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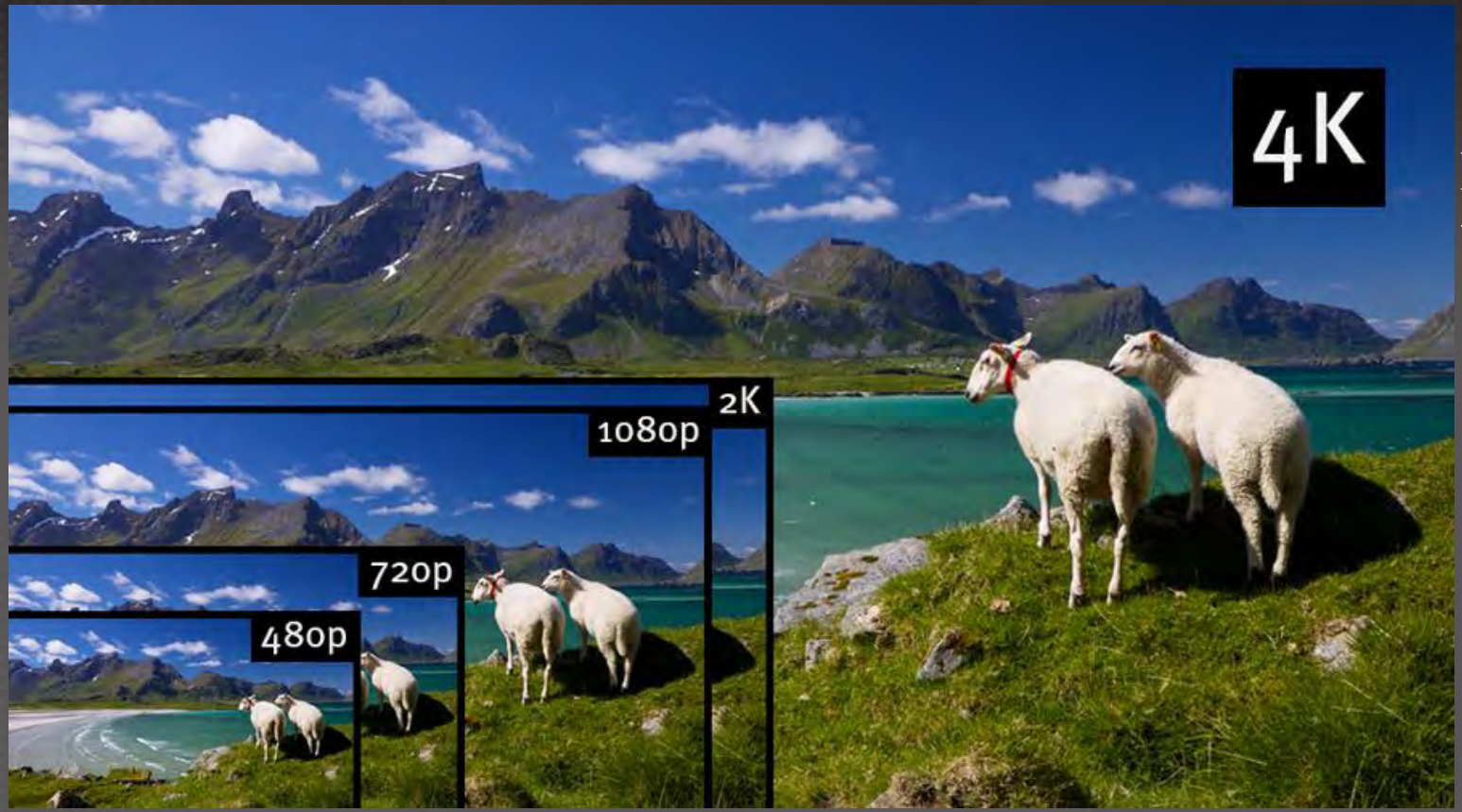
How UHD Changes Revenue Security Landscape

November 2014

Background

- The pay-TV market is in the early stages of planning and deploying support for ultra high-definition (UHD) or “4K” content
- UHD content will be high-value premium programming, necessitating the highest level of protection
- As a market leader in pay-TV security, Verimatrix will fully support deployment of UHD pay-TV services and will ensure that our customers have access to the highest value studio content
- This presentation provides an overview of the security requirements for UHD content and the application of the VCAS solution for UHD service security

What Does 4K/UHD Mean?

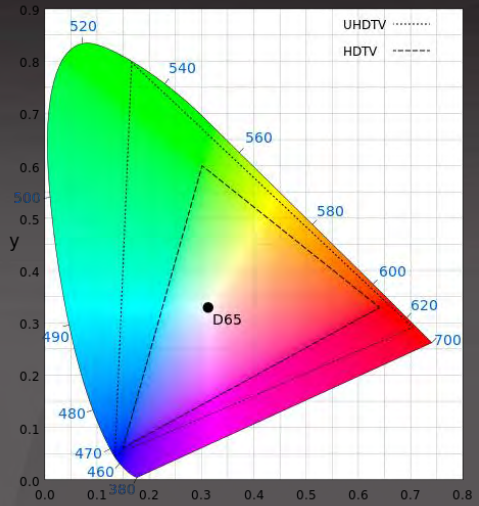


ITU (Rec 2020) defines Ultra HD (UHD) as:
- 3840x2160 pixels
- 16x9 format
- Progressive scan only

Beyond More Pixels….

Richer color space:

10 or 12 bit color depth
Color space rendition far beyond that of HD



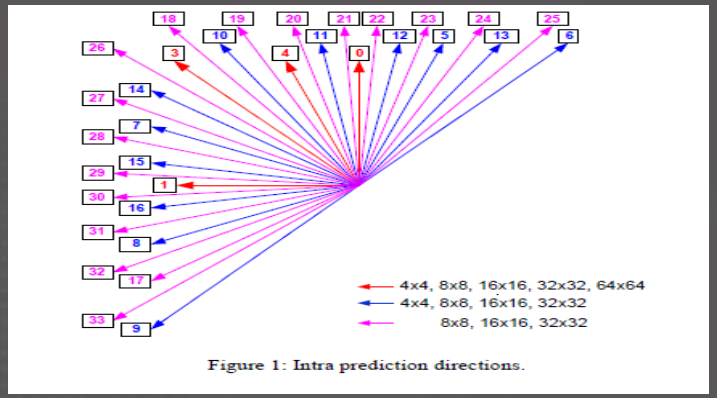


Figure 1: Intra prediction directions.

Increased encoding sophistication:

35 intra prediction directions in HEVC vs. 9 in H.264
50% bit-rate saving for H.265/HEVC vs H.264

Note – reference data courtesy of Elemental

UHD Security Requirements

4K/UHD – New Security Requirements
MovieLabs Specification Background

- Hollywood studios see 4K/UHD as their next opportunity to redefine security requirements for content protection
- When HD came out, the studios defined AACS but it failed over time
- With UHD, the studios have defined broad requirements and will let the market develop the best content protection solutions
- Specs published as: http://www.movielabs.org/ngvideo/index.html

  Note that the specification is intended as a guide, with adherence to be decided independently by each studio

Threats

1. Availability and Distribution of Ripping Software
   - ❑ “hack one, hack all”
   - ❑ Breaking protection on one device, breaks it on a wide class of devices
2. Release Day Availability of Rips
   - ❑ Ripping a new release requires no additional information or technology than ripping a previous one.
3. Pre-Release Day Availability of Rips
   - ❑ Leaks in the supply chain
4. Output Capture
   - ❑ Secure video path
   - ❑ Output protection
   - ❑ Camcording

Cryptography

1. **State of the art cryptography (e.g. AES128)**
   - Used by IPTV and OTT today, DVB moving to CSA3
2. **Side channel attack resistance**
   - Mainly SoC feature
3. **True Random Number Generation (TRNG)**
   - Most SoCs support today

HW Root of Trust

1. **Secure chain of trust for trusted applications**
   - Must be securely provisioned (e.g. burned in factory)
   - Most SoCs support it today
2. **Device-unique private key for protecting stored secrets**
   - Securely provisioned (e.g. Blackbox in factory)
   - Used to Identify and Authenticate device
   - Used to bind content to host or storage

Secure Computing Environment

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1. **Only authenticated code performs critical operations**
   - Supported via secure boot
   - Support for TrustZone/TEE or security processor
2. **Secure OS, HW isolation mechanism for trusted code**
   - Supported via TrustZone/TEE, security processor, etc.
3. **Memory protection**
   - Supported via SoC memory scrambling
   - Supported via TrustZone/TEE on-chip memory
4. **Run-time integrity checks for secure applications**
   - Supported via TrustZone/TEE or security processor

Connectivity

1. **License key delivery at a specified date (e.g. “street date”)**
   - Deliver content keys just-in-time and independent of movie file delivery
2. **Copy/move mechanism using on-line key delivery**
   - DVR does not stores content keys – they are delivered on-line when needed; same process for copying
   - DVR re-encrypts content using local HW keys

Hack Containment

1. **Key binding to device**
   - Content key protected by a unique SoC key
   - Unique Device Certificate in TEE
2. **SW diversity**
   - SW attacks should not be portable
   - Vary by SW version, by Platform and by individual Installation
3. **Title diversity**
   - Breach of one title does not make another title automatically available
   - Each title is protected differently; mainly for optical media
   - Custom Trusted Application (TA) in TEE/security processor

Revocation and Renewal

1. **Revoke and renew versions of clients**
   - Support SW and TA upgrades
2. **Revoke and renew code signatures of the root of trust chain**
   - Prevent SW version rollbacks and enforce server side checks
3. **Revoke an individual device or a class of devices**
   - Revoke a device certificate
   - De-entitle an individual client
4. **Proactive SW updates**
   - Upgrade client SW periodically or as a response to a breach

Secure Media Path and Output Control

1. **Protect DRM keys and secrets**
   - ❑ SoC One-Time Programmable memory and/or TEE
2. **Protect compressed video**
   - ❑ No access to video by non-authorized component; a.k.a. Secure Video Path
3. **Protect decompressed video**
   - ❑ Secure Video Path; SoC feature
4. **HDCP 2.2 or higher**
   - ❑ Signal minimum HDCP version

Watermarking

1. **Forensic watermark**
   - Secure forensic marking on client or on server
     - Verimatrix VideoMark or StreamMark
   - Robust against forensic information corruption
   - Watermark must be guaranteed even on compromised devices
2. **Playback watermark**
   - Detect Cinavia watermark (used in Digital Cinema)
     - Responsibility of the decoder/SoC

Certification, Anti-piracy Monitoring and Rapid Response

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1. **Certification by 3rd party and Trusted Implementers**
   - Merdan, Farncombe, etc.
2. **Code signing keys not released until device certification is complete**
   - CA/DRM vendor typically owns signing keys and certifies STB implementations
3. **Active breach monitoring**
   - IPTV clone detection
   - Monitor the market, hacker websites, etc.
   - Watermark extraction process (VideoMark Reveal)
4. **Agreements must include rapid response provisions**
   - Turn on countermeasures at run-time as a response to a breach
   - Download a new CAS client or a DRM TA as a response to a breach

Thank You!

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