Test Equipment for DisplayPort™ and DisplayPort™ over USB Type-C

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CTO, Unigraf Oy

Overview

- About Unigraf
- Unigraf Test Equipment
- DP 1.4a Link Layer compliance testing
- HDCP 2.2/2.3 compliance testing
- HDR and AV Sync testing

CAPTURING THE WORLD

Unigraf Oy

- Privately owned
- Established in 1990
- Located in Espoo, Finland
- World-leading video electronics testing company
- Contributor for DisplayPort standards
- Unique product range for DP, HDMI & USB-C
- Comprehensive distribution network
- Strategic partnerships with

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UCD-400 DisplayPort™ 1.4a Test Tool

- VESA Approved DP 1.4a Link Layer CTS Test Tool
- DCP Approved HDCP 2.2 and HDCP 2.3 CTS Tool
- 8K and 4K Reference Sink & Source
- DP 1.4a / HBR3 input and output in one unit
- MST support (4 streams)
- DSC 1.2a, FEC and LTTPR support
- HDCP 1.3 and HDCP 2.2/2.3 support
- UCD Console GUI for debugging
- High level API for easy integration

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UCD-424 USB-C DP1.4a Alt Mode Tester

- USB-C input and output with Power Delivery 3.0
    - ✓ Capable to sink & source 9V@3A
    - ✓ PD Role swaps supported
- DP 1.4a / HBR3
    - ✓ Same capabilities as UCD-400
- USB3.1 Gen2 bypass
- UCD Console GUI for debugging
- High level API for easy integration
- Prototype testing ongoing. ETA December 2019

UCD-340 USB-C DP Alt Mode Sink and Source

- Test DP Alt Mode video and audio
- Test USB-C Power Delivery with DP Alt Mode
- USB-C and PD2.0 controls
- Power source and load up to 100W
- **Electrical test for DUT connector pins**
- **Cable flip with SW**
- **The only USB-C TE approved by DCP for HDCP 2.2 and HDCP 2.3 CTS**
- UCD Console GUI for debugging
- High level API for easy integration

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DPA-400 with the AUX Channel Monitor GUI

- Compatible with all DP versions
  - ✓ **DP 2.0 supported**
- Time stamped interaction log
- Detect and parse all DPCD locations
- Decode Sideband Channel Communication messages
- Flexible in MST testing
- Decode HDCP transactions
- USB controlled & powered, small and light weight

AUX Channel Monitor is mandatory tool for any engineer verifying or debugging Compliance Test or Interoperability

DP 1.4a Link Layer CTS

- Source Device Tests
  - 4.2.1 – AUX reads after HPD Plug event
  - 4.2.2 – EDID and DPCD reads
  - 4.3.1 – Link Training
  - 4.3.2 – Link Maintenance
  - 4.3.3 – Video Time Stamp generation
  - 4.4.1 – Main Stream Data Mapping
  - 4.4.2 – Video Stream Format Change Handling
  - 4.4.3 – Power Management
  - 4.4.4 – Audio Stream Transmission
  - 4.5.1 – Source FEC Protocol
  - 4.6.1 – Source DSC Protocol (released)

- Sink Device Tests
  - 5.2.1 – AUX Channel Protocol
  - 5.2.2 – Sink Device DPCD Field Implementation
  - 5.3.1 – Link Training
  - 5.3.2 – Link Maintenance
  - 5.4.1 – Video Stream Reconstruction
  - 5.4.2 – Video Stream Format Change Handling
  - 5.4.3 – Power Management
  - 5.4.4 – Audio Stream Reconstruction
  - 5.5.1 – Sink FEC Protocol
  - 5.6.1 – Sink DSC Protocol (released)
  - 5.6.2 – Sink DSC Protocol Extension (in progress)

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HDCP 2.2/2.3 CTS

- Transmitter Tests (UCD family certified by DCP)
  - 1A test set – downstream procedure with Receiver
  - 1B test set – downstream procedure with Repeater

- Receiver Tests (UCD family certified by DCP)
  - 2C test set – upstream procedure with Transmitter

- Repeater Tests (UCD-400 certified by DCP)
  - 3A test set – downstream procedure with Receiver
  - 3B test set – downstream procedure with Repeater
  - 3C test set – upstream procedure with Transmitter

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High-dynamic-range Video

High-dynamic-range video (HDR video) describes video having a dynamic range greater than that of standard-dynamic-range video (SDR video).

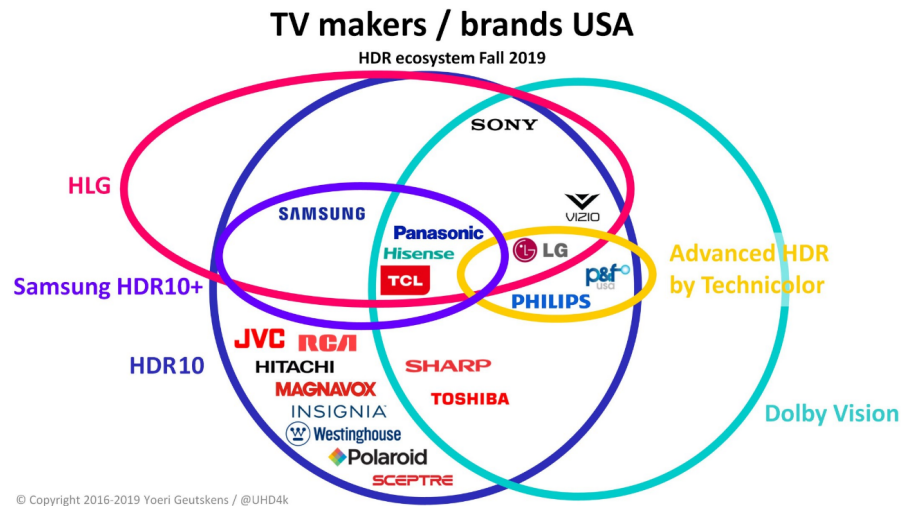*HDR video involves capture, production, content / encoding, and display.*

HDR capture and displays are capable of brighter whites and deeper blacks.

To accommodate this, HDR encoding standards allow for a higher maximum luminance and use at least a 10-bit dynamic range in order to maintain precision across this extended range.
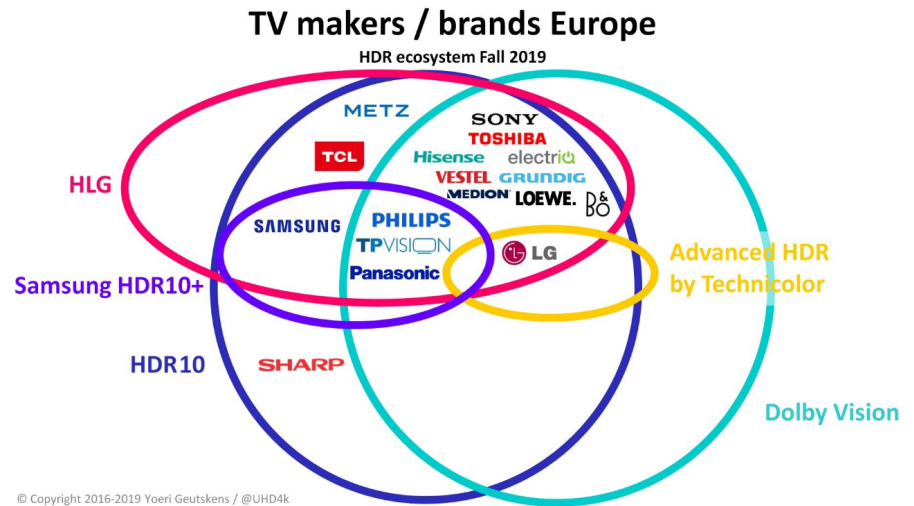
While technically "HDR" refers strictly to the ratio between the maximum and minimum luminance, the term "HDR video" is commonly understood to imply wide color gamut as well.

Wikipedia

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HDR Types

TV makers / brands USA
HDR ecosystem Fall 2019

HLG
Samsung HDR10+
HDR10

SONY
VIZIO
SAMSUNG
Panasonic
Hisense
TCL
LG
P&F usa
PHILIPS
Advanced HDR by Technicolor
JVC RCA
HITACHI
MAGNAVOX
SHARP
TOSHIBA
INSIGNIA
Westinghouse
Polaroid
SCEPTRE
Dolby Vision

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TV makers / brands Europe
HDR ecosystem Fall 2019

HLG
Samsung HDR10+
HDR10

METZ
TCL
SONY
TOSHIBA
Hisense electriQ
VESTEL GRUNDIG
MEDION LOEWE. B&O
SAMSUNG
PHILIPS
TP VISION
Panasonic
LG
Advanced HDR by Technicolor
SHARP
Dolby Vision

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HDR Types

Smartphones / Tablets / Notebooks

Prosumer/Consumer Monitors

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HDR Ecosystem

HDR Content

Video & Metadata

Conversion parameters

SDR Video

Extract parameters

Display capabilities

Display tuning

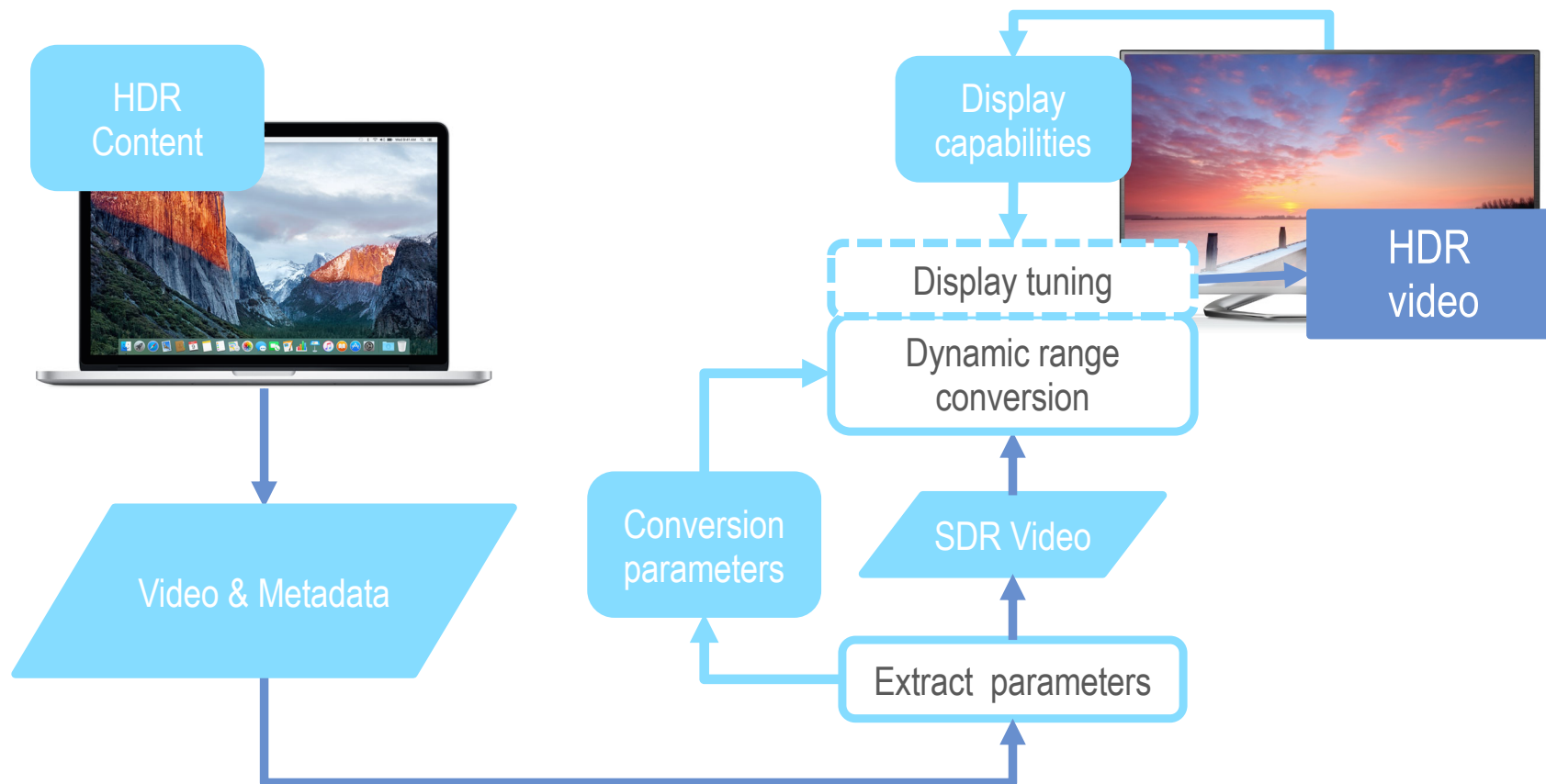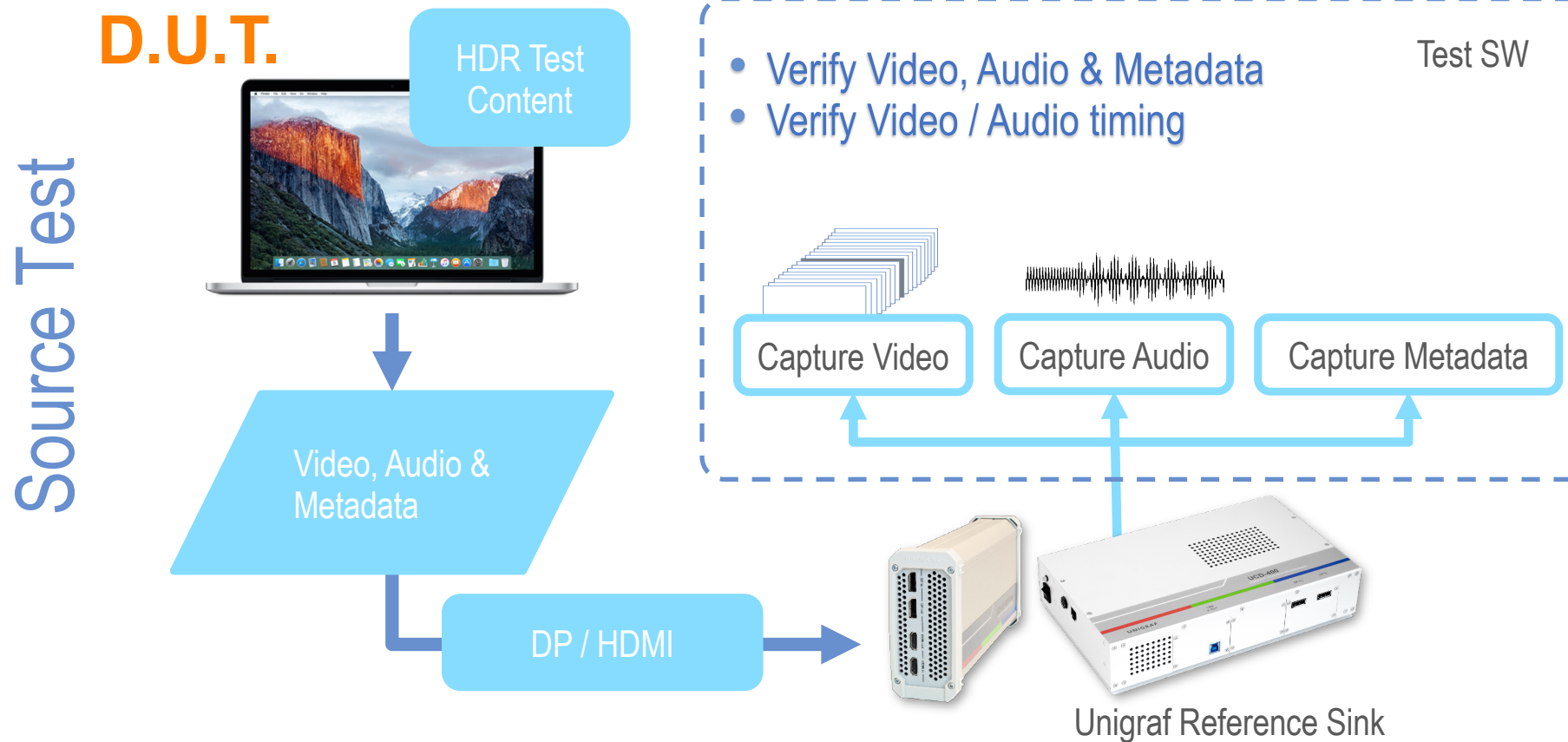Dynamic range conversion

HDR video
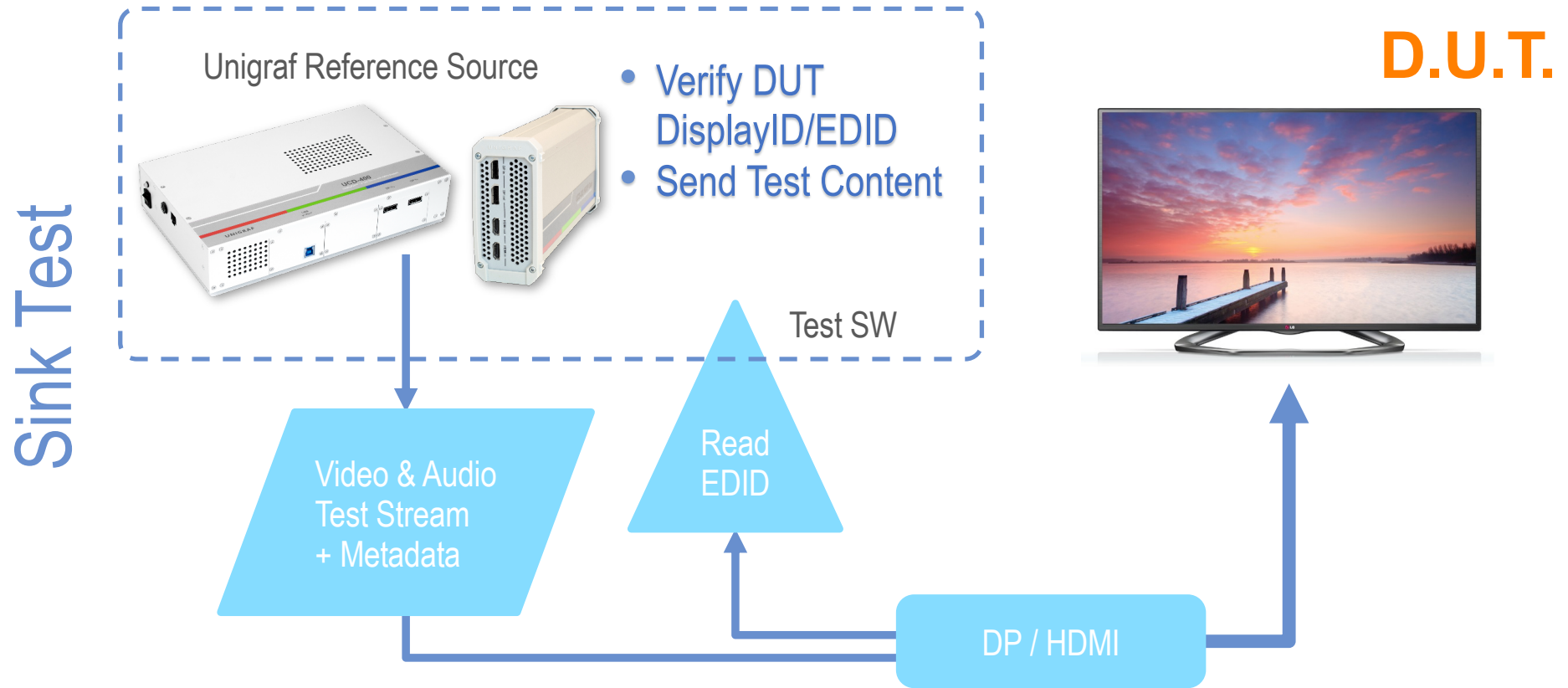
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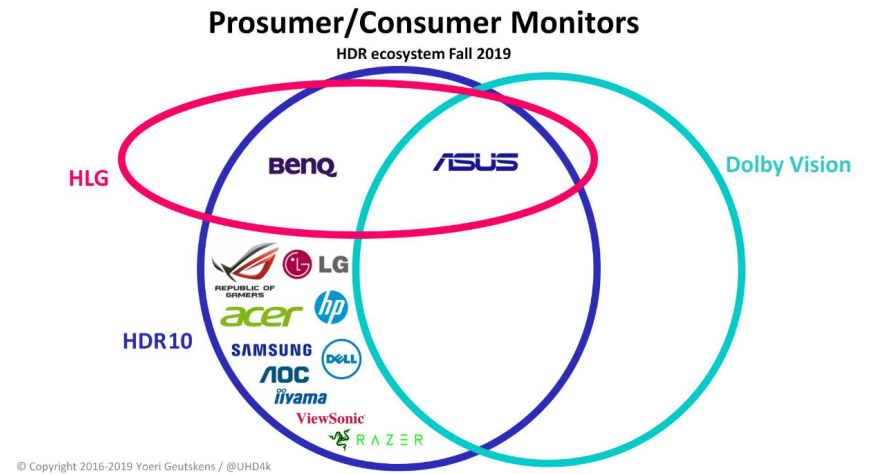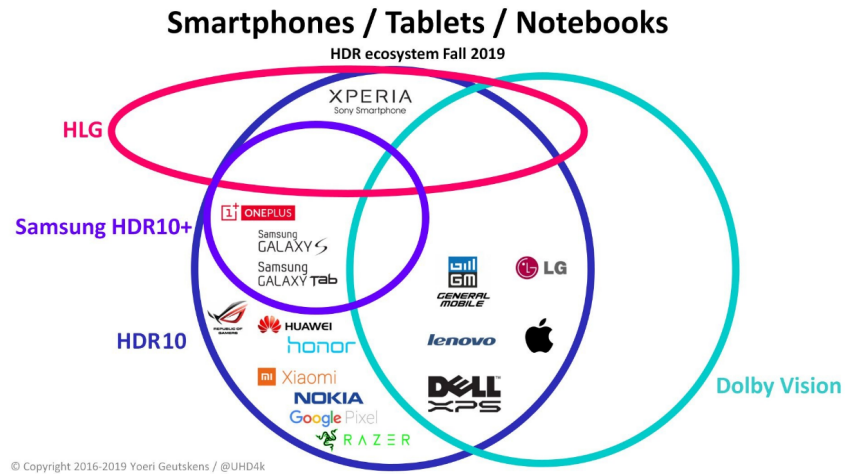
HDR Testing with Unigraf Tools

Source Test

- Verify that the source correctly provides video and related metadata

Sink Test

- Verify that the sink correctly interprets and displays video content

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D.U.T.

Source Test

HDR Test Content

Video, Audio & Metadata

DP / HDMI

Test SW

- Verify Video, Audio & Metadata
- Verify Video / Audio timing

Capture Video   Capture Audio   Capture Metadata

Unigraf Reference Sink

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Sink Test

Unigraf Reference Source

- Verify DUT DisplayID/EDID
- Send Test Content

D.U.T.

Test SW

Video & Audio Test Stream + Metadata

Read EDID

DP / HDMI

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Thank You!

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