HDMI FORUM

HDMI 2.1 SPECIFICATION RELEASE

November 2017

HDMI Forum
and
HDMI Licensing Administrator, Inc.

The HDMI Forum Mission

Support and develop future versions of the
HDMI Specification

Support the eco-system of interoperable
HDMI-enabled devices

Foster broader industry participation
in the development of future versions of
the HDMI Specification

HDMI Forum Members

The organization brings together the world's leading manufacturers of consumer electronics,
personal computers, mobile devices, cables
and components

In the last year the organization has grown from 83 to 92 members

HDMI Forum Membership

Membership in the HDMI Forum is open to any interested company wishing to become a member

Companies are encouraged to apply and help shape the future of HDMI technology

Benefits:

- Participate in the HDMI specification development

- Gain insight into the future of HDMI technology

- Members are eligible to join the Technical Working Group and Marketing Working Group, and be elected to the Board of Directors

GROWING RANGE OF HDMI DEVICES

- Flat Panel TV
- DVD & Blu-ray player/recorder
- TV Set Top Box
- Media Stick
- Projector
- AV Receiver
- Video Game Console
- Virtual Reality
- Digital Still Camera
- Digital Camcorder
- Wearable Camera

- Discrete Adapter Solution
- Desktop PC
- Notebook PC
- PC Tablet
- LCD PC Monitor
- Notebook PC Docking Station
- Smart Phone
- Media Tablet
- Karaoke Player
- Health Care AV

HDMI-ENABLED DEVICES

Almost 7 billion HDMI-enabled devices have shipped since 2003

Nearly 900 million HDMI-enabled devices are expected to ship in 2017

HDMI 2.1

HIGHER RESOLUTIONS
FASTER REFRESH RATES
DYNAMIC HDR
ULTRA HIGH SPEED HDMI CABLE
eARC
ENHANCED REFRESH RATE FEATURES
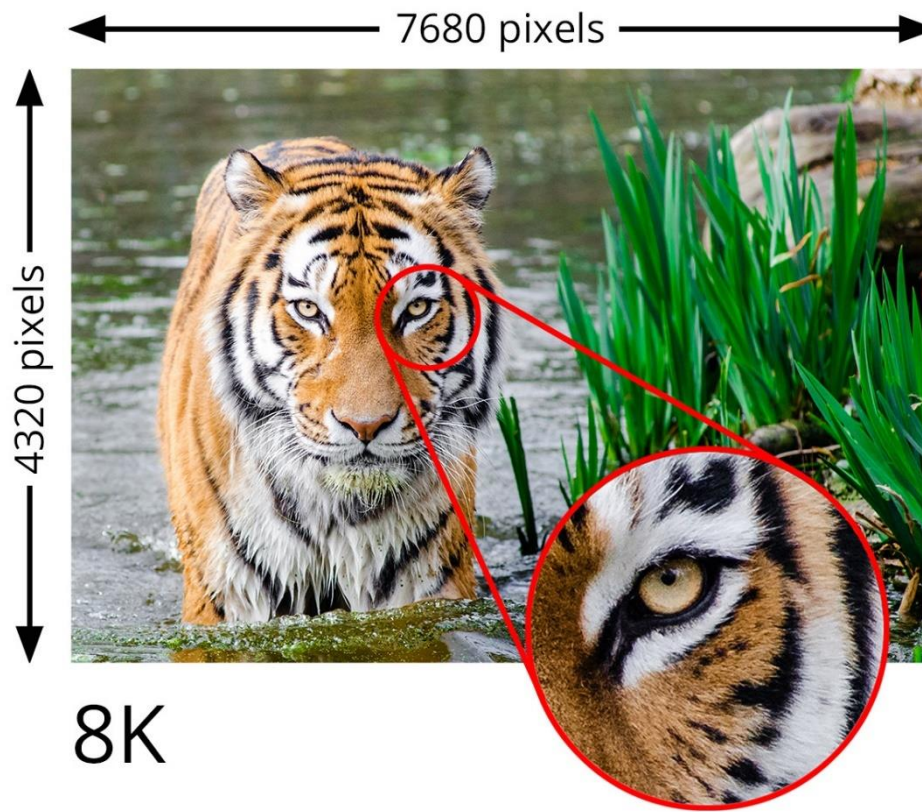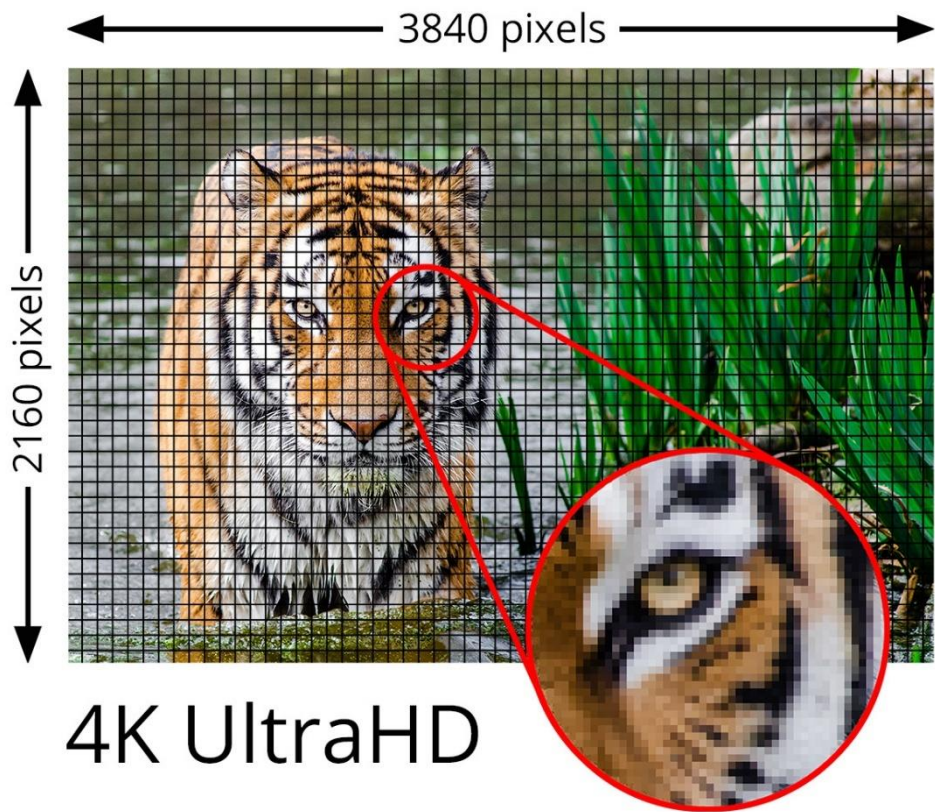# AUTO LOW LATENCY MODE

Higher Resolutions
Faster Refresh rates

HIGHER RESOLUTIONS AND FASTER REFRESH RATES

HDMI technology enables
end-to-end 8K and 4K solutions
with higher refresh rates
with a single upgraded cable for seamless integration
with the HDMI eco-system

HIGHER RESOLUTIONS AND FASTER REFRESH RATES

Full **HD**
1920 x 1080

4K
3840 x 2160

5K
5120 x 2160

8K
7680 x 4320

10K
10240 x 4320

In addition to 4K and 8K, a range of resolutions are supported including 5K and 10K

HIGHER RESOLUTIONS AND FASTER REFRESH RATES

Faster Refresh Rates

8K60 enables smooth and sharp viewing of content with high-speed action

4K120 enables ultra fast-motion UHD images to be crisp and razor sharp – in particular sports, action movies, high-performance gaming and VR benefit significantly

HDMI FORUM

RESOLUTIONS/MEGAPIXELS AND REFRESH RATES

Multiple resolution support includes 5K and 10k resolutions for PC displays, digital signage, surveillance, and various commercial and industrial AV solutions

4K48/50/60	4K100/120	8 MPixels
5K48/50/60	5K100/120	11 MPixels
8K48/50/60	8K100/120*	33 MPixels
10K48/50/60*	10K100/120*	44 MPixels

* Require Display Stream Compression (DSC)

ADDITIONAL SUPPORTED FEATURES AND CAPABILITIES

Both uncompressed and compressed bandwidth are supported and enabled to deliver a full range of features

Supports the latest color spaces such as BT.2020 with 10 or more bits per color and at higher frame rates

CIE 1931 chromaticity diagram showing the Rec. 2020 (UHDTV)color space in the triangle and the location of the primary colors

By CIExy1931.svg: Sakuramboderivative work: GrandDrake (talk) – CIExy1931.svg, CC BY-SA 3.0, https://commons.wikimedia.org/w/index.php?curid=21864661
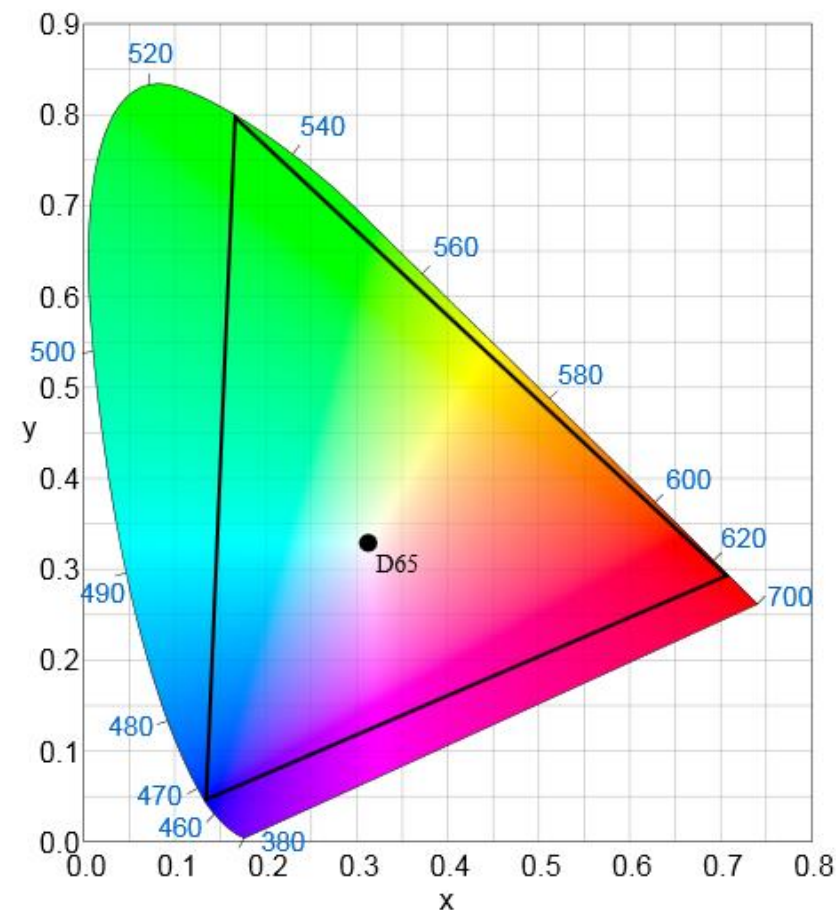
DYNAMIC HDR

Dynamic HDR Support

The HDMI 2.1 specification supports multiple static and dynamic HDR solutions

HDR ENHANCED VIDEO

HDR enhances video images with an extended dark to bright contrast range for deeper blacks and brighter whites,

greater detail in both the dark and bright parts in the same image, and

greater detail within an extended color space

SDR

HDR

simulated images

SDR   Static HDR   Dynamic HDR

Dynamic HDR enables a noticeable progression in overall video image quality from SDR to static HDR, and now static HDR to dynamic HDR

simulated images

THE DYNAMIC HDR ADVANTAGE

Movies and other content will be able to take advantage of HDR's expanded contrast ranges, brightness levels, and heightened levels of detail—and now have them optimized on a scene-by-scene or even a frame-by-frame basis

simulated images

STATIC HDR – A TITLE-ONLY ENHANCEMENT

Static HDR uses a single image descriptor in metadata that is a compromise that applies to every scene and every frame of the whole movie

Image descriptor

simulated images

DYNAMIC HDR – SCENE OR FRAME SPECIFIC OPTIMIZATION

Dynamic HDR ensures every moment of a video is displayed at its ideal values for depth, detail, brightness, contrast, and wider color gamuts—on a scene-by-scene or even a frame-by-frame basis

Dynamic HDR image descriptor in metadata can be specific to each individual scene…

or even on a frame-by-frame basis
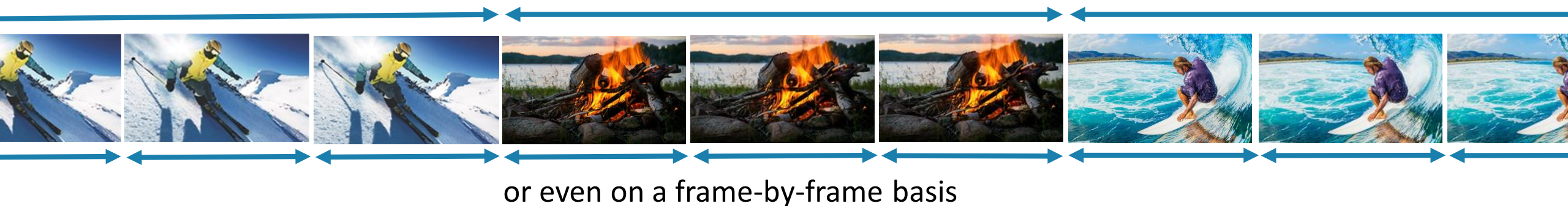
simulated images

Ultra High Speed HDMI Cable

INTRODUCING THE ULTRA HIGH SPEED HDMI CABLE

Ensures high-bandwidth dependent features are delivered including enhanced video and audio performance, and also improves EMI characteristics relative to High Speed Cables

ULTRA HIGH SPEED HDMI® CABLE

INTRODUCING THE ULTRA HIGH SPEED HDMI CABLE

Supports the full range of uncompressed HDMI 2.1 Specification features including 8K video with HDR

Enables up to 48Gbps bandwidth

HDMI 1.4
10.2 Gbps

HDMI 2.0
18 Gbps

HDMI 2.1
48 Gbps
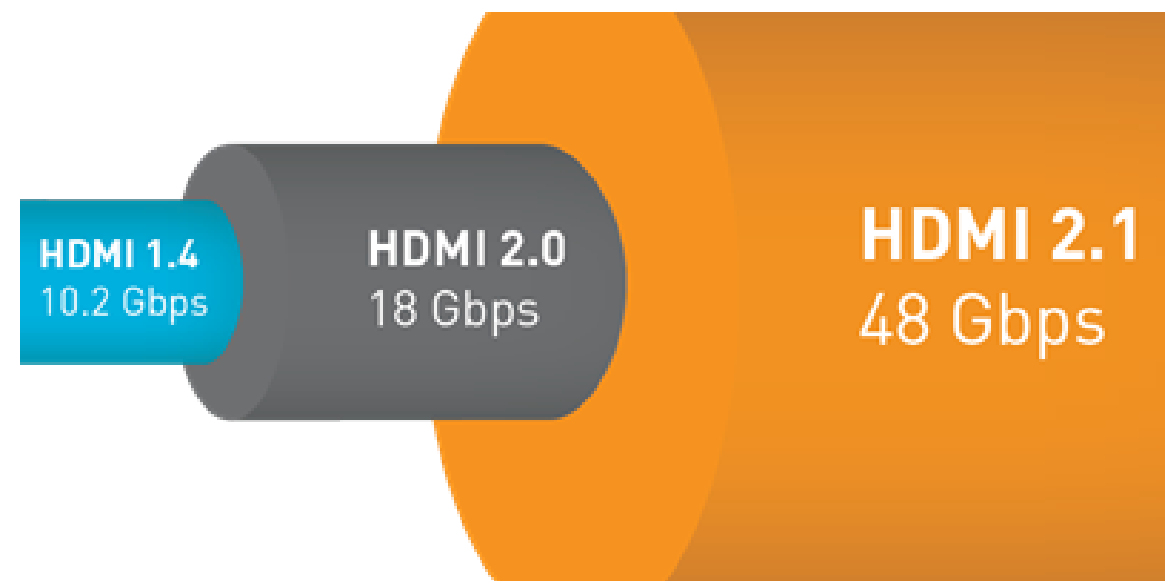
ULTRA HIGH SPEED HDMI CABLE ADVANTAGES

A more reliable high quality cable for robust, higher-bandwidth performance

Exceptionally low EMI emitted by the cable minimizes adverse impacts on nearby devices

Utilizes existing HDMI connectors Types A, C and D

Includes the HDMI Ethernet Channel

Cable is backwards compatible and can be used with the existing installed base of billions of HDMI devices

eARC

eARC (Enhanced Audio Return Channel)

eARC is an HDMI 2.1 feature which ensures
full compatibility between audio devices and upcoming HDMI 2.1 products

eARC simplifies connectivity, provides greater ease of use, and supports the
most advanced audio formats and highest audio quality

HDMI-Enabled Support for Highest Quality Audio

Home theater enthusiasts will have the ability to seamlessly utilize HDMI connectivity with AVRs and utilize a range of the highest quality audio formats available

Consumers that want to easily enhance their UHD viewing will now have access to the most advanced audio formats through a simple-to-setup HDMI-enabled sound bar system.

eARC Object-Based Audio Support

eARC supports the most advanced high-bitrate home theater audio formats, object-based audio, uncompressed 5.1 and 7.1, and 32-channel uncompressed audio

Object-based audio provides an immersive multi-dimensional experience and enhanced audio detail and depth

Enhanced Refresh Rate Features

ENHANCED REFRESH RATE FEATURES

Enhanced refresh rate features
ensure an added level of smooth and seamless
motion and transitions
for gaming, movies, and video

VARIABLE REFRESH RATE

Variable Refresh Rate (VRR) is a gaming feature which produces a more fluid and better detailed gameplay experience

Variable Refresh Rate syncs up source and display with continually changing refresh rate, up to a frame-by-frame basis

VARIABLE REFRESH RATE

3D graphics processor transmits video frames at the moment they are rendered, without being constrained to a fixed output or frame rate

Each frame is rendered, delivered and displayed at its optimal quality

Frames transmitted and displayed as soon as rendered without restraints
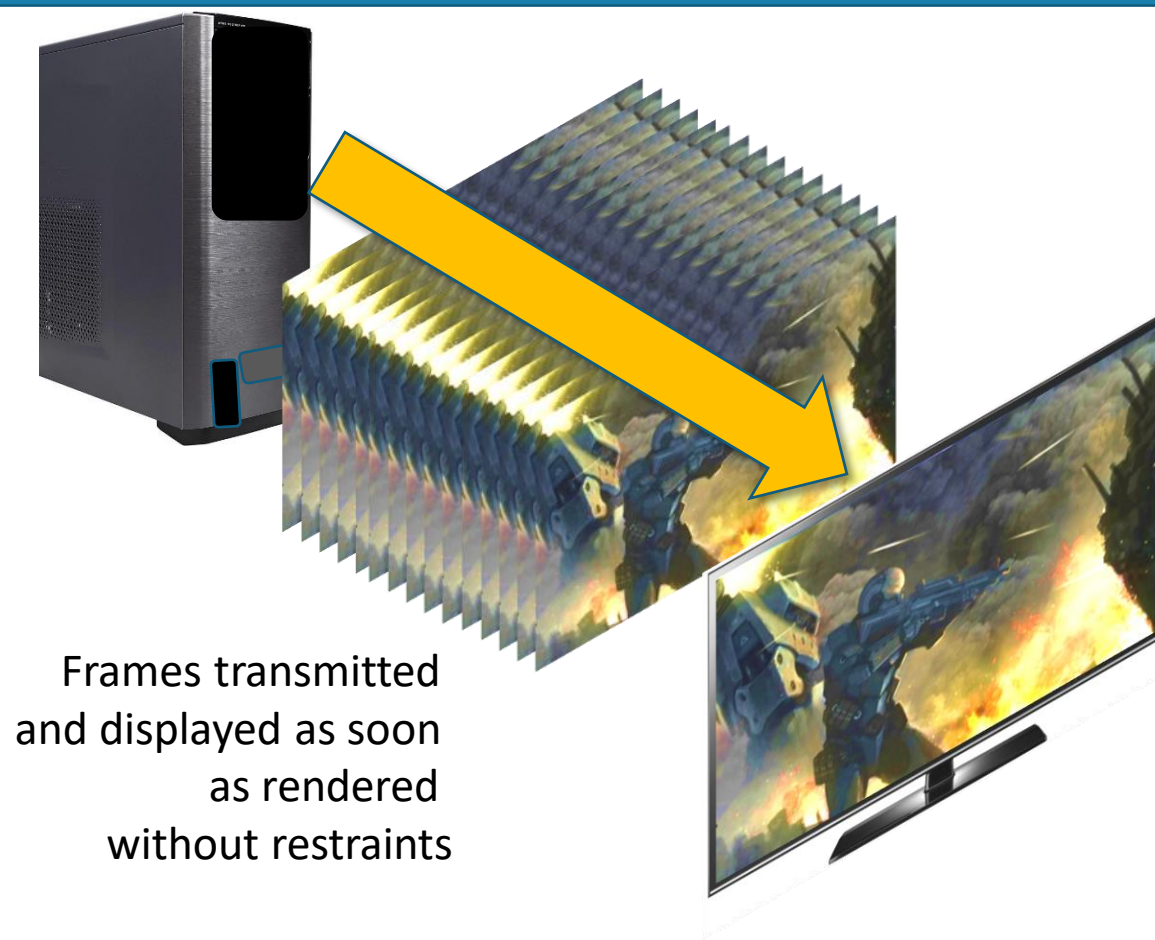
VARIABLE REFRESH RATE

Reduces or eliminates...

- Game interaction lag

- Frame stutter, skipping, and freezing

- Frame tearing

Tear Point

Quick Media Switching

With Quick Media Switching (QMS) a source device can instantly switch the resolution or frame rate of its content without any display blackout, such as when switching between 60fps and 24fps video. The QMS-capable display will instantly:

- Vary refresh rate

- Switch resolution

- Engage correct viewing mode

QUICK MEDIA SWITCHING

No matter the source or content –
Quick Media Switching is super smooth, eliminating delay that may result in display stutter or blank screens before the content is displayed
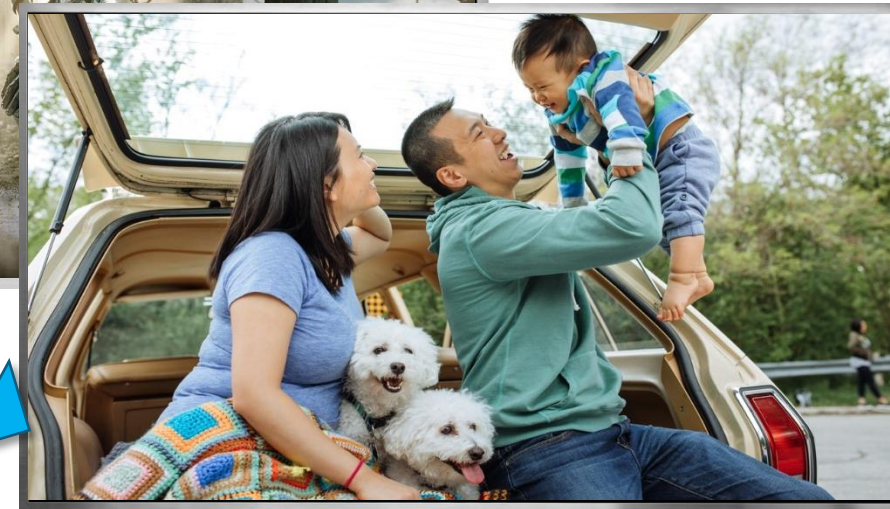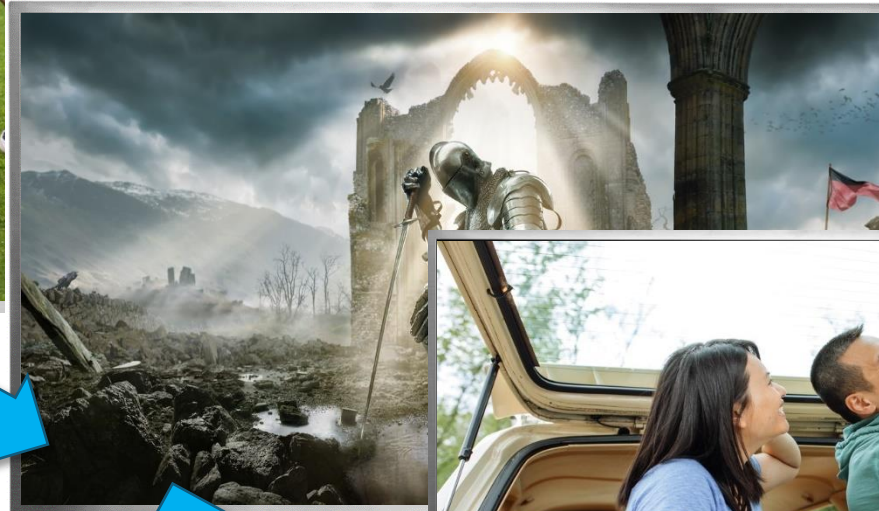
QUICK FRAME TRANSPORT

Another aspect of the enhanced refresh rate capabilities is
Quick Frame Transport (QFT)

- Each video frame travels faster from the source even though the source does not increase its frame rate and results in deceasing latency

- This reduces lag for gaming, real-time interactive virtual reality, and enables more responsive karaoke

Auto Low Latency Mode

Auto Low Latency Mode

Auto Low Latency Mode (ALLM) allows the ideal latency setting to automatically be established for various entertainment applications, allowing for uninterrupted viewing and interactivity

Auto Low Latency Mode enables latency mode auto-switching from applications such as movies and video to low latency applications such as gaming and real-time interactive virtual reality

The latency setting is optimized for whatever application is used

REFERENCE CHARTS AND TABLES

Graphics, charts and tables from throughout this presentation are available for download:
https://www.hdmi.org/press/press_kit.aspx

Feature Support Table

	HDMI version						
	1	1.1	1.2–1.2a	1.3–1.3a	1.4–1.4b	2.0–2.0b	2.1
Full HD Blu-ray Disc and HD DVD video	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Consumer Electronic Control (CEC)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
DVD-Audio	No	Yes	Yes	Yes	Yes	Yes	Yes
Super Audio CD (DSD)	No	No	Yes	Yes	Yes	Yes	Yes
Auto lip-sync	No	No	No	Yes	Yes	Yes	Yes
Dolby TrueHD / DTS-HD Master Audio bitstream capable	No	No	No	Yes	Yes	Yes	Yes
Updated list of CEC commands	No	No	No	Yes	Yes	Yes	Yes
3D video	No	No	No	No	Yes	Yes	Yes
Ethernet channel (100 Mbit/s)	No	No	No	No	Yes	Yes	Yes
Audio return channel (ARC)	No	No	No	No	Yes	Yes	Yes
4 audio streams	No	No	No	No	No	Yes	Yes
2 video streams (Dual View)	No	No	No	No	No	Yes	Yes
Hybrid Log-Gamma (HLG) HDR OETF	No	No	No	No	No	Yes	Yes
Static HDR (HDR static metadata)	No	No	No	No	No	Yes	Yes
Dynamic HDR (HDR dynamic metadata)	No	No	No	No	No	No	Yes
Enhanced audio return channel (eARC)	No	No	No	No	No	No	Yes
Variable Refresh Rate (VRR)	No	No	No	No	No	No	Yes
Quick Media Switching (QMS)	No	No	No	No	No	No	Yes
Quick Frame Transport (QFT)	No	No	No	No	No	No	Yes
Auto Low Latency Mode (ALLM)	No	No	No	No	No	No	Yes
Display Stream Compression (DSC)	No	No	No	No	No	No	Yes
	1	1.1	1.2–1.2a	1.3–1.3a	1.4–1.4b	2.0–2.0b	2.1
	HDMI version						

Resolution/fps	Chroma	Color Bit Depth	Eff. Data Rate	Speed
SD 480/60i	4:2:0	8	0.81Gbps	Standard
SD 576/50i	4:2:0	8	0.81Gbps	Standard
HD 720/50-60p	4:2:0/4:2:2	8	2.23Gbps	Standard
HD 1080/50-60i	4:2:0/4:2:2	8	2.23Gbps	Standard
FHD 1080/24-30p	4:2:0/4:2:2	8, 10 or 12	2.23Gbps	Standard
FHD 1080/50-60p	4:2:0/4:2:2	8, 10 or 12	4.455Gbps	High Speed
	4:4:4/RGB	8	4.455Gbps	High Speed
	4:4:4/RGB	10	5.57Gbps	High Speed
	4:4:4/RGB	12	6.68Gbps	High Speed
FHD 1080/100-120p	4:2:0/4:2:2	8, 10 or 12	8.91Gbps	High Speed
	4:4:4/RGB	8	8.91Gbps	High Speed
	4:4:4/RGB	10	11.14Gbps	High Speed
	4:4:4/RGB	12	13.37Gbps	High Speed
UHD 4K/24-30p	4:2:0/4:2:2	8, 10 or 12	8.91Gbps	High Speed
	4:4:4/RGB	8	8.91Gbps	High Speed
	4:4:4/RGB	10	11.14Gbps	Premium High
	4:4:4/RGB	12	13.37Gbps	Premium High
UHD 4K/48-60p	4:2:0*	8	8.91Gbps	Premium High
	4:2:0*	10	11.14Gbps	Premium High
	4:2:0*	12	13.37Gbps	Premium High
	4:2:2	8, 10 or 12	17.82Gbps	Premium High
	4:4:4/RGB	8	17.82Gbps	Premium High
	4:4:4/RGB	10	20.05Gbps	Ultra High
	4:4:4/RGB	12	24.06Gbps	Ultra High
UHD 4K/100-120p	4:2:0*	8	17.82Gbps	Premium High
	4:2:0*	10	20.05Gbps	Ultra High
	4:2:0*	12	24.06Gbps	Ultra High
	4:2:2	8, 10 or 12	32.08Gbps	Ultra High
	4:4:4/RGB	8	32.08Gbps	Ultra High
	4:4:4/RGB	10	40.1Gbps	Ultra High
	4:4:4/RGB	12	48.11Gbps	Ultra High
5K/24-30p	4:2:0/4:2:2	8, 10 or 12	11.88Gbps	Premium High
	4:4:4/RGB	8	11.88Gbps	Premium High
	4:4:4/RGB	10	14.85Gbps	Premium High
	4:4:4/RGB	12	17.82Gbps	Premium High
5K/48-60p	4:2:0*	8	11.14Gbps	Premium High
	4:2:0*	10	13.92Gbps	Premium High
	4:2:0*	12	16.71Gbps	Premium High
	4:2:2	8, 10 or 12	20.05Gbps	Ultra High
	4:4:4/RGB	8	20.05Gbps	Ultra High
	4:4:4/RGB	10	25.06Gbps	Ultra High
	4:4:4/RGB	12	30.07Gbps	Ultra High

Resolution/fps	Chroma	Color Bit Depth	Eff. Data Rate	Speed
5K/100-120p	4:2:0*	8	20.05Gbps	Ultra High
	4:2:0*	10	25.06Gbps	Ultra High
	4:2:0*	12	30.07Gbps	Ultra High
	4:2:2	8, 10 or 12	40.1Gbps	Ultra High
	4:4:4/RGB	8	40.1Gbps	Ultra High
	4:4:4/RGB	10	50.12Gbps	Ultra High#
	4:4:4/RGB	12	60.14Gbps	Ultra High#
8K/24-30p	4:2:0*	8	17.82Gbps	Premium High
	4:2:0*	10	20.05Gbps	Ultra High
	4:2:0*	12	24.06Gbps	Ultra High
	4:2:2	8, 10 or 12	32.08Gbps	Ultra High
	4:4:4/RGB	8	32.08Gbps	Ultra High
	4:4:4/RGB	10	40.1Gbps	Ultra High
	4:4:4/RGB	12	48.11Gbps	Ultra High
8K/48-60p	4:2:0*	8	40.1Gbps	Ultra High
	4:2:0*	10	40.1Gbps	Ultra High
	4:2:0*	12	48.11Gbps	Ultra High
	4:2:2	8, 10 or 12	64.15Gbps	Ultra High#
	4:4:4/RGB	8	64.15Gbps	Ultra High#
	4:4:4/RGB	10	80.19Gbps	Ultra High#
	4:4:4/RGB	12	96.23Gbps	Ultra High#
8K/100-120p	4:2:0*	8	64.15Gbps	Ultra High#
	4:2:0*	10	80.19Gbps	Ultra High#
	4:2:0*	12	96.23Gbps	Ultra High#
	4:2:2	8, 10 or 12	128.3Gbps	Ultra High#
	4:4:4/RGB	8	128.3Gbps	Ultra High#
10K/24-30p	4:2:0*	8	20.05Gbps	Ultra High#
	4:2:0*	10	25.06Gbps	Ultra High#
	4:2:0*	12	30.07Gbps	Ultra High#
	4:2:2	8, 10 or 12	40.1Gbps	Ultra High
	4:4:4/RGB	8	40.1Gbps	Ultra High
	4:4:4/RGB	10	50.12Gbps	Ultra High#
	4:4:4/RGB	12	60.14Gbps	Ultra High#
10K/48-60p	4:2:0*	8	40.1Gbps	Ultra High#
	4:2:0*	10	50.12Gbps	Ultra High#
	4:2:0*	12	60.14Gbps	Ultra High#
	4:2:2	8, 10 or 12	80.19Gbps	Ultra High#
	4:4:4/RGB	8	80.19Gbps	Ultra High#
	4:4:4/RGB	10	100.24Gbps	Ultra High#
	4:4:4/RGB	12	120.29Gbps	Ultra High#
10K/100-120p	4:2:0*	8	80.19Gbps	Ultra High#
	4:2:0*	10	100.24Gbps	Ultra High#
	4:2:0*	12	120.29Gbps	Ultra High#

* YC_BC_R 4:2:0 pixel encoding (Y420VDB)

NOTES: HDMI 2.1 supports 8-, 10-, 12- & 16-bit color options, and static and dynamic HDR

\# Requires Display Stream Compression (DSC)

Function	TOSLINK: GOOD	HDMI-ARC: BETTER	HDMI-eARC: BEST
Cable Used	Optical S/PDIF	HDMI	HDMI with Ethernet
Stereo Support	Yes	Yes	Yes
Compressed 5.1	Yes	Yes	Yes
Uncompressed 5.1	No	No	Yes
Uncompressed 7.1	No	No	Yes
High Bitrate & object based up to 192kHz, 24-bit (eg; Dolby Atmos®, DTS:X™)	No	No	Yes
Maximum Audio Bandwidth	~384 Kbits/second	~1 Mbits/second	37 Mbits/second
Discovery	No	CEC	eARC data channel
eARC Capability (Audio EDID, etc.)	None	CEC	eARC data channel
Lip Sync Correction	No	(Optional)	(Mandatory)
TV Mutes & Controls Volume	No	Yes (CEC)	Yes (CEC)
Powering TV Powers Audio Device	No	Yes (CEC)	Yes (CEC)
ARC Fallback	No	N/A	Yes

The eARC Data Channel is a bi-directional, 1 MHz common mode signal which is transmitted over the eARC (HEAC) differential pair. This channel provides auto discovery and other features listed above.

* 6.144 MHz ARC mode operation is marginal, as no cable spec or CTS has been written to cover Pin 14 used in single mode ARC. Actual link bandwidth in this case is 24.576MHz, which is problematic for the single-pin used by ARC.

HDMI FORUM MEMBERSHIP CONTACT

For More Information: www.hdmiforum.org

Contact: Admin@hdmiforum.org

PRESS CONTACTS AND HDMI LA BOOTH INFORMATION

PRESS

NORTH AMERICA MEDIA CONTACTS:

Doug Wright / Henry Feintuch

Feintuch Communications

hdmi@feintuchpr.com

1-212-808-4903 / 1-212-808-4901

Brad Bramy

HDMI Licensing Administrator, Inc.

bbramy@hdmi.org

CES 2018

Visit HDMI LA at CES 2018

To get the latest on HDMI 2.1

LVCC South Hall 1, Booth 20542

or to schedule a meeting contact vrobbins@hdmi.org