SYNOPSYS®
Silicon to Software™

使用IP为HDMI和DisplayPort SoC设计做出最佳抉择

网络研讨会

许 可，资深产品市场经理

2021-01-19

AGENDA

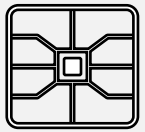
- Market Trends and Use-Case

- Display Interface Standards and Evolution

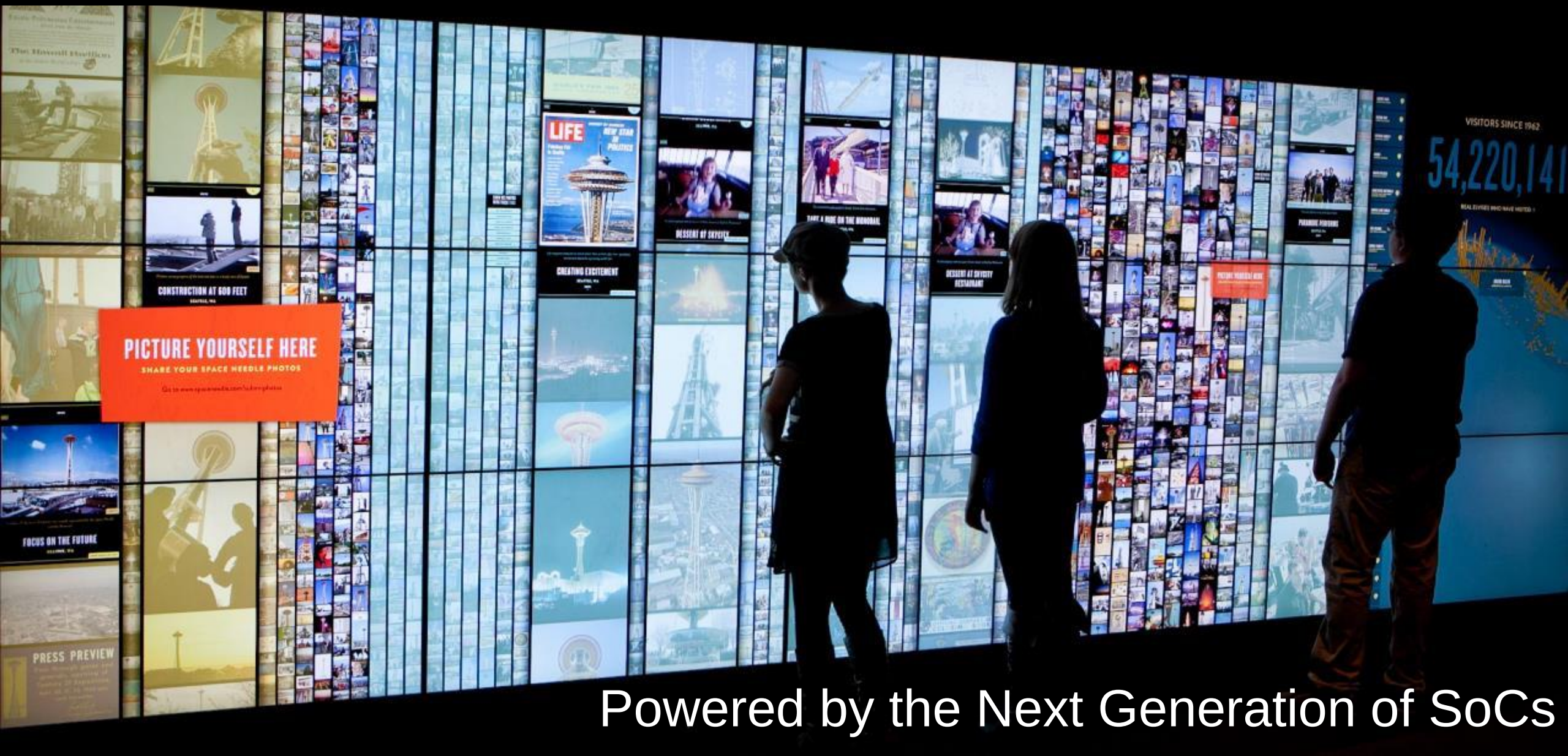
HDMI™ HIGH-DEFINITION MULTIMEDIA INTERFACE

VESA

- IP for Display SoCs



Displays Are the Ubiquitous Interface to our Digital Lives



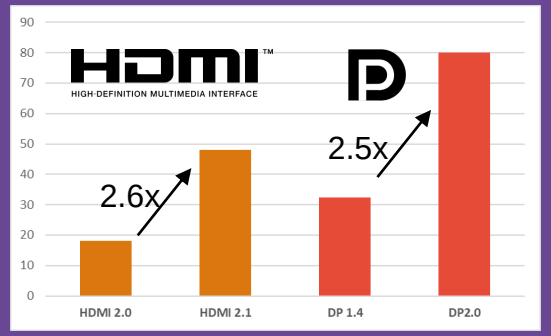
Powered by the Next Generation of SoCs

Display Market Trends

Higher Bandwidth, New Display Technologies, Value-Added Features

Higher Bandwidth

DP2.0 80Gbps
HDMI 2.1 48Gbps
DSC with 3-5x compression

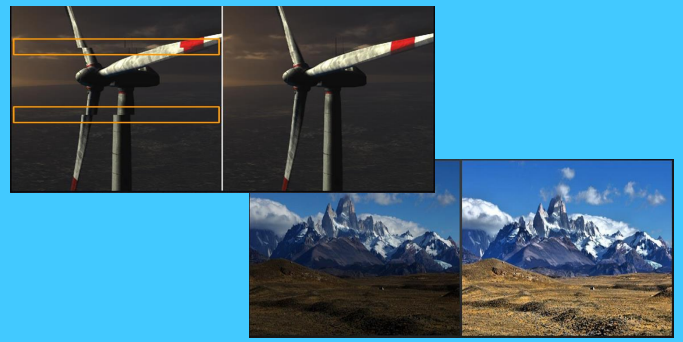


Display Technologies

Modular displays with microLED's (800 inch)
Flexible and rollable display

Value-Added Features

Variable refresh rate modes for gaming - 4k120Hz



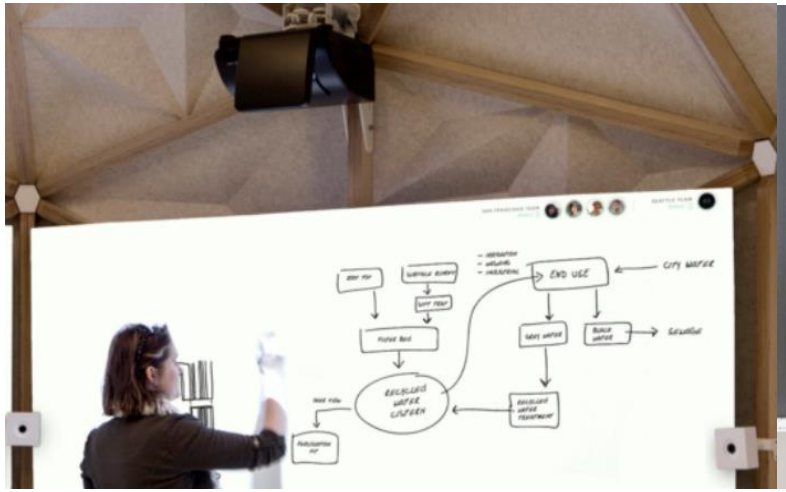
New Use-Cases Are Emerging

Edge devices for AI-augmented video output

e.g. for Industry applications like portable security cameras

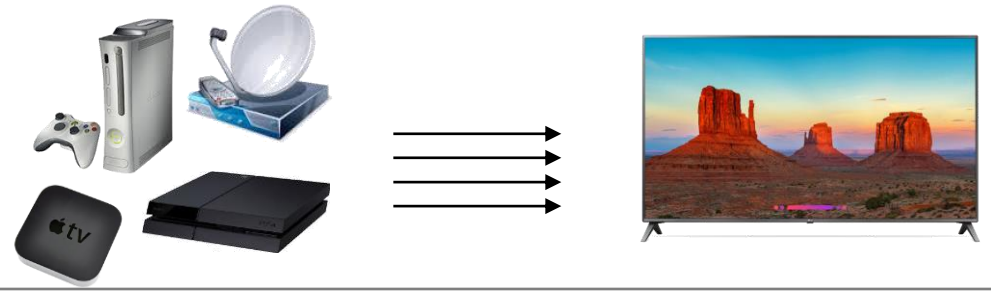
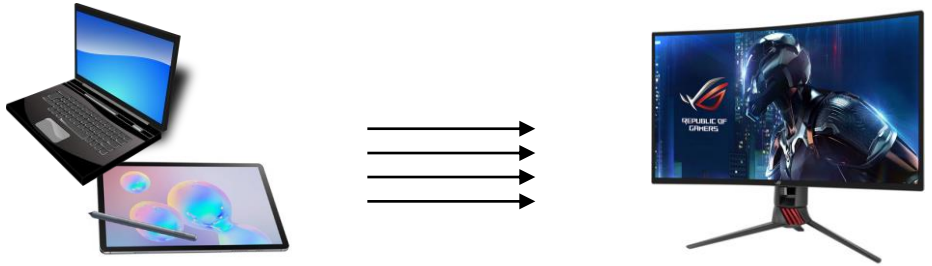
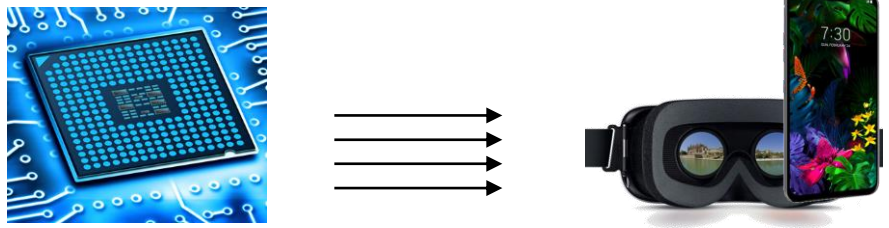
Displays that combine camera with screen

AI enabled cameras for new productivity or leisure use-cases



(Wired) Display Standards and Market Segments

HDMI, DisplayPort, and MIPI DSI/DSI-2

Consumer Electronics	HDMI™ HIGH-DEFINITION MULTIMEDIA INTERFACE	
Laptop, PC	DisplayPort™ (DP/eDP/Type-C)	
Embedded / Mobile	mipi® alliance (MIPI DSI)	

The Evolution of The HDMI Standard

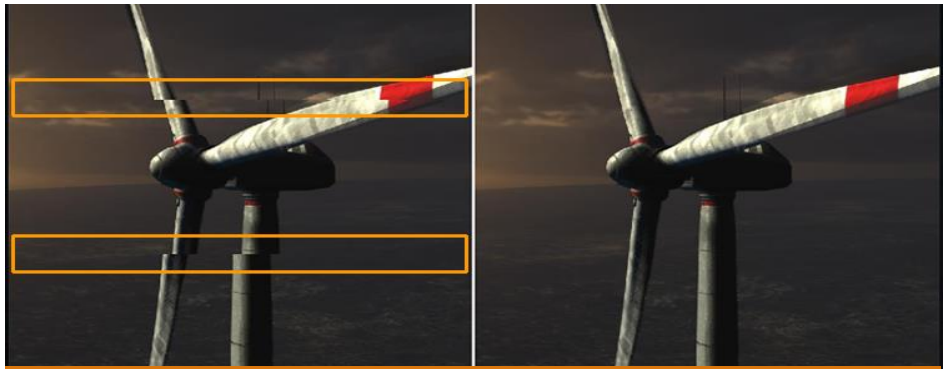
HDMI 2.1 Since Nov 2017

- 48.0 Gbps
- 10K, 8K, 5K, 4K
- FRL w/ FEC
- Dynamic HDR
- Game Mode VRR
- Audio Return Channel
- Display Stream Compression

48G – Higher Bandwidth

Dynamic HDR – Better Image Quality

eARC – Enhanced Audio Features



VRR - Low Latency for Gaming

The Evolution of The DisplayPort Standard

DP 1.4 Since Mar 2016 (DP 2.0 Since Jun 2019)

32.4 - 80Gbps

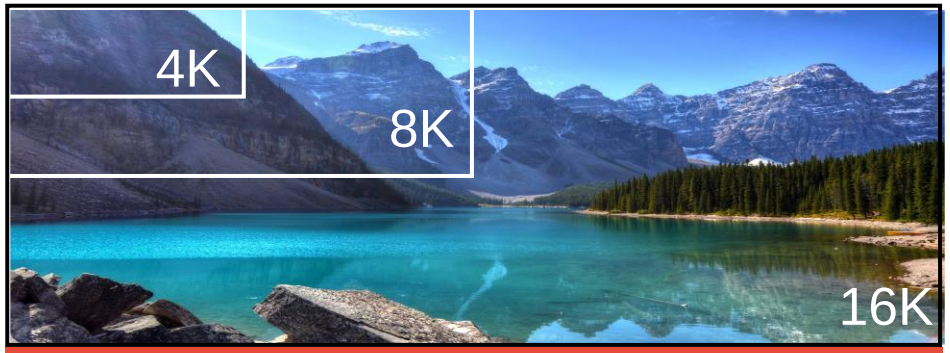
UHD - 8K

Game Mode Adaptive Sync

Multi Stream

Display Stream Compression

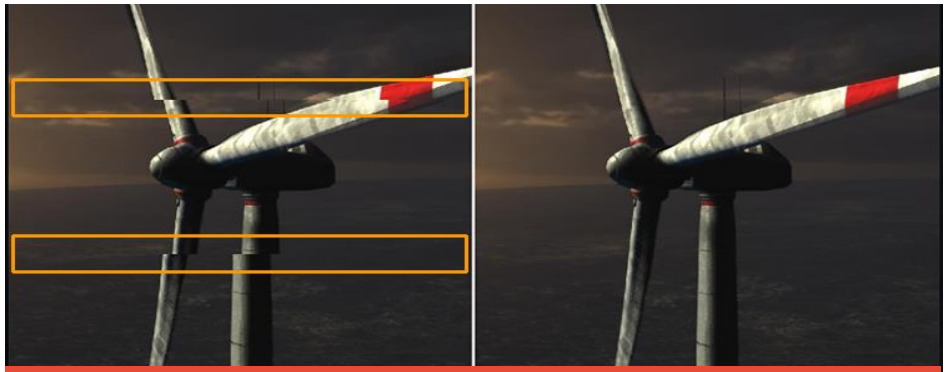
Embedded DisplayPort



80G – Higher Bandwidth

Dynamic HDR – Better Image Quality

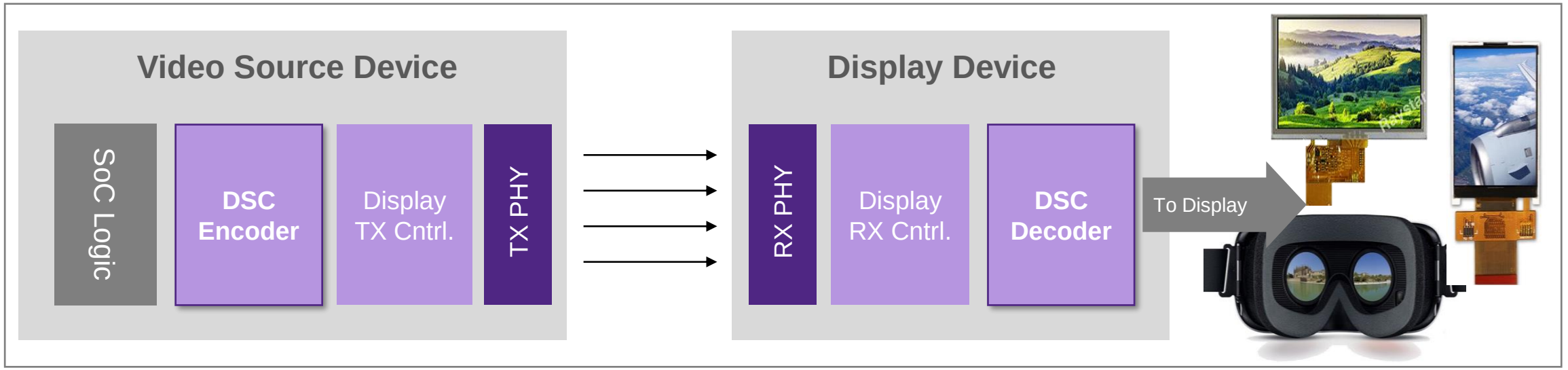
Multi Stream, Display Stream Compression



Adaptive Sync for Gaming

The Evolution of The VESA DSC Standard

Visually Lossless and Real-Time Compression



Features	DSC 1.1	DSC 1.2a	VDC-M 1.1
Visually lossless compression performance 30 bit color 24 bit color	3.75:1 (8bpp) 3:1 (8bpp)	3.75:1 (8bpp) 3:1 (8bpp)	5:1 (6 bpp) 4:1 (6 bpp)
Adopted standard	**MIPI DSI 1.2** **DSI-2 1.0** VESA eDP 1.4b	HDMI 2.1 VESA DP 1.4a	**MIPI DSI-2 1.1** VESA DP 2.0

Example Display Ecosystem and Connectivity

Host Devices

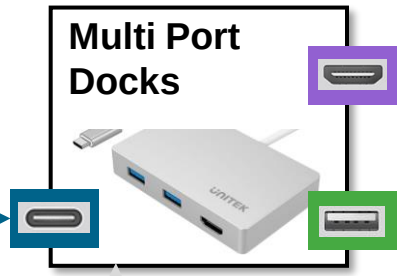
Displays

Laptops often have dedicated ports for Display

Panel uses eDP

Form factor allows only one Type-C to channel out all functionality

Dedicated display ports consumer HDMI, automotive DP, eDP for panels



Externalize connectivity by utilizing Thunderbolt, USB Type-C or USB4 that share cable for display, data and power

Monitors have HDMI, DP connectors and some have Type-C allowing to power laptop

DTVs exclusively have HDMI inputs, HDMI 2.1 new standard for VRR and HDR benefits

HDMI Connector
DisplayPort Connector
Type-C Connector
USB Connector
eDP Connection

Accelerate Design With Controller and PHY IP

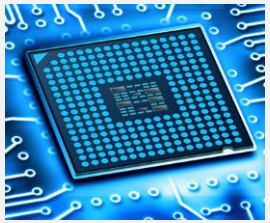
Consumer Electronics

TRNG	HDCP 2.3		HDCP 2.3	TRNG	
DSC	HDMI 2.1 Cntrl	PHY	PHY	HDMI 2.1 Cntrl	DSC

Laptop, PC

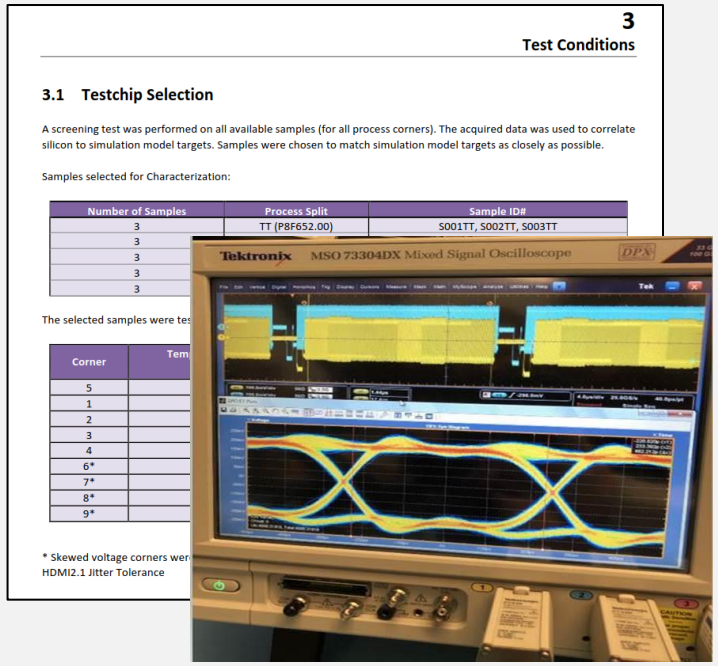
TRNG	HDCP 2.3		HDCP 2.3	TRNG	
DSC	DP 1.4 Cntrl	PHY	PHY	DP 1.4Cntrl	DSC

Embedded / Mobile

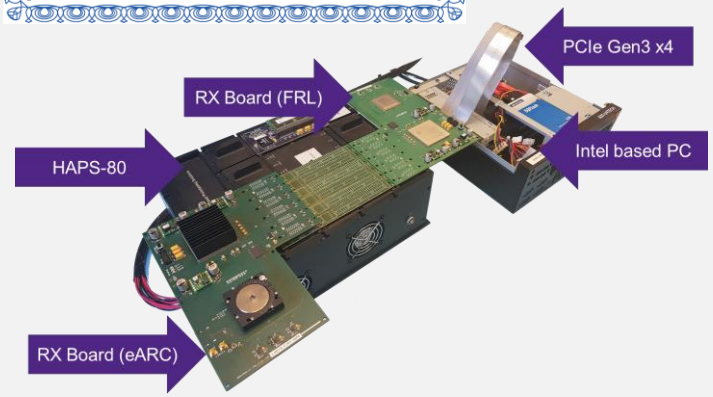


DSC	MIPI DSI Host	PHY	PHY	MIPI DSI Device	DSC

Ensure Quality by Using Proven IP



Check for analog IP performance over full PVT

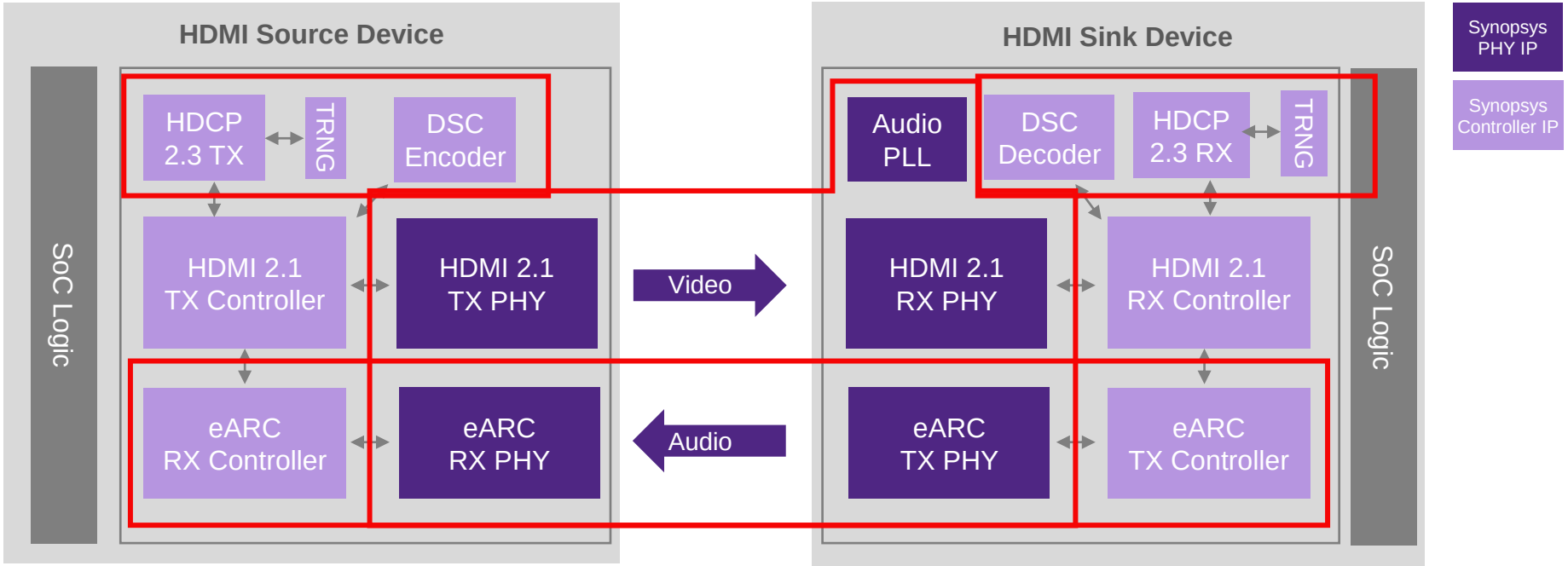


Check for certified and integrated IP solution

Check for extensive interop testing
(both in lab & at plug-fests)

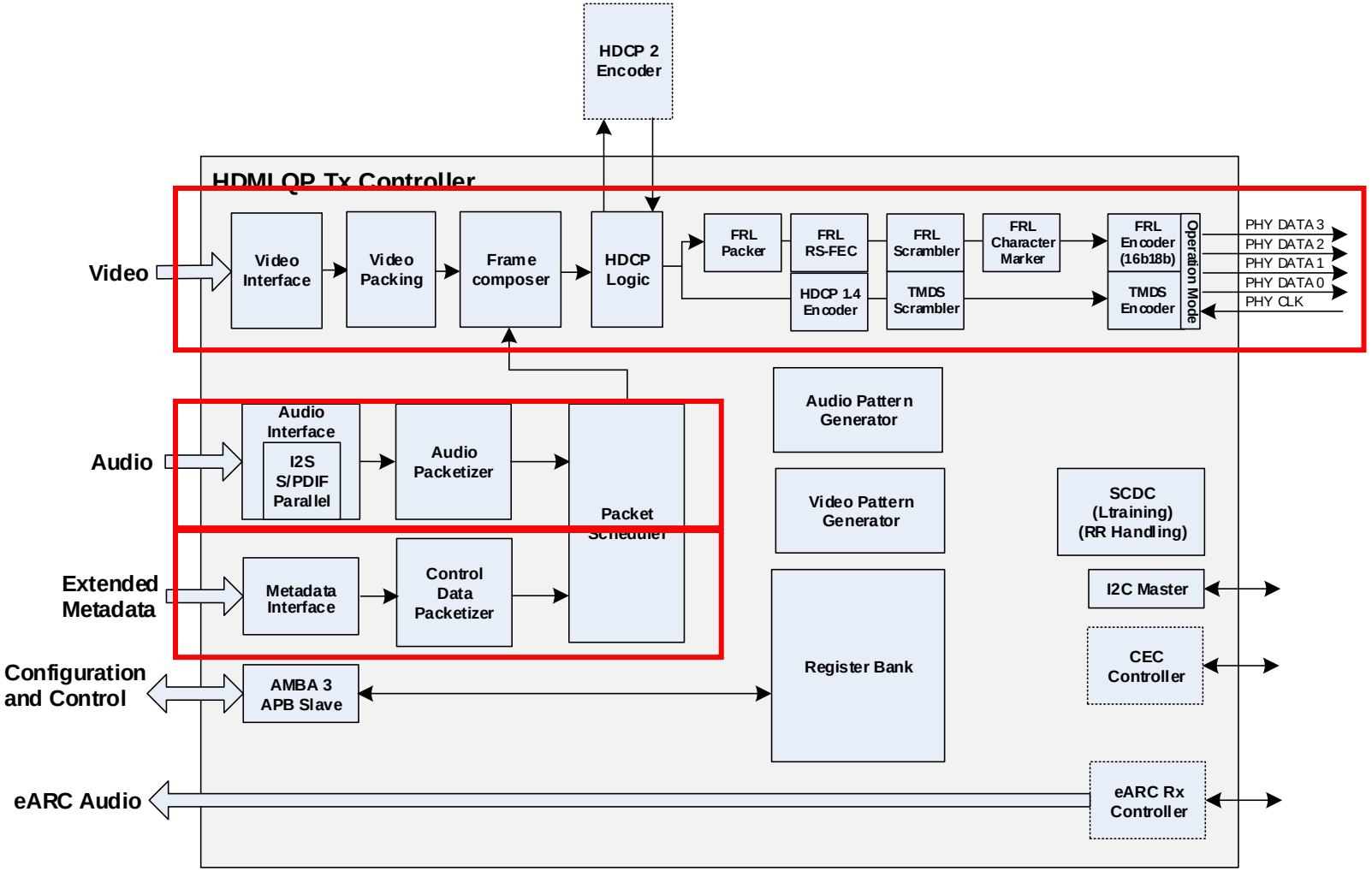
What You Need to Know About HDMI 2.1 IP

IP Selection Guideline



- PHY IP popular FinFET Nodes for power reasons at 48G speeds
- eARC standard for sending audio back to soundbars and speaker
- DSC Compression typically required for RX but optional for TX (to save power)
- Latest HDCP is a must for handling any digital rights content

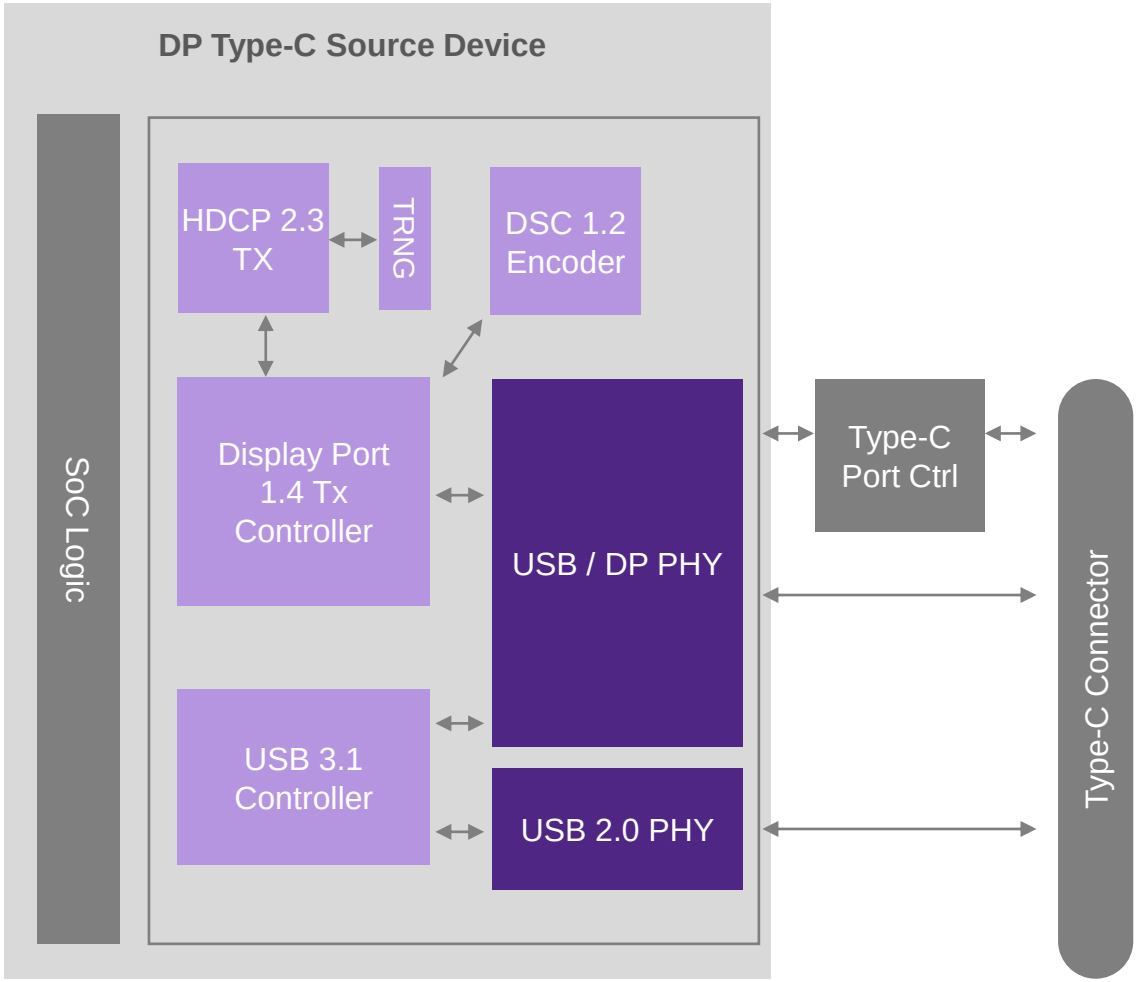
HDMI 2.1 Tx Controller Essentials



- Full 48G bandwidth achieving native 10k
- Most vivid video with dynamic HDR
- Sought after quick frame/media switch support for gaming
- Support for eARC, latest audio formats including Dolby Atmos
- Seamless integration with other controllers and PHYs

What You Need to Know About DisplayPort 1.4 TX IP

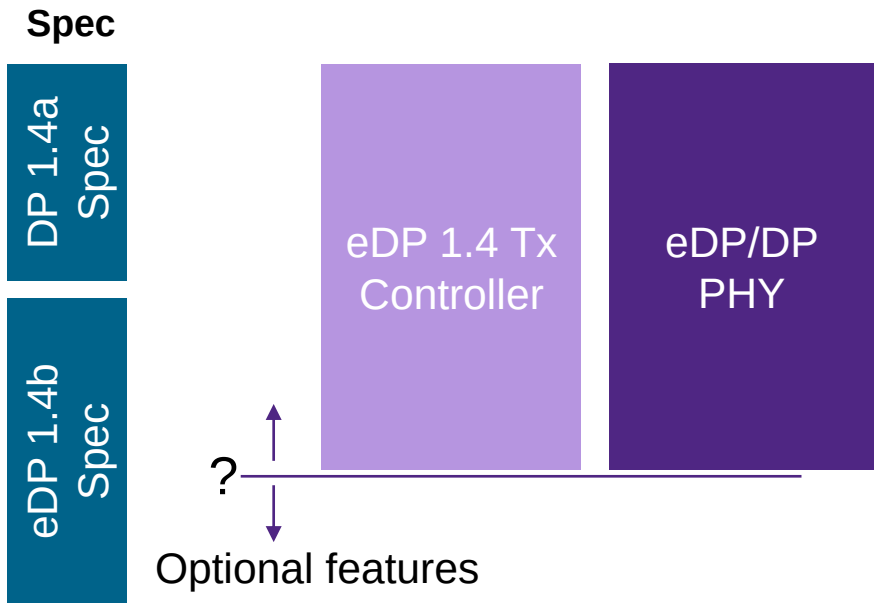
IP Selection Guideline With and Without Type-C Support



- Type-C Alt Mode is compelling solution to bring video, USB data, and power over one cable
  - DisplayPort HBR3 up to 8.1 Gbps
  - Need USB PHY and controller to support legacy USB
  - Simultaneous USB & DisplayPort for docking
- Use DP legacy connector for up to 32.4 Gbps without USB support
- Choose analog IP based on process technology needs (FinFET most popular down to 5-nm process)
- DSC is always a tradeoff for memory but could be shared across interfaces
- HDCP 2.3 mandatory for content protection

What You Need to Know About eDP IP

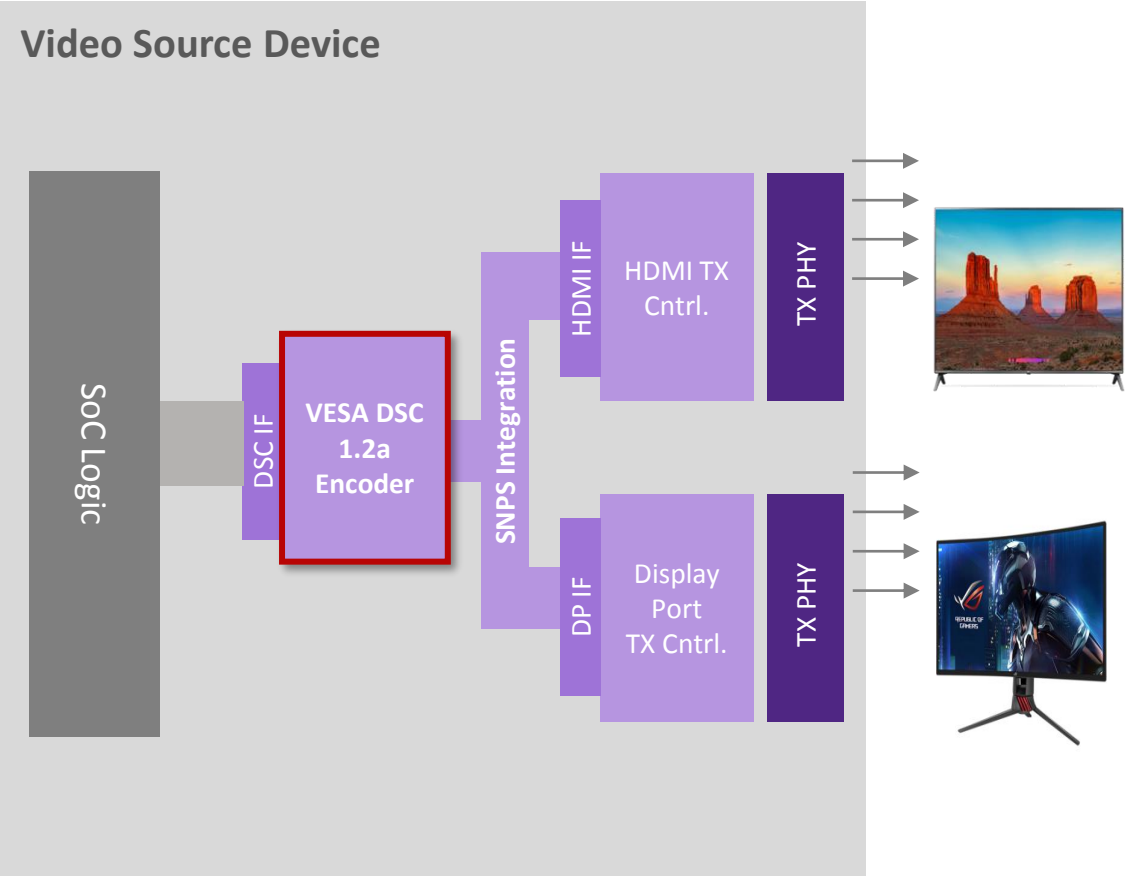
IP Selection Guideline



- eDP connects directly to a panel vs DP via a cable, and is optimized for low power
- Note that:
  - Different voltages and proprietary connector
  - No fixed standard between host and screen, spec leaves details up to each product
- eDP spec features are all optional
  - Check IP against mandatory vs optional requirements
  - IP Vendors can help customize for your needs

What You Need to Know About DSC IP

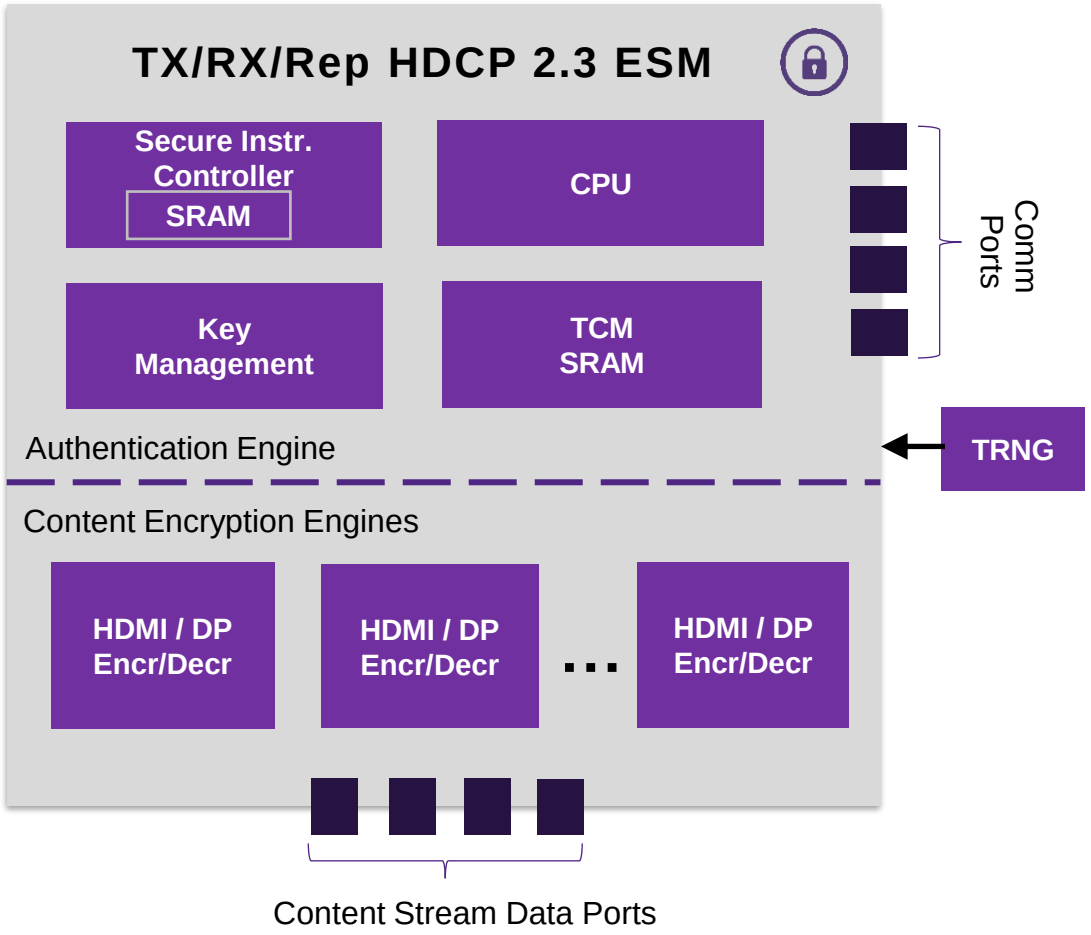
Popular in Latest Designs to Conserve Bandwidth and Save Power



- Ability to time share encoder across interfaces to offer area advantages
- Reduce clock speeds by reading multiple pixels in parallel
- Offer configurable slicing (typical 1-16 slices) to support highest resolutions
- Work with single Port RAM for lowest cost and power efficiencies
- Ability to future proof for extensions towards VDC-M

What You Need to Know About HDCP 2.3 IP

Protect 8K Ultra HD Content Complying With the Latest Standard



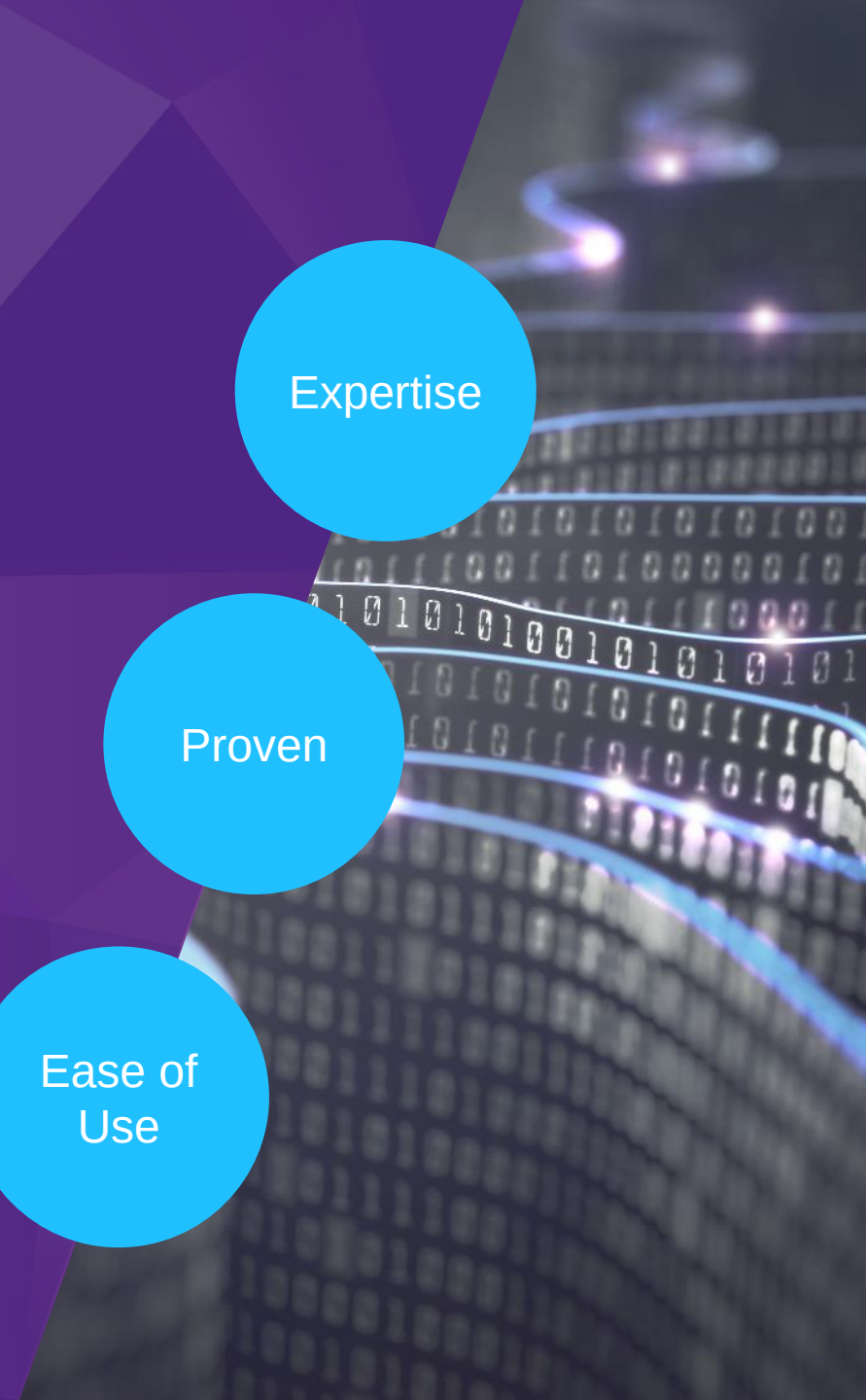
- Compliant with HDCP v2.3 spec (absolute mandatory)
- Deliver on strict robustness requirements
  - Hardware Root of Trust
  - Hardened execution environment
  - Runtime integrity checking
  - Integrity check after unauthorized modification
- Shareable between multiple ports and protocols saving significant area and power
- Seamlessly integrate with other IP

Synopsys DesignWare Display IP

- Available IP for all major display protocols: DesignWare HDMI, DP, eDP, MIPI DSI/DSI2, and VESA DSC IP solutions
- Extensive IP development experience with 100s of successful designs in FinFET processes including 5-nm

- Trusted and silicon-proven by major tier-1 DTV vendors
- Type-C Alt mode support in USB with USB IP for >15 years

- Single-vendor with integrated solution supporting full standards
- Investments in quality and prototyping with active participation in industry events



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Thank You