. Sheer volume of the uncompressed 4K UHD bit rate will be a formidable barrier for copy protection infringement.

Preserving native content through backward incompatibility is an interesting and unique stance for HDCP. The result essentially demands complete replacement of all available infrastructures and therefore considerably delays deployment of this service.

In order for providers to be profitable and sustainably generate native 4K UHD content, the marketplace requires sufficient amount of playback and display devices conforming to HDCP 2.2 specifications. Looking at the current deployment of cable, satellite and streaming players, it can reasonably be concluded that the mass market acceptance of HDCP 2.2 is a long ways away. Of course, this situation will have a considerable impact on content providers' business decisions to create 4K UHD native content for many years to come.

We have recently witnessed how un-availability of infrastructure and consumer un-friendly features impacted the deployment of new video services. The war between HD-DVD and Blu-ray quickly shifted consumers to internet streaming instead of buying disc media. Reluctance of consumers to wear 3D glasses accompanied by complaints of discomfort and a lack of 3D content practically removed 3D from the list of useful or desired features.

I think the barriers for implementation plus the backward incompatibility imposed by HDCP 2.2 make 4K UHD with HDCP 2.2 adoption an even more difficult proposition for many years to come.