

Advanced HDR by
technicolor



Broadcasting HDR

- use of dynamic metadata

Philips
October 2022

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 interdigital™

Agenda

- ▶ Why distribute HDR ?
- ▶ Challenges to introduce HDR in distribution
- ▶ Solutions to meet these Challenges
- ▶ Advanced HDR by Technicolor as possible implementation
 - Existing deployments
- ▶ Demo clips / screenshots
- ▶ Q&A

HDR Dynamic Metadata Uses



HDR10 Base Layer
+ dynamic metadata

- ▶ HDR CE display HDR10 video
- ▶ SL-HDR receivers optimize each image tone mapping to any HDR or SDR display



SDR Base Layer
+ dynamic metadata

- ▶ Legacy CE display SDR video
- ▶ SL-HDR receivers optimize each image tone mapping to any HDR display



HLG Base Layer
+ dynamic metadata

- ▶ HDR CE display HLG video
- ▶ SL-HDR receivers optimize each image tone mapping to any HDR or SDR display

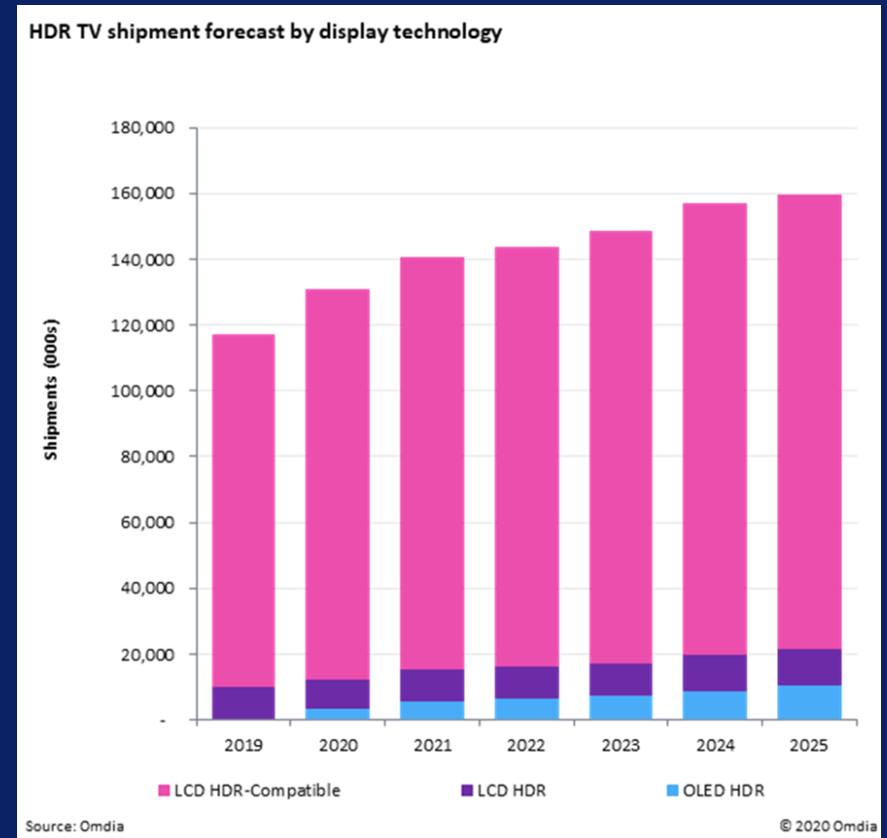
Why distribute HDR ?

- ▶ Today, streaming platforms propose more and more content in HDR
- ▶ More and more Live Sports events are produced in HDR
- ▶ Most of new TVs & Mobile devices are HDR-capable
- ▶ Once an end viewer has an HDR device, (s)he likes to enjoy as much content in HDR as possible but Live TV channels are still very much in transition towards HDR
- ▶ Conclusion
 - ⇒ Distributing in HDR is becoming a must-have for VoD and Live Sports events
 - ⇒ Distributing 100% of Live TV channels in HDR can be a real differentiator !

Challenges to distribute HDR

- ▶ Availability of HDR content
- ▶ There is no available bandwidth to broadcast HDR in parallel to SDR
- ▶ Distributing HDR via OTT can double the distribution complexity and cost (need to duplicate all SDR files in HDR...)
- ▶ HDR itself hardly brings additional revenue
- ▶ Lot of UHD/HDR TVs have limited performance
 - Early UHD TVs are only SDR BT709 capable
 - Early HDR TVs support HDR only on HDMI input (not antenna)
 - Most “HDR TVs” sold to the market are capable of less than 500 nits (“HDR compatible”), often rendering a worse image when receiving an HDR signal (clipping HDR10, ...) than when receiving an SDR signal (*)
 - OMDIA definition of “HDR compatible” means less than 500nits for LCD, far below the UHDA requirement of 1000 nits

(*) Note: Chromecast (Google TV) is no longer forcing HDR output on HDR TVs...
<https://www.flatpanelshd.com/news.php?subaction=showfull&id=1619691310>

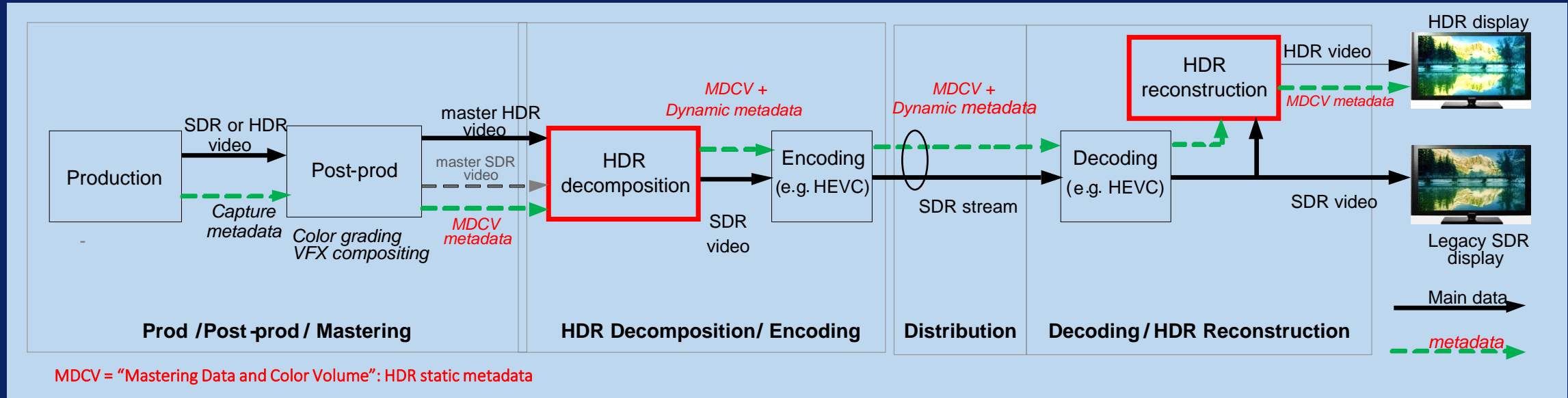


Possible solution that meet these Challenges

- ❑ Upscaling of SDR to HDR content
 - Professional quality: as graders would do it

- ❑ Single stream distribution of SDR and HDR (Broadband & Broadcast)
 - Decomposition of HDR into SDR and metadata
 - Using legacy HD-transmission channels
 - ⇒ Saving bandwidth and costs
 - Compatible with SDR **HD** receivers
 - ⇒ Enabling a good quality SDR experience to low-performing HDR and HDR-compatible TVs
 - ⇒ In case of upscaled SDR: maintain original SDR grading (Roundtrip option)
 - Full HDR experience for high performance HD receivers
 - ⇒ Offer the best experience to end viewers (in SDR or HDR) whatever their TV

Possible Solution: SDR + dynamic Metadata



- ▶ Start with existing HDR content and/or upconverted existing SDR content
- ▶ Automatically down-convert this HDR into SDR + dynamic metadata
 - ☑ Use existing SDR distribution formats (for both Broadcast & OTT)
 - ☑ Add « HDR capability » on top of these streams thanks to dynamic metadata

Possible Solution: SDR + dynamic Metadata

▶ Benefits

- ✓ Compatible with any video compression format
- ✓ Address all devices with the same single (existing) stream (just add dynamic metadata)
- ✓ Legacy devices receive the stream, ignore dynamic metadata and display the SDR images (same as today)
- ✓ Dyn. metadata-enabled devices reconstruct HDR and optimize it to their specific display capability (for example: 300 nit, 600 nit, 1000 nit...)

▶ Specific point of interest for OTT

- ✓ No additional file storage (just replace existing SDR streams by SDR + dyn. metadata streams)
=> Reducing by 2 the storage & management requirements for HDR & SDR distribution
- ✓ No need to check upfront HDR device capability

Possible Technical Solution: Advanced HDR by Technicolor [1/2]

Create more HDR



TECHNICOLOR HDR ITM
(Intelligent Tone Management)

Up-convert from SDR to high quality HDR

Generate HDR dynamic metadata



TECHNICOLOR SL-HDR
(Used for SL-HDR Distribution)

- ▶ Convert any HDR format (PQ or HLG) to high quality SDR
- ▶ Generate Single-Layer SL-HDR distribution format, enabling to optimize each image on SL-HDR devices

- ▶ **Dynamic** analyzing and optimizing each individual image
- ▶ **AI application**, based on 1000's of examples from the best of professional graders
- ▶ **Tunable** systems to respect content owner preference
- ▶ **Real Time** system with **low latency** (~2 frames)

- ▶ **Fully standardized** and flexible solutions that can be used independently in production, contribution and distribution.
- ▶ **Single Layer** distribution streams (HDR- or SDR-based)
- ▶ **Backwards compatible** in existing standards
- ▶ **Round trip** feature for upscaled SDR content

Technicolor HDR (SL-HDR) for Distribution

AVAILABLE STANDARDS

- ETSI** (TS 103 433)
- ATSC 3.0** (SL-HDR1 as option)
- Brazil SBTVD TV2.5** (SL-HDR1 as option)
- Brazil SBTVD TV3.0** (SL-HDR1/2 as option)
- DVB** (SL-HDR2 as option)
- SMPTE** (ST2094-20 / ST2108)
- HDMI** (dynamic metadata over HDMI 2.1)
- Blu-Ray Disc UHD** (SL-HDR2 as option)

SL-HDR: Dynamic HDR Distribution Standards



SL-HDR2

HDR10 Base Layer
+ dynamic metadata

- ▶ HDR CE display HDR10 video
- ▶ SL-HDR receivers optimize each image tone mapping to any HDR or SDR display



SL-HDR1

SDR Base Layer
+ dynamic metadata

- ▶ Legacy CE display SDR video
- ▶ SL-HDR receivers optimize each image tone mapping to any HDR display



SL-HDR3

HLG Base Layer
+ dynamic metadata

- ▶ HDR CE display HLG video
- ▶ SL-HDR receivers optimize each image tone mapping to any HDR or SDR display

SL-HDR1 and ITM deployments



- ▶ USA Sinclair Broadcast Group
 - #1 US Terrestrial Broadcaster
 - Owning 294 stations
 - Already deployed 34 stations with SL-HDR1/ATSC3.0, adding >10 station each quarter
 - Reaching > 50 % US TV households now targeting full USA coverage by end 2022
 - Bally Sports Network+ (*) and Tennis Channel+ start streaming events in SL-HDR1 in Q4/22



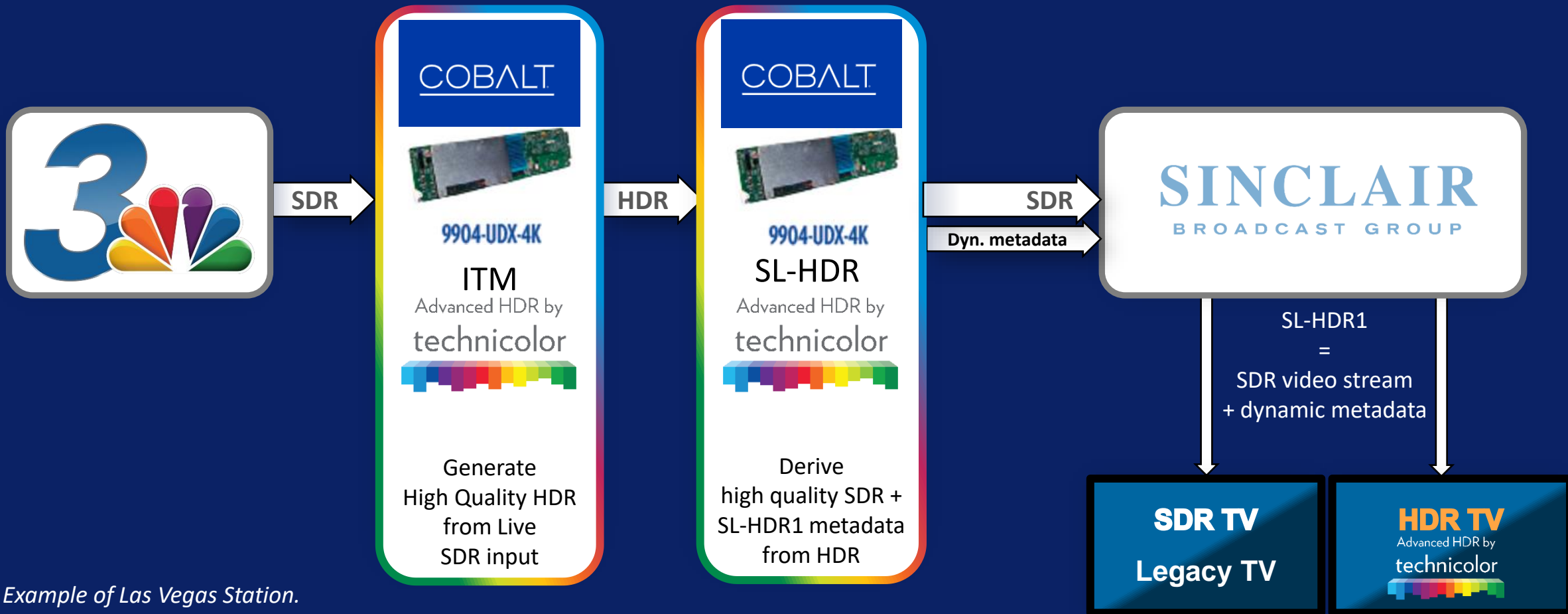
See also: <https://vimeo.com/711839752>

- ▶ Europe: ARTE live HbbTV service available for TV makers to test the service
- ▶ Brazil: TV Globo planning TV2.5 standard deployment with SL-HDR1

(*) Former Fox Sport Network

Sinclair implementation for ATSC 3.0 stations

Commercial services deployed in USA

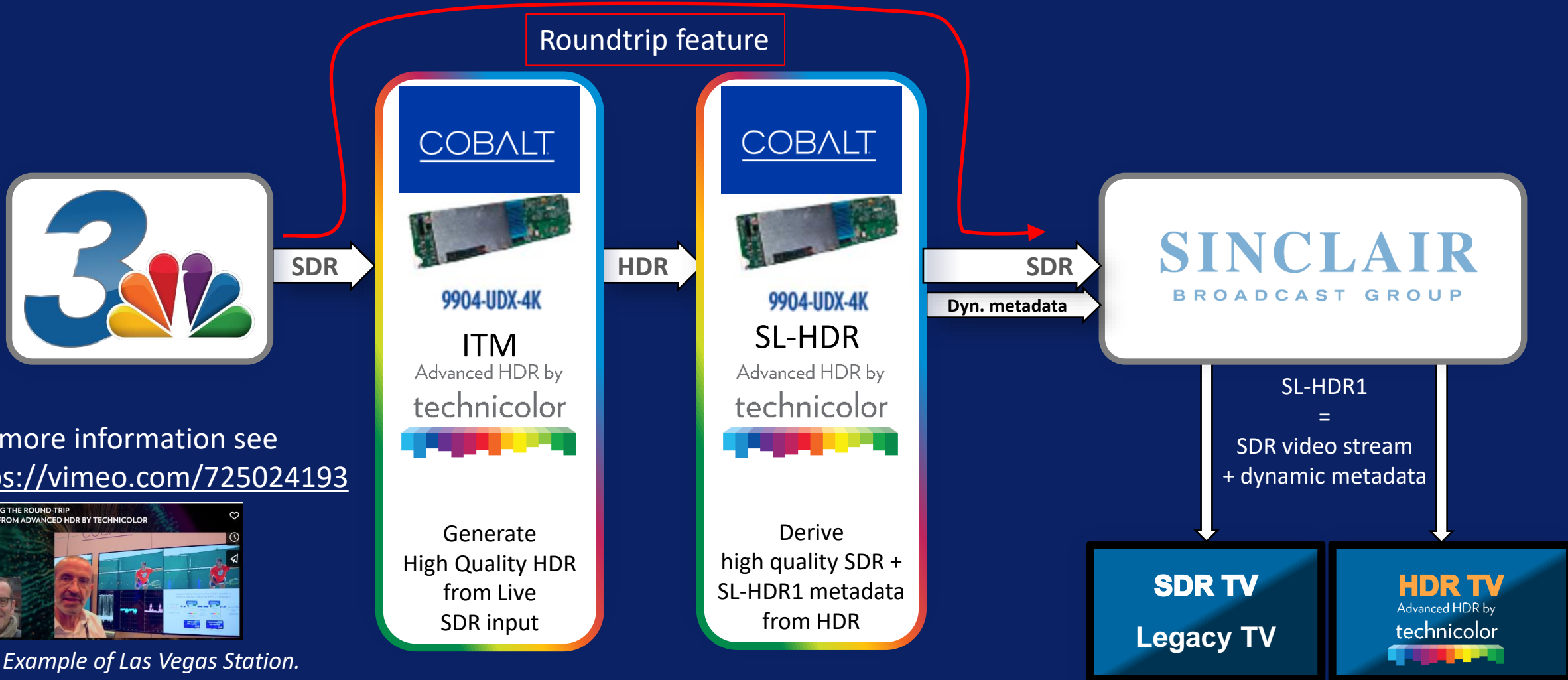


Example of Las Vegas Station.

List of SL-HDR1 stations available on UHD Forum page <https://ultrahdforum.org/uhd-service-tracker/>

Sinclair implementation for ATSC 3.0 stations

Commercial services deployed in USA



For more information see
<https://vimeo.com/725024193>

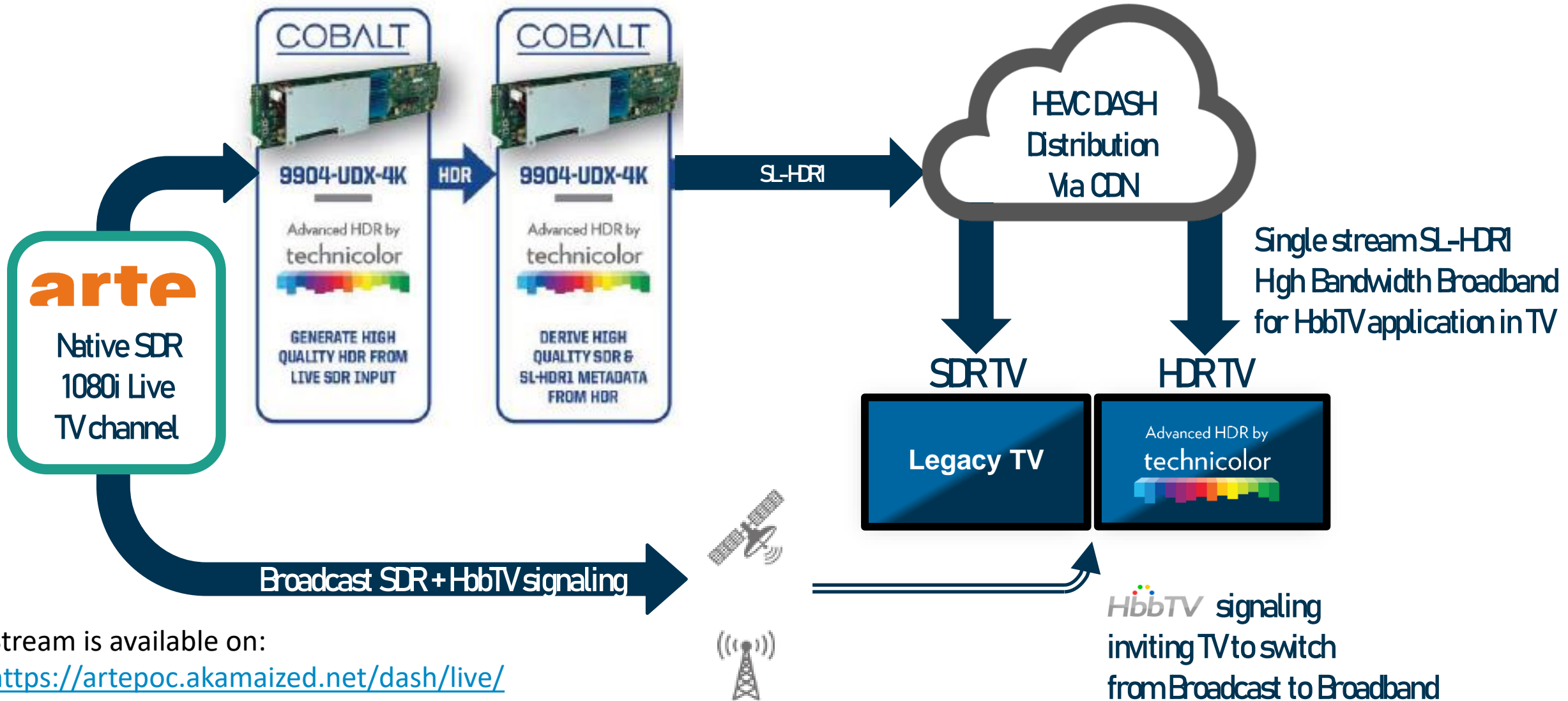


Example of Las Vegas Station.

List of SL-HDR1 stations available on UHD Forum page <https://ultrahdforum.org/uhd-service-tracker/>

More information on roundtrip feature: <https://vimeo.com/725024193>

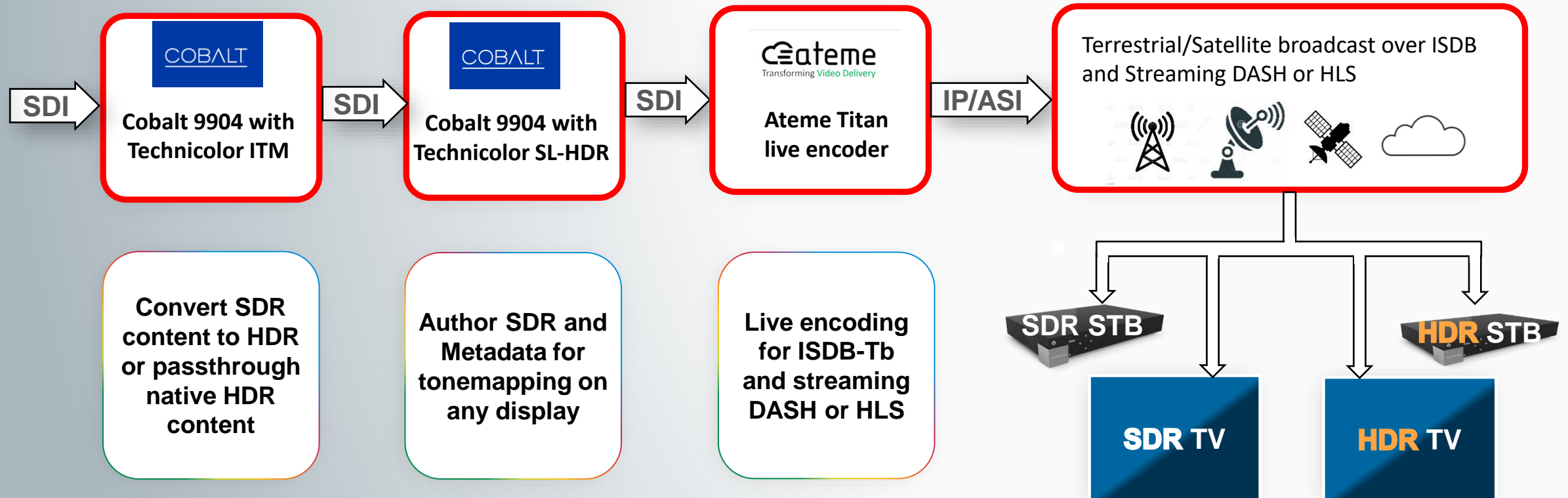
ARTE Live HDR HbbTV test service



Stream is available on:

<https://artepoc.akamaized.net/dash/live/2029556/arte-hdr/dash.mpd>

TV Globo Trial in view of commercial deployment

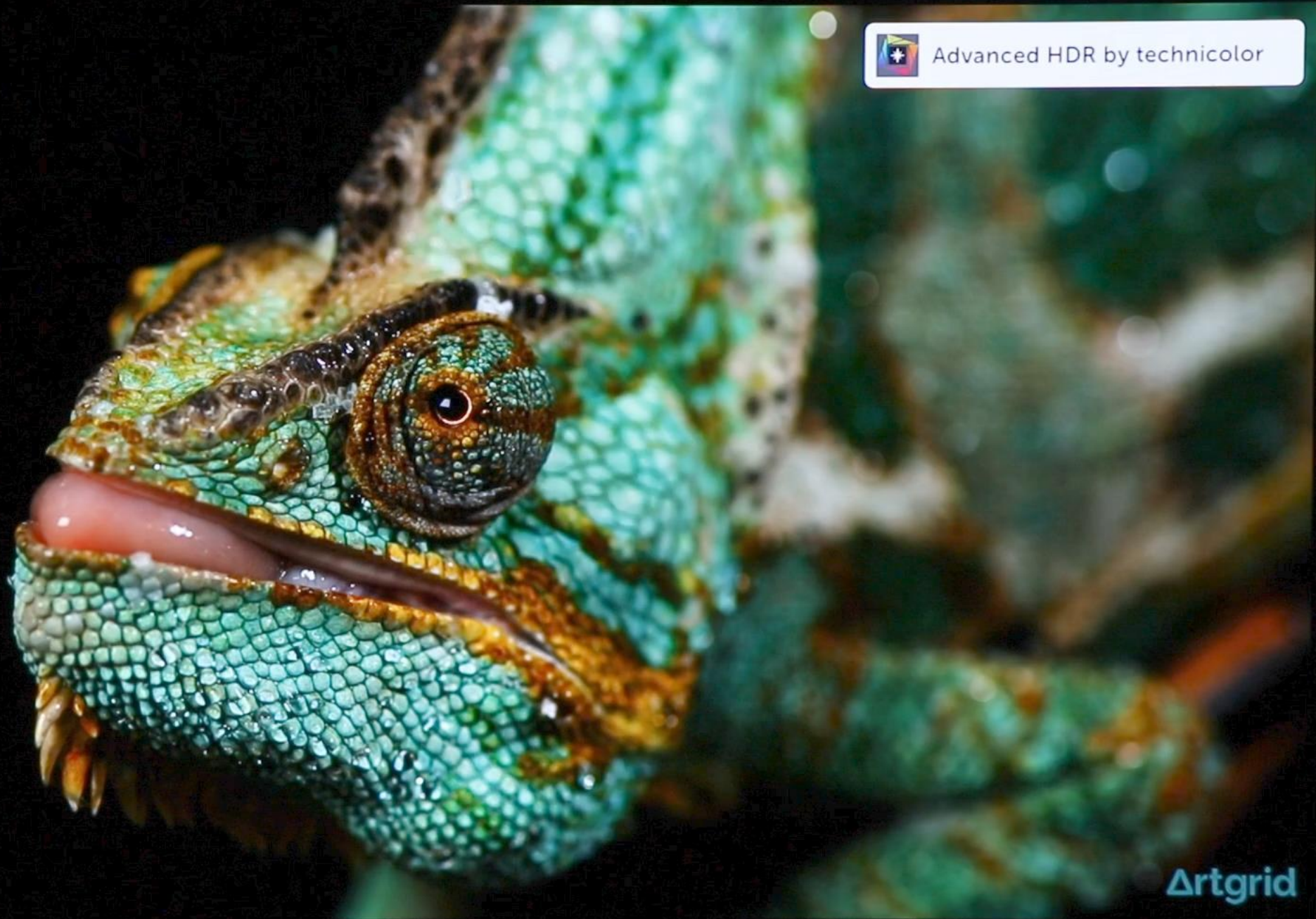


TV Globo has conducted broadcast trials over ISTB-Tb according to the TV2.5 SBTVD standard (AVC 8 bit, BT709, 1080i) using SL-HDR1 distribution format









Concern about Metadata in the HDR production process

- ▶ A number of broadcasters have voiced concerns about the complexity of carrying dynamic metadata in the production process
- ▶ Currently, down conversion from HDR to SDR is done with **fixed** LUTs
- ▶ Also, because multiple LUTs are currently used, this leads to significant issues
 - Mostly, but not exclusively, 2 LUTs are being used: BBC and NBCU
- ▶ These issues are discussed in an EBU WG “HDR down mapping”
 - Intention is to agree on a single LUT, but there is a growing understanding that – long term – a metadata-based approach must be adopted

ITM & SL-HDR1 Benefits for Broadcast & OTT

- ❑ Offer more HDR content ⇒ Up-convert native SDR to great HDR with ITM
- ❑ Offer HDR content to SDR customers ⇒ Derive high quality SDR from native HDR with SL-HDR
- ❑ No bandwidth increase to offer HDR quality ⇒ Send SL-HDR1 encoded stream i.o. SDR
(less than 60kbit/s extra bandwidth needed)
- ❑ Guarantee a good HDR experience ⇒ All *Advanced HDR by Technicolor* SL-HDR receivers are certified !
- ❑ Low CAPEX ⇒ 2 Cobalt cards between playout and distribution encoder

Specific to OTT:

- ❑ No increase of stored content formats ⇒ Replace SDR stored files by SL-HDR1 or use ITM in CDN
- ❑ No need to check HDR capability of receiving TV ⇒ Distribute SL-HDR1 stream to all CE devices

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