HDMI 2.1 Support for 8K Helps Drive Video Technologies Into the Future

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Who’s Behind HDMI Technology

**HDMI Licensing Administrator, Inc. (HDMI LA)** is the agent appointed by the HDMI Forum to license Version 2.x of the HDMI Specification and is the agent appointed by the HDMI Founders to license all earlier HDMI Specifications. HDMI LA provides marketing, promotional, licensing and administrative services. [www.hdmi.org](http://www.hdmi.org)

**HDMI Forum, Inc.,** is the organization that developed the HDMI 2.1 Specification. It’s an open trade association comprised of 94 companies whose mission is to foster broader industry participation in the development of future versions of the HDMI Specification and to further expand the ecosystem of interoperable, HDMI-enabled products. For more information on the HDMI Forum or on becoming a member please visit [www.hdmiforum.org](http://www.hdmiforum.org)

**The HDMI Founders** are Maxell, Ltd; Philips Consumer Electronics Int’l B.V.; Lattice Semiconductor; Panasonic Corporation; Sony Corporation; Technicolor S.A. and Toshiba Corporation. The HDMI Founders developed the 1.x versions of the specification and license the fundamental HDMI IP through HDMI LA.
Almost 1 Billion
HDMI-enabled devices expected to ship in 2019

8 billion HDMI-enabled products will have shipped worldwide since the first HDMI specification was launched in 2002

Over 1700 licensed HDMI Adopters represent thousand brands sold worldwide
HDMI Technology Market Position

BROAD RANGE OF CATEGORIES
- Flat Panel TV
- DVD & Blu-ray Player
- Set Top Box
- Media Stick
- Home Theater/Business Projector
- AV Receiver
- Soundbar
- Cables
- Video Game Console
- Digital Still Camera
- Digital Camcorder
- VR Headset
- Drone
- Discrete Adapter Solution
- Desktop PC
- Mobile PC
- PC Tablet
- LCD PC Monitor
- Mobile PC Docking Station
- Media Tablet
- Automotive
- Medical
- Digital Signage
HDMI 2.1 Feature Highlights
HDMI 2.1 specification was developed by The HDMI Forum member companies including major manufacturers and solution providers that are quickly implementing the specification features.

Many products supporting HDMI 2.1 features have already been launched.
Licensed HDMI 2.1 products enable the seamless end-user experience and the growth of 8K displays, supporting products and infrastructure

- Products in compliance with the 2.1 specification meet requirements for performance ensuring manufacturers and resellers of an interoperable HDMI-enabled ecosystem
- Prior to mass production, all products claiming compliance with the HDMI 2.1 specification must successfully pass all testing required by the HDMI 2.1 Compliance Test Specification (CTS)
- Testing is performed by 17 HDMI Authorized Test Centers (ATCs) located around the world
- Support is continuous through global developers conferences and plugfests
HDMI 2.1 Features Overview

- 4k120 / 8K60 and resolutions up to 10K
- Uncompressed and Compressed Support
- Fixed Rate Link (FRL)
- Dynamic HDR - supporting various industry formats
- 48 Gbps Bandwidth
- New Ultra High Speed HDMI Cable
- Enhanced Audio Return Channel (eARC)
- Auto Low Latency Mode (ALLM)
- Variable Refresh Rate (VRR)
- Quick Frame Transport (QFT)
- Quick Media Switching (QMS)
Higher Resolutions & Faster Refresh Rates

8K delivers a super-immersive viewing experience with 2x the horizontal and vertical resolution of 4K, and 4 times as many pixels.

8K@60Hz enables smooth and sharp viewing of content with high-speed action.

4K@120Hz enables ultra fast-motion UHD images to be crisp and razor sharp – sports, action movies, high-performance gaming and VR benefit significantly.
Plus Resolutions up to 10K

In addition to 4K and 8K, a range of resolutions are supported including 5K and 10K for commercial and industrial applications including digital signage, medical, and military.
Supported Colorimetry

HDMI 2.1 Specification supports the latest color spaces including BT.2020 with 10, 12, and 16 bits per color component.

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

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.

Static and Dynamic HDR-enabled devices that implement the HDMI 2.1 Specification transmit both Static and Dynamic HDR metadata over the HDMI interface in a standardized way.

These devices go through the same mandatory HDMI compliance testing to ensure they can properly send/receive Static and Dynamic HDR metadata over the HDMI interface regardless of product manufacturer. This ensures consumers can get all the benefits of Dynamic HDR without possible compatibility issues.
HDMI 2.1 Fixed Rate Link – New Signaling Technology

Fixed Rate Link (FRL) is necessary to achieve the higher uncompressed resolutions such as those above 4k60 as well as the ultra high speed bandwidths up to 48Gbps. It’s also required for compressed video transport which in turn enables operation at lower data rates for example 4k60 and ultra-high pixel rate video such as 10Kp120.

FRL replaces the current TMDS but HDMI 2.1 specification still requires support for TMDS for backwards compatibility with billions of HDMI 1.4b and 2.0 devices in the world.

FRL is most likely going to require new hardware as firmware upgradeability needs to be designed into the silicon and that is up to the manufacturers.
48Gbps Bandwidth

HDMI 2.1 increase bandwidth to 48Gbps

Over 2 ½ times faster than the previous HDMI 2.0b specification

Supports the higher resolutions and refresh rates
Compressed and Uncompressed Support

For the first time an HDMI specification supports both uncompressed and compressed modes.

Compression is supported via VESA DSC 1.2a specification, which is a visually lossless compression scheme.

It can be used to obtain higher resolutions than 8K60/4:2:0/10-bit color, such as 8K60 RGB, 8K120 and even 10K120. Compression also supports 4Kp50/60 with the benefit of enabling operation at much lower link rates.

PRODUCT SUPPORT DESIGNATIONS
- 4K100_A – supports uncompressed mode
- 4K100_B – supports compressed mode
- 4K100_AB – supports both
- 4K120_A – supports uncompressed mode
- 4K120_B – supports compressed mode
- 4K120_AB – supports both
- 8K50_A – supports uncompressed mode
- 8K50_B – supports compressed mode
- 8K50_AB – supports both
- 8K60_A – supports uncompressed mode
- 8K60_B – supports compressed mode
- 8K60_AB – supports both
Ultra High Speed HDMI Cable

The Ultra High Speed HDMI Cable is the only cable that supports all the HDMI 2.1 features including uncompressed 8k@60 / 4K@120 and up to 48Gbps bandwidth

Cables exceed the requirements of the latest international EMI standards to significantly reduce the probability of interference with wireless services such as Wi-Fi

All Ultra High Speed cables support the Ethernet channel

Cables are backwards compatible

The HDMI 2.1 Specification supports passive, active and converter Cat 3 cable assemblies (for active optical)
Enhanced Audio Return Channel (eARC)

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.

eARC simplifies connectivity, provides greater ease of use.

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, and solutions such as Dolby Atmos® and DTS:X®.
Gaming and Media Features

There is a new suite of HDMI 2.1 features that benefit gaming and media playback including:

- Auto Low Latency Mode (ALLM)
- Variable Refresh rate (VRR)
- Quick Frame Transport (QFT)
- Quick Media Switching (QMS)
Auto Low Latency Mode (ALLM)

ALLM lets a game console, PC or other device send a signal to the display which will cause it to automatically switch to a low-latency, low-lag mode for gaming.

This could benefit other uses, such as karaoke and video conferencing.

When the source no longer requires this mode—for example, when switching to a movie stream—the source disables the signal and the display reverts back to its previous mode.
Variable Refresh Rate (VRR)

VRR lets a gaming source deliver video frames as fast as it can, which in many cases is slower than the normal static refresh rate.

Graphics processor rendering is dependent upon the scene complexity, GPU horsepower, resolution selected and frame rate. When the GPU is taxed by the other three factors and does not finish rendering the next frame by the time it needs to be displayed, the source must either repeat the current frame or display the partially-rendered next frame, which causes judder and tearing.

By waiting until the next frame is ready to transport it, a smoother gaming experience can be provided to the user.
Quick Frame Transport (QFT)

QFT transports each frame at a higher rate to decrease “display latency”, which is the amount of time between a frame being ready for transport in the GPU and that frame being completely displayed.

This latency is the sum of the transport time through the source’s output circuits, the transport time across the interface, the processing of the video data in the display, and the painting of the screen with the new data.

QFT operates on the transport portion of this equation by reducing the time it takes to send only the active video across the cable.

This results in reduced display latency and increased responsiveness.
Quick Media Switching (QMS)

Every time a different frame rate is selected, the entire system must change its clocking and re-sync, causing an A/V blackout (a “bonk”). Some streaming services add a built-in delay so that users don’t miss the first part of their content, or output everything at the same frame rate—which requires either the service to provide single-frequency streams or the streaming box to perform the conversion.

QMS eliminates the blackout period when all devices in the HDMI connection chain change video modes. As long as the resolution remains the same QMS will smoothly switch between media rates.
HDMI 2.1 Products In the Marketplace Growing Rapidly
Thank You

www.HDMI.org