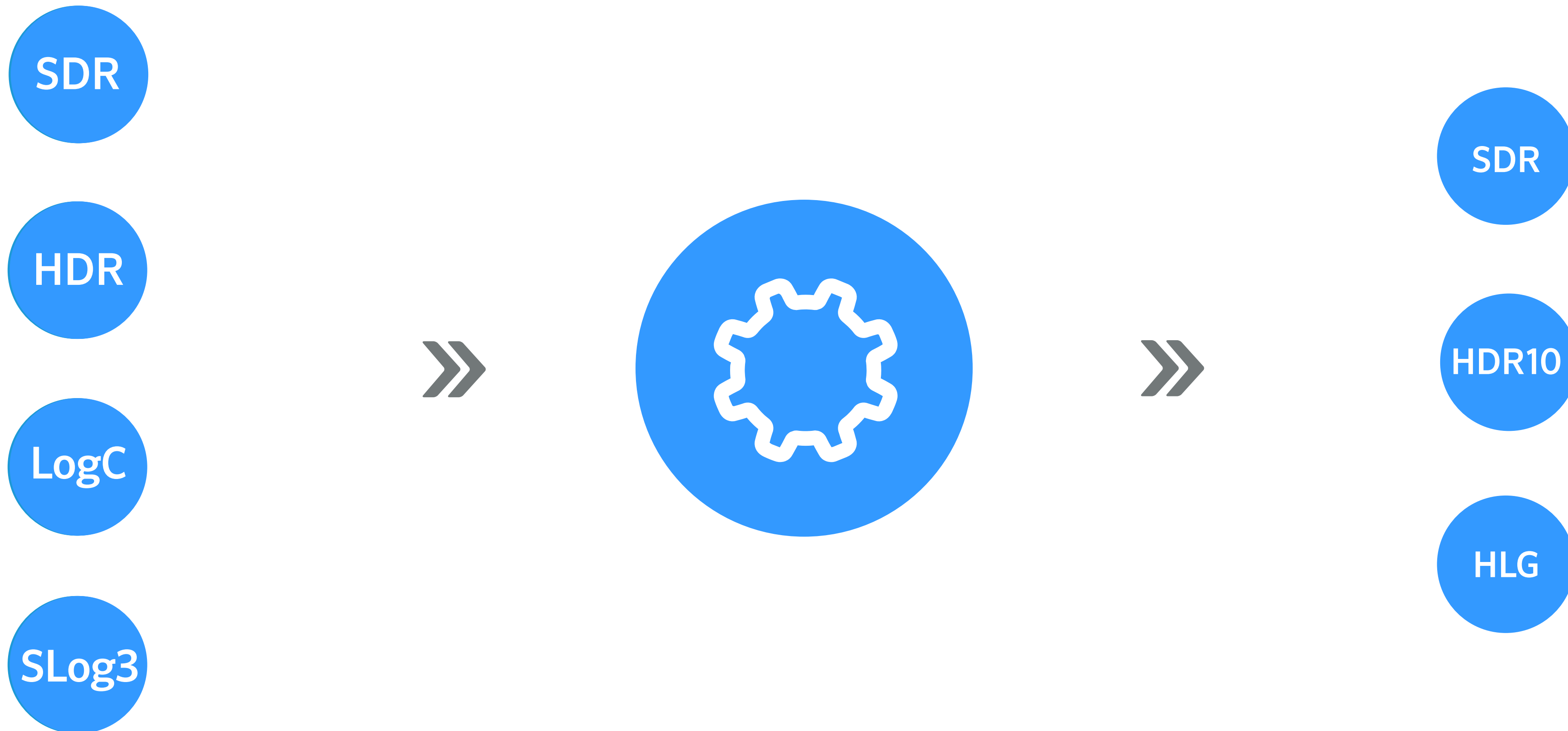# COLORFRONT
ENGINE™

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Challenge

A SIMPLE COMMON SINGLE MASTER IMAGE PIPELINE IS NEEDED

▶ Today there is ever increasing number of acquisition sources and delivery requirements

▶ Neither practical nor affordable to separately support each individual standard, color space, brightness level, source or delivery format

▶ A simple common image pipeline is needed from on-set through final delivery to ensure image integrity
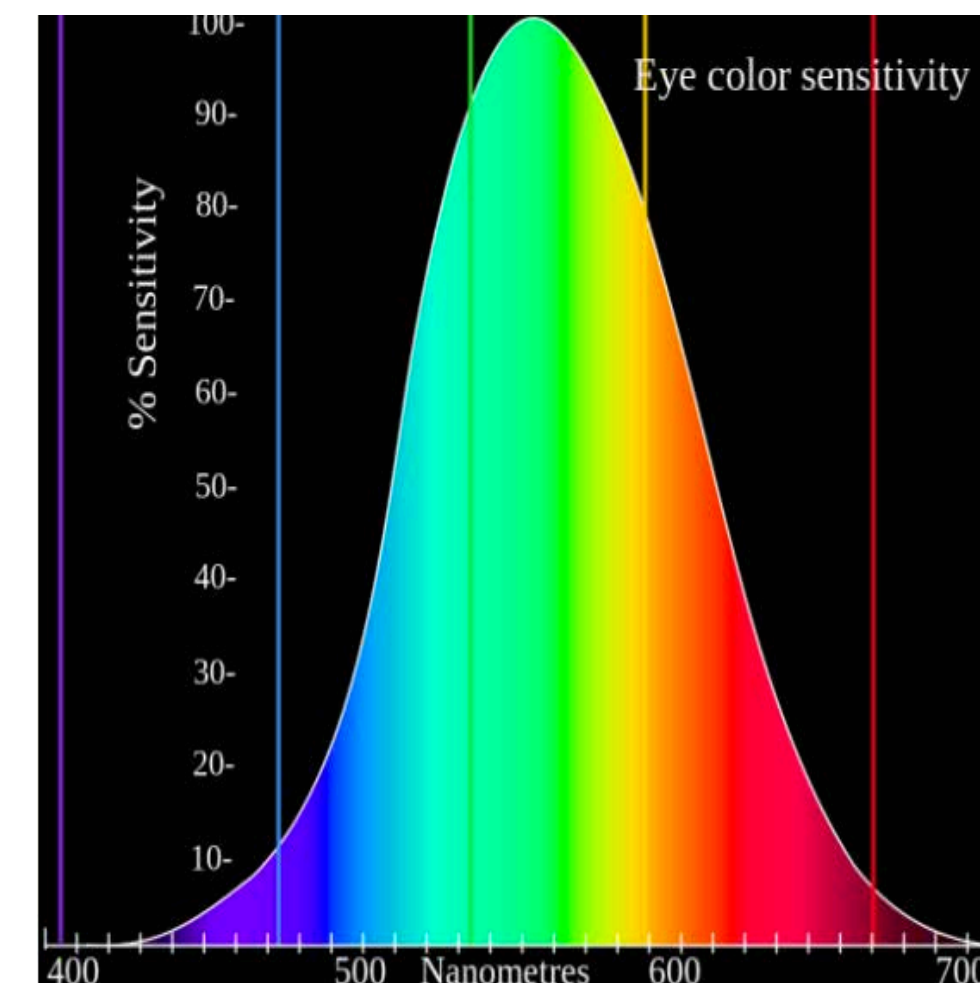
What is Colorfront Engine?

AUTOMATICALLY MANAGED COLOR PIPELINE

▶ Colorfront Engine is a state-of-the-art, automatically managed, ACES-compliant color pipeline

▶ Brings true plug-and-play simplicity to today's complex production requirements

▶ The technology applies various format-specific input and output transformations to the image

- camera-specific live signal

- camera recorded footage

- projector in P3 color space

- display in either SDR or HDR mode

Why Colorfront Engine?

IMAGE INTEGRITY AND COLOR FIDELITY

▶ Bring all types of input color spaces and formats into one common denominator

▶ Ensure image integrity and color fidelity from the on-set world to the multitude of current and future delivery requirements

▶ Simplify them into a single workflow
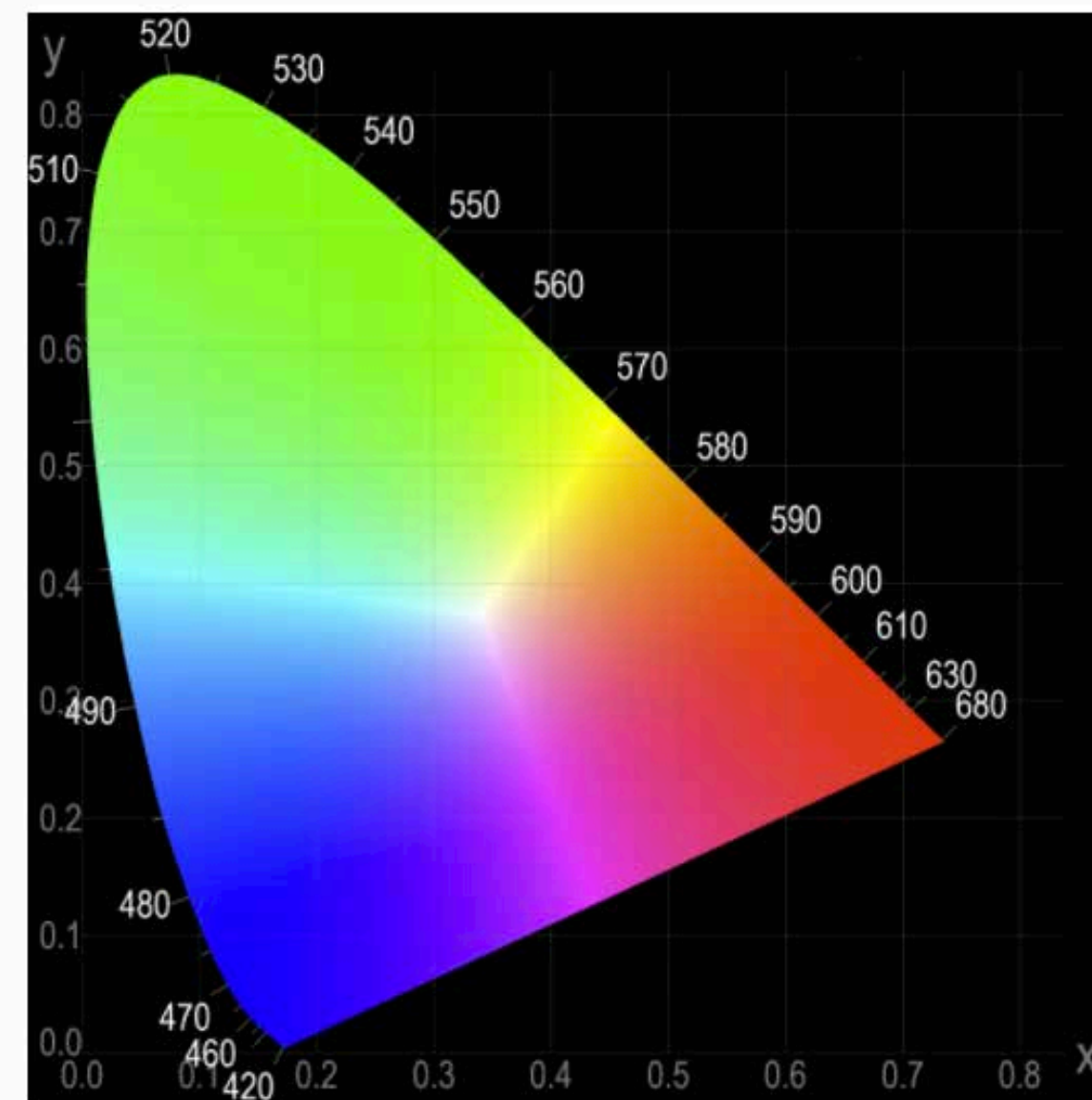
▶ Maintaining an industry-leading color quality

Advantages of using Colorfront Engine

UHD/HDR/WCG PROCESSING BASED ON HUMAN PERCEPTION

▶ Colorfront Engine differs from any other systems because it's algorithms are based on how the human eye actually sees the world

▶ Not just on a linear mathematics system

▶ The **perceived relationships of color and brightness remain constant** across differing dynamic ranges, brightnesses, and color gamuts

Linear Mathematical model   vs.   **Perceptually Uniform model**
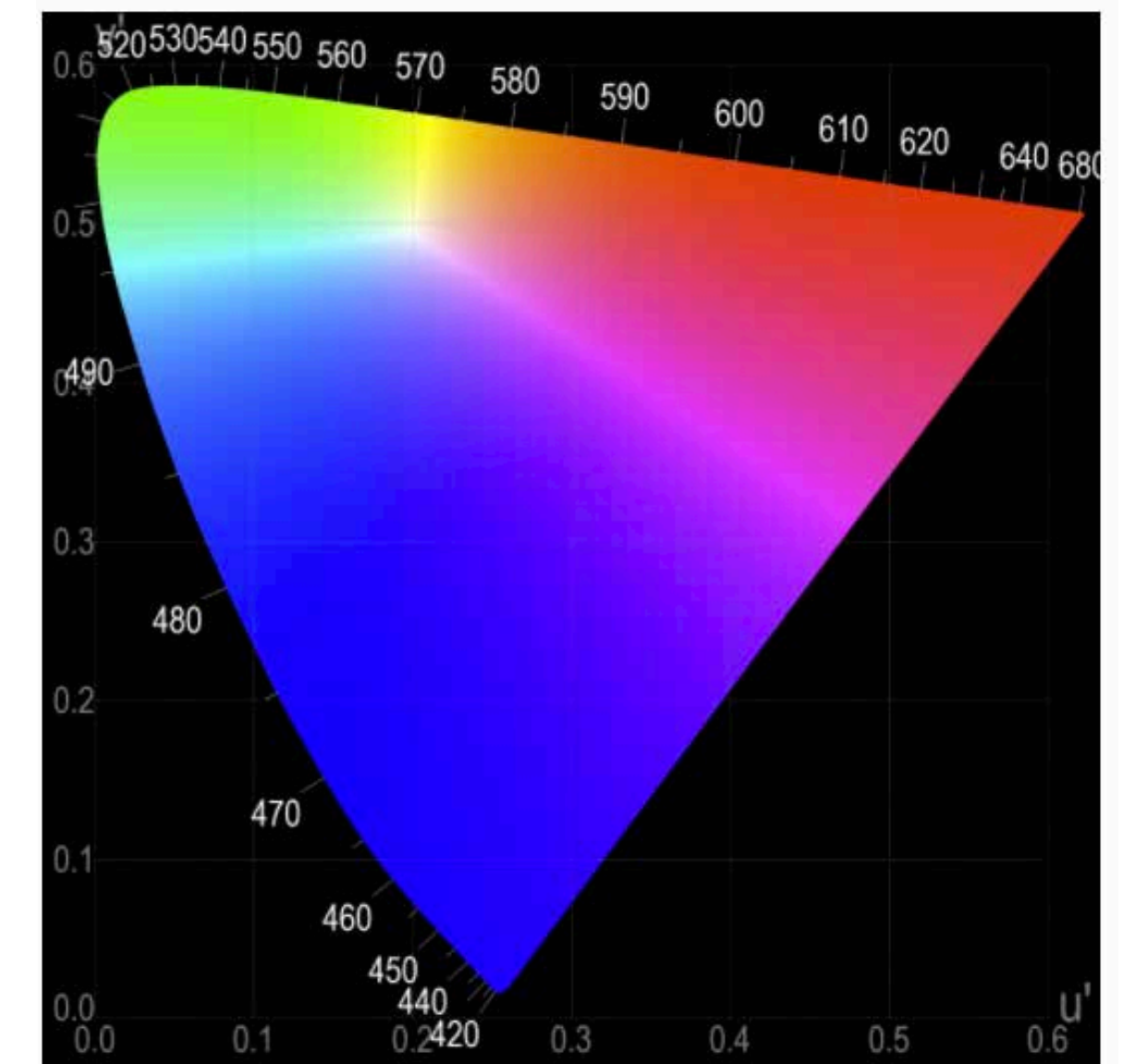
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Maintaining perceptual integrity
PRESERVING ORIGINAL CREATIVE INTENT

With a perceptually optimized color volume remapping technology, Colorfront Engine is designed to preserve the original creative intent when converting between numerous original camera and delivery formats, no matter what the color space, brightness level, or dynamic range is.

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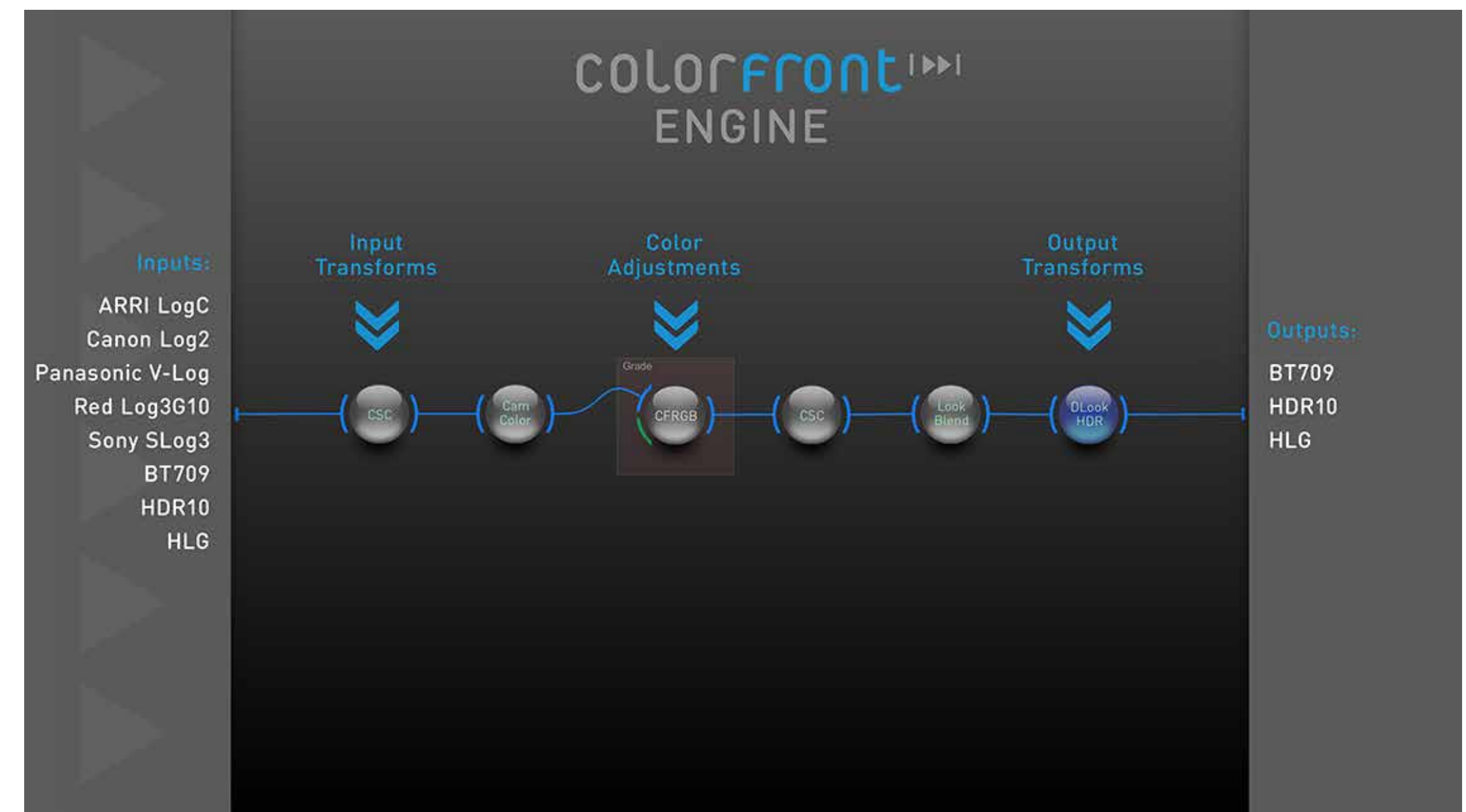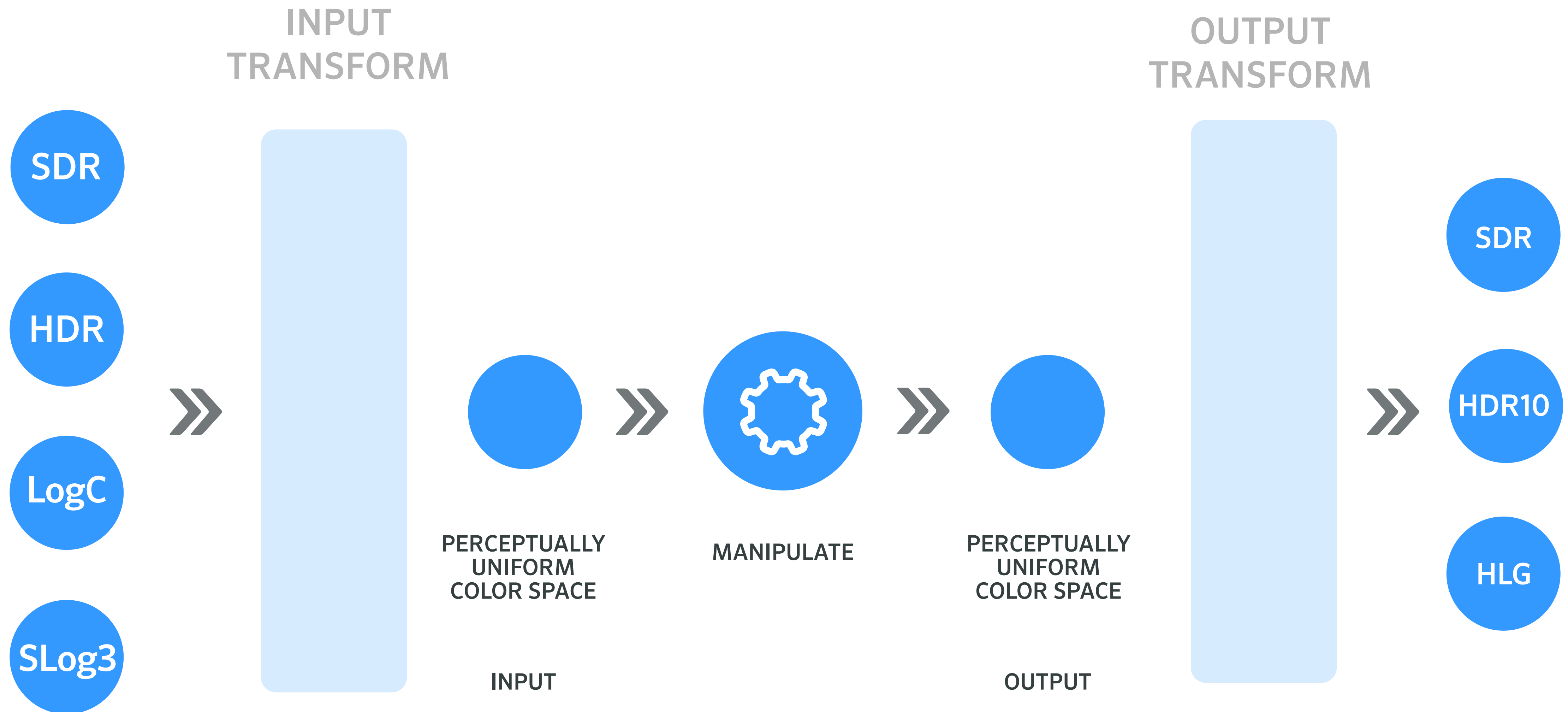
Use cases

CONVERT BETWEEN CAMERA LOG AND HDR/SDR

▶ **Mapping from various camera native log formats** to multiple concurrent HDR / SDR outputs

▶ **SDR preview on HDR monitors** allows instantaneous previewing of SDR / HDR on a single HDR display, without changing settings

▶ **HDR to SDR down conversions** facilitating single master workflows

▶ **SDR to HDR up conversions** allowing the integration of legacy SDR content into HDR workflows

▶ **Remapping between various HDR and SDR nit levels**

▶ **Remapping between standard and wide color gamuts,** including BT.709, BT.2020, P3 and ACES

▶ **Converting between various resolutions,** including 8K, 4K, UHD, HD, SD

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HDR Conversions:

HDR to HDR

HDR to SDR

SDR to HDR

WCG Conversions:

BT.709 to BT.2020

BT709 to P3

BT.2020 to BT.709

BT.2020 to P3

P3 to BT.709

P3 to BT.2020

Up and Down Conversions:

Converting HD SDR BT.709 sources to UHD HDR BT.2020

Converting UHD HDR BT.2020 sources to HD SDR BT.709

Colorfront Engine and ACES
BUILT ON ACES

Colorfront Engine complements the Academy Color Encoding System

It works with mathematical transform functions, not LUTs

▶ Perceptually consistent Light Level conversions

▶ Dynamic Light Level conversions

▶ Up/down conversion from SDR to HDR

▶ Tunable ambient surround compensation

▶ Supports virtually any dynamic range

▶ User selectable and tunable Look Library

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Format agnostic and future proof:

COMPATIBLE WITH CURRENT / FUTURE DELIVERY FORMATS

DOLBY VISION

SAMSUNG HDR10+

HDR 10 - PQ 1000 nit BT.2020

HYBRID LOG GAMMA BT.2100

DCI P3 48 nits

DOLBY CINEMA / ECLAIR COLOR

ACES(archive)

BT.709 / 601 SDR

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Camera agnostic

COMPATIBLE WITH MAJOR CAMERA LOG FORMATS

▶ Colorfront Engine can take incoming imagery from some of the most popular professional cameras in the world today

▶ Convert their LOG output in realtime to 4K/UltraHD or 2K/HD

▶ Output as either HDR or SDR

▶ This greatly simplifies workflows in a mixed camera environment and provides for a unified input workflow to HDR or SDR capable switchers and more.

Sony S-Gamut3/S-Log3   ARRI LogC Wide Gamut   Panasonic Vlog   Red Log3G10 Wide Gamut   Canon Log2

File based workflows:
COLORFRONT ENGINE POWERS EXPRESS DAILIES AND ON-SET DAILIES

On-Set Dailies
Express Dailies

- **Express Dailies** and **On-Set Dailies** are both built on **Colorfront Engine™**
- Enables creative, on-set look creation
- Ensures the color integrity of UHD HDR dailies/deliverables, with associated metadata, through the entire camera-to-post chain
- Express Dailies and On-Set Dailies have proven perennially popular in on-set workflows, most of feature and episodic TV shows, including: **Blade Runner 2049** (Warner), **Atomic Blonde** (Universal), **Star Trek Beyond** (Paramount), **Game Of Thrones – Season 7** (HBO), **Avengers: Infinity War** (Disney), **Robin Hood: Origins** (Lionsgate), **Spider-Man: Homecoming** (Sony), Amazon Studios' titles including **Red Oaks, The Grand Tour, Bosch – Season 3**, and **The Man In The High Castle**.

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File based workflows in the mastering facility:
TRANSKODER 2017 IS POWERED BY COLORFRONT ENGINE

Transkoder

Transkoder 2017 enables post houses, broadcast and OTT content service facilities to further streamline the delivery of Ultra High Definition (UHD), High Dynamic Range (HDR), Wide Color Gamut (WCG) content.

▶ Running on fast, cost-effective Supermicro and HP Z840 workstations

▶ Cutting-edge GPU performance of the very latest NVidia graphics cards

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File based workflows in the mastering facility:
TRANSKODER 2017 IS POWERED BY COLORFRONT ENGINE

▶ AJA's high-density Corvid 88 I/O card supports multiple, independent HD-SDI outputs

▶ Dual independent UHD outputs for simultaneous real-time views of UHD HDR and HD HDR/SDR masters in a wide variety of formats and color spaces

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File based workflows in the mastering facility:
TRANSKODER 2017 IS POWERED BY COLORFRONT ENGINE

split view

butterfly view

side by side view

▶ Uniquely soft-proofing various light level versions on a single monitor for preview

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Colorfront Engine enters the broadcast world

COLORFRONT ENGINE ALSO POWERS AJA FS-HDR

- ▶ AJA upcoming 1RU, rack-mount, universal converter/frame synchronizer FS-HDR's extensive HDR and WCG processing support enables real time processing of live video in 4K/UltraHD and 2K/HD

- ▶ Convert between BT.709 and PQ BT.2020

- ▶ FS-HDR also enables the conversion of popular camera formats from multiple vendors into the HDR space

- ▶ Plus conversion to-and-from BT.2020/BT.709

- ▶ Critical for the widespread acceptance of HDR alongside SDR in broadcast and OTT workflows

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2017 HPA Engineering Excellence Award Winner

HPA AWARDS 2017

> *Judging criteria for the technology include the following: uniqueness, significant contribution to the industry at this time, excellence, outstanding implementation, design and utility, offers a path to continued industry progress, represents an achievement that allows for increased efficiency or creativity, and streamlines or enhances current processes.*

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NAB 2017 Awards of Excellence Winner

ProductionHUB.com

" *Sometimes the best new product isn't overly flashy or expensive, but they sure do fill a need.*

Our first AoE winner AJA FS-HDR is right there. The FS-HDR is such a smart product - right

place and right time. Just makes sense as our industry is making the big time leap to HDR.

I predict that the FS-HDR is going to fly off of the shelves and be a big seller for AJA. "

Colorfront Engine production use

Colorfront Engine continues to be the core image processing tool on high end productions. It was used for the look development for last year's Academy Awards Best Picture **Moonlight** by colorist Alex Bickel, this year's upcoming blockbuster **The Dark Tower**, Amazon's **The Grand Tour** series or Alex Haley's **Roots** remake, just to name a few.
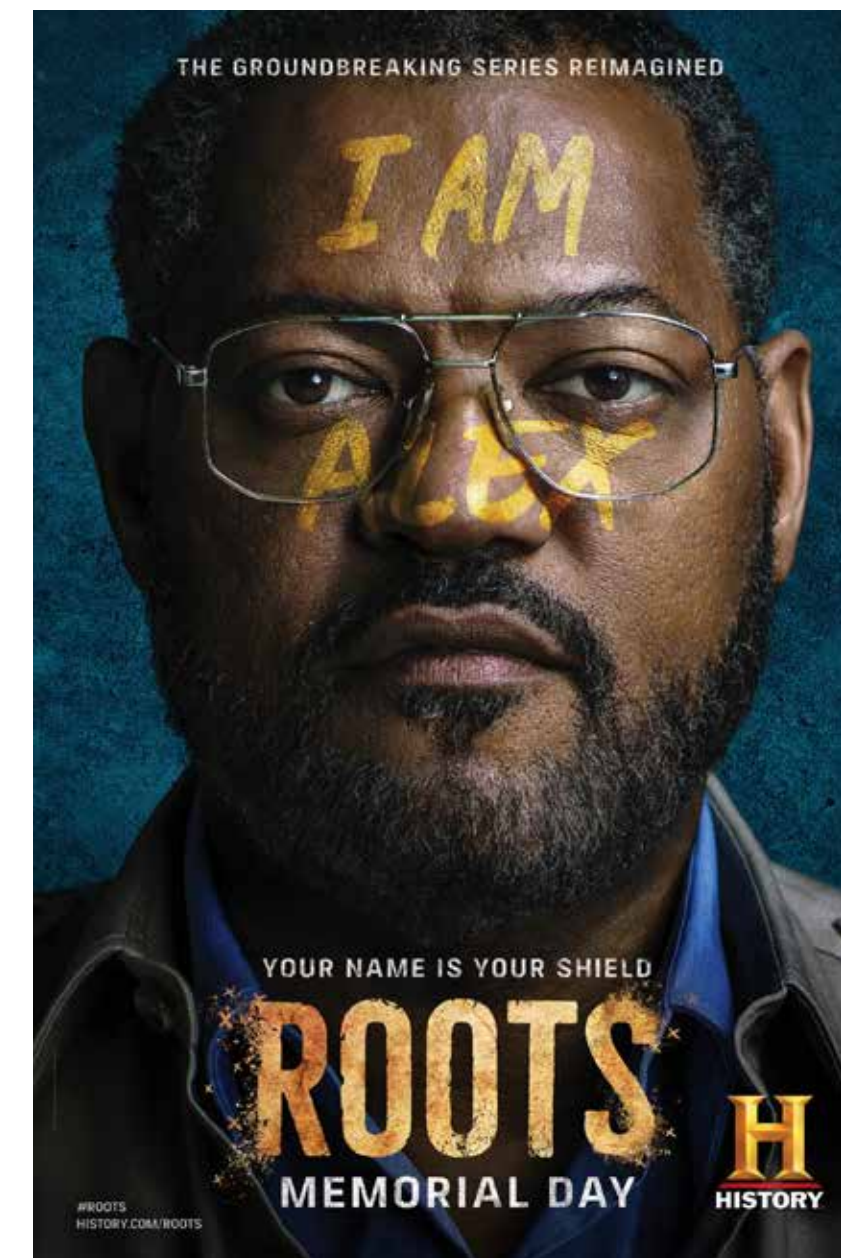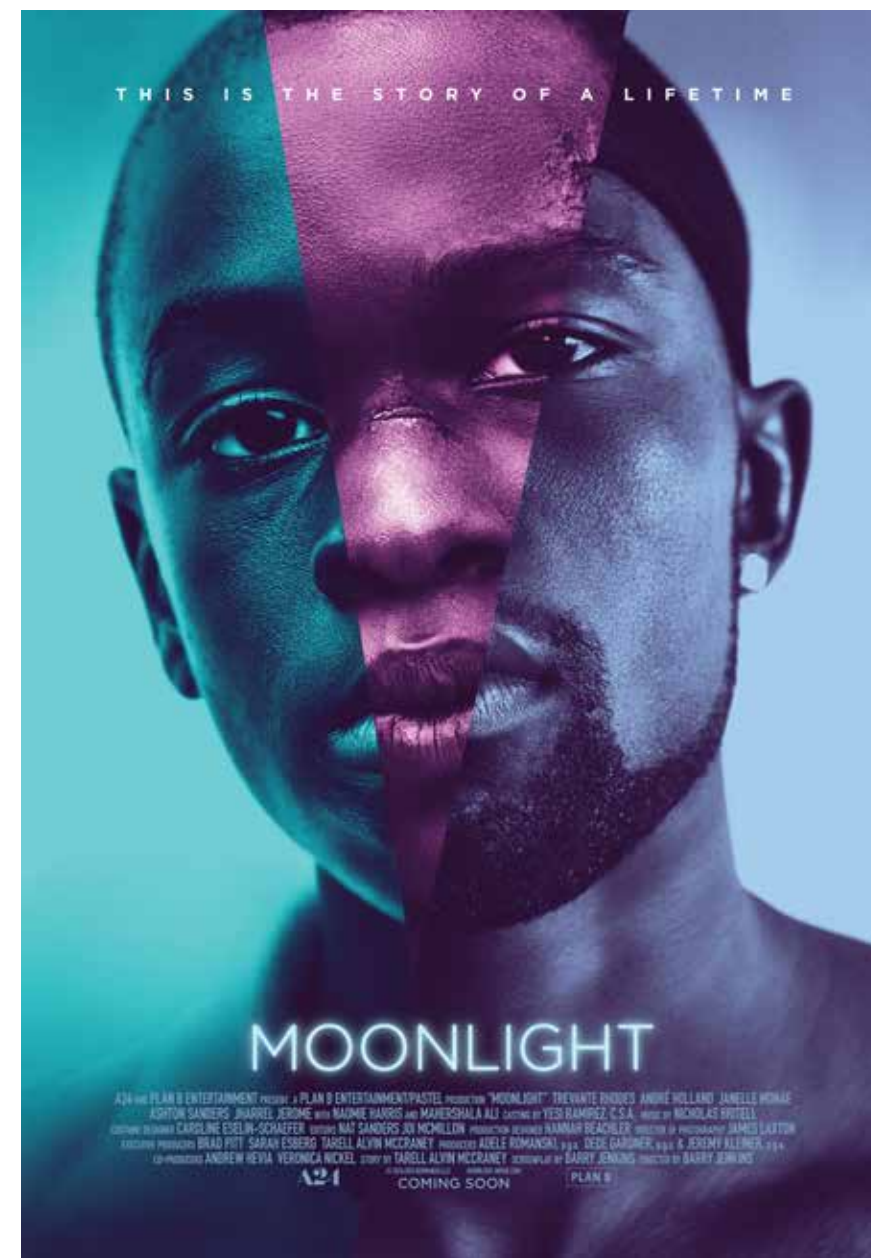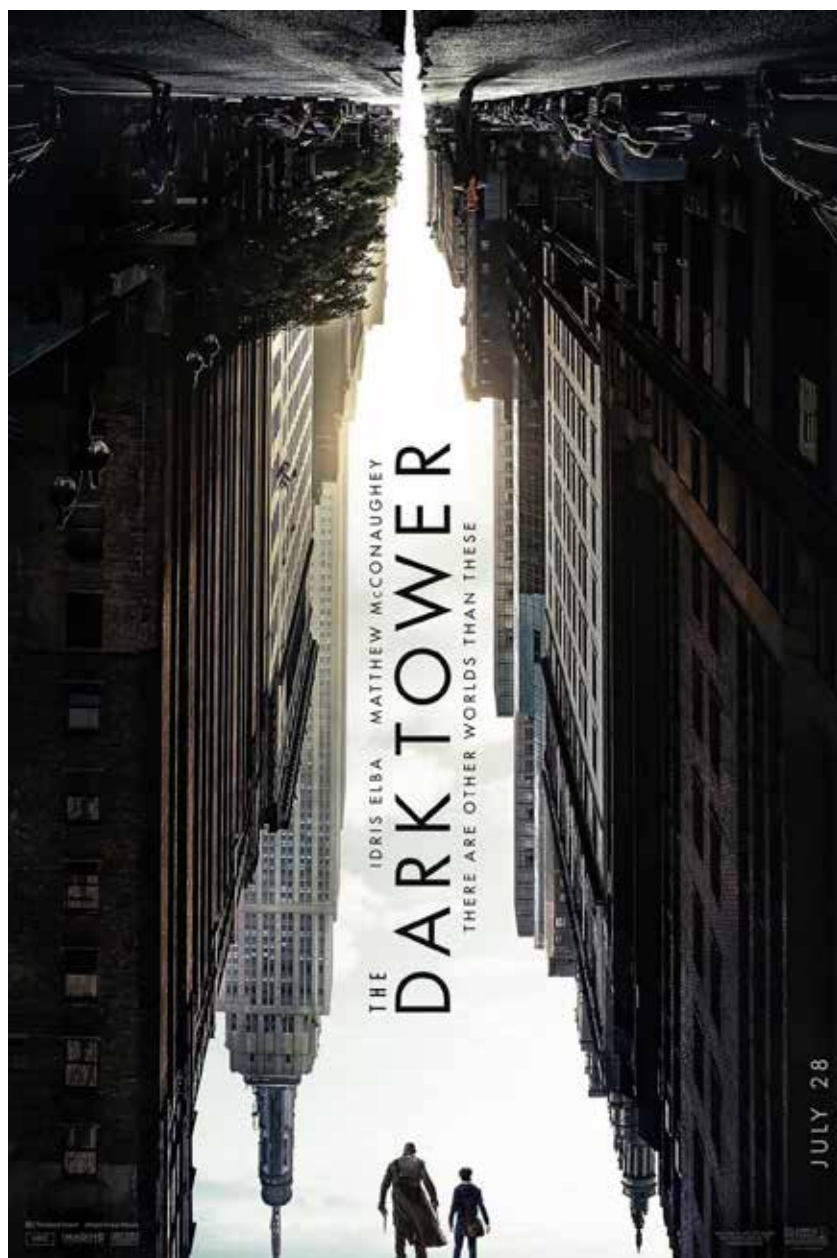
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