

HDCP for HDMI Receivers

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What Is It?

- HDCP: High-bandwidth Digital Content Protection System
- All specs freely available from: <https://www.digital-cp.com/>
- Encrypts/decrypts video and audio over high-speed interfaces (HDMI, DisplayPort).
- Three versions in common use:
 - 1.4 (broken, master key was (likely) reverse engineered)
 - 2.2
 - 2.3: Same as 2.2 but support must be unlocked on receiver chip.
- Easy to implement for a transmitter: just enable it! Supported in drm.
- Much harder for receivers: up to implementer to ensure decrypted video does not 'escape': decrypted video is typically routed through secure memory and out to an internal display or re-encrypted to a video output.
- HDCP has to be negotiated: V4L2 controls.

Mainlining HDCP V4L2 Support

- Has been in use with Cisco for many years.
- Never mainlined due to lack of HDCP enabled hardware that can be tested on a mainline kernel.
- Figured out how to do this for the old HDCP 1.4 adv7604 receiver and adv7511 transmitter.
- First step is to emulate this in the vivid driver and document the new controls.
- Two modes:
 - HDCP Receiver: video terminates here (e.g. a TV)
 - HDCP Repeater: video is processed and passed on to a video output (e.g. an A/V Receiver)
- Repeaters are more complex, useful to be able to emulate this in vivid.
- A Video Source must collect all public keys from the devices up to the display and compare it to a list of prohibited keys. E.g. a blu ray disc will contain a list like that.
- Important to realize: no secret keys are ever exchanged, only public keys. The secret key is typically fused inside the HDMI receiver.

Current Status

- The vivid driver was modified to emulate HDCP 1.4 negotiation.
- Support for HDCP 2.2 negotiation still needs to be added.
- Controls need to be documented.
- No time yet to implement HDCP 1.4 in adv7604 and adv7511.
- <https://git.linuxtv.org/hverkuil/media.git/log/?h=hdcv-vivid>
- HDCP 2.3 unlocking of receiver chip is out-of-scope: very device specific.