

**Business white paper**

# Connect to a better view

**Choosing a monitor with video and audio ports to match your needs**



# Sorting out your ports

Many newer PCs, tablets, smartphones, and video players are designed to deliver outstanding picture quality when they're hooked up to a high-definition (HD) display. You can make your computer games, photos, movies, and business presentations look and perform their best—regardless of where they're stored—by showing them on the big screen.

Understanding how the various connection ports on your devices work, and which connection is built to deliver the experience you want, will help you choose the optimal match in a display. HP provides a broad selection of PC monitors with multiple connectivity options to help you get more value and enjoyment from your digital devices.

To help simplify your choice of monitor, here is an overview of the most popular connectivity options available today, as well as some emerging standards.

## The shift away from analog

### VGA

One of the oldest and most familiar video connection ports is Video Graphics Array (VGA), which supplies an analog—rather than digital—signal from device to monitor. VGA connectors are inexpensive to manufacture and provide decent picture quality for basic computing and image viewing.

Some PCs, desktop monitors, and projectors still come with a VGA port. However, the rise of digital content—in cameras, HDTVs, DVD and Blu-ray players, and many other products—is quickly making analog inputs obsolete.

In order to display digital content on-screen through a VGA connection, the signal has to be converted to analog and then back to digital, which can reduce picture quality. That's a challenge for consumers who want to experience the latest digital movies and video games in vivid detail. But VGA monitors are still a reliable option for business users who mainly view non-digital content using a desktop PC or video projector.



## Digital innovations make content come alive

Nearly all new TV and computer monitors on the market are designed for digital video, and many can handle a full HD signal to reproduce images at a resolution of 1920 x 1080 pixels or higher. Vivid and responsive digital video makes PC games, movies, and photos come alive on at-home screens. Businesses of all kinds also rely on high-resolution monitors for creating and presenting digital content—from sales presentations and promotional videos to medical and scientific imagery—in crystal-clear detail.

### Seeking out the right port

If you're looking to buy a new monitor but aren't sure what type of connectivity options you'll need, here are some questions to consider.

- Which devices do you want to plug into the monitor, and what types of ports do they use?
- Will you be playing high-speed, graphics-rich content such as video games and streaming movies?
- Do you want to have as few cables as possible running between your devices and the monitor?
- Are you looking for outstanding sound reproduction as well as picture quality from a single connection?

HD devices such as gaming consoles and video players that support faster graphics, larger image files, and sharper picture quality will perform at their best through a connection built specifically for digital data. Digital connections also enforce High-bandwidth Digital Content Protection (HDCP) safeguards built into Blu-ray discs, HDTV signals, and other copyright-protected media.

Consumers and professionals have a growing range of digital connectivity options for general purposes as well as more specialized needs.

### DVI

The Digital Visual Interface (DVI) standard improves on VGA in two important ways. First, it supports HDCP safeguards. Second, PCs and monitors equipped with a DVI-integrated (DVI-I) port can handle both digital and analog video signals through one connection with no conversion or loss of quality.

Like VGA, though, DVI ports are fairly large and ill-suited for thin, compact PC products such as notebooks and tablets. DVI is also designed to only carry a video signal, so this standard is gradually being replaced by smaller and more versatile digital port designs that can support video, sound, and data on one connection.

### DisplayPort

DisplayPort is an all-digital connectivity standard that not only carries audio and video, but also has the potential to handle a data signal from a Universal Serial Bus (USB) device such as a webcam or PC mouse. DisplayPort can transmit data at up to 21 gigabits per second, making it a great option for computer users who need to move large audio and video files between devices.

Gamers and home-theater watchers will appreciate the high-definition picture quality, ultra-fast graphics refresh rate, and vivid color palette that DisplayPort enables. DisplayPort version 1.2 also supports Multi-Stream Transport, so one cable from your PC can be used to connect up to four monitors together.

### HDMI

High-Definition Multimedia Interface (HDMI) is an all-digital connection standard that can carry a video signal and several digital audio channels on one cable. HDMI is widely used on consumer electronics equipment such as HDTVs, Blu-ray players, and gaming consoles. Many newer PCs, tablets, and smartphones also feature mini-HDMI ports.

HDMI can deliver a smooth, sharp picture and crisp sound with almost no signal loss. HDMI systems will also automatically convert a picture into its most appropriate aspect ratio, such as 16:9 or 4:3. Thanks to its versatility and compact size, a mini-HDMI port works well on handheld devices. Plus, the simplicity of sending audio and video through a single port means fewer tangled cables snaking between your devices and monitors.

### Mobile High Definition Link MHL

The newest standard connection type takes advantage of already existing technology but adds functionality useful to mobile users. Mobile High Definition Link, or MHL, connects to monitors or TVs via a familiar HDMI port. You can view the content on your smart phone on your larger LED backlit display for a better viewing experience. The bonus is that the MHL technology charges your phone while it's connected.

1 Depending on the connector size, an adapter may be required.

MHL technology is optimized for mobile platforms. A single cable with 5-pin interface supports 4K video, digital audio, and provides power to your mobile device. Like DVI and DisplayPort, it supports HDCP content protection. It offers 8 channels of uncompressed surround sound with no lag or compression when playing music, videos or gaming. One of the benefits of MHL is






that it takes advantage of existing connectors saving space inside the form factor and allowing consumers to get more functionality from a single connector.

### Thunderbolt

Another single-cable option that handles multiple types of content, the Thunderbolt connectivity standard delivers high-speed data as well as high-quality video and audio. As an added bonus, Thunderbolt technology is compatible with standard DisplayPort monitors.<sup>1</sup>

Video and sound engineers can use Thunderbolt cables to interconnect several computer hard drives, rapidly transfer huge data files to a PC, then play back the images and sound in vivid detail. At-home users can make equally quick work of saving digital photos, organizing their music collection, and uploading videos to a social media website.

### Connectivity standards at a glance

Standard	Content sources	Characteristics	HDCP support
<b>VGA</b> 	Analog	<ul style="list-style-type: none"> <li>• Inexpensive</li> <li>• Decent picture quality</li> </ul>	No
<b>DVI</b> 	Analog and digital video	<ul style="list-style-type: none"> <li>• Versatile</li> <li>• Supports copyright protection</li> </ul>	Yes
<b>DisplayPort</b> 	Digital video and audio; can support USB signals	<ul style="list-style-type: none"> <li>• Versatile</li> <li>• Compact port design</li> <li>• Supports high-resolution images</li> <li>• Fast graphics, vivid colors</li> <li>• Enables high-speed data streaming</li> </ul>	Yes
<b>HDMI</b> 	Digital video and audio	<ul style="list-style-type: none"> <li>• Exceptional picture quality</li> <li>• Crisp sound</li> <li>• Compact port design</li> <li>• Widely available</li> </ul>	Yes
<b>Thunderbolt</b> 	Digital video and audio; high-speed data	<ul style="list-style-type: none"> <li>• High-speed data transfer</li> <li>• High-quality video and audio</li> <li>• Compact port design</li> </ul>	Yes

## Connect with HP

A high-quality PC monitor can make movies, games, web conferences, and other digital video experiences more exciting and memorable. To help customers enjoy more of their content on the big screen, HP home and business monitors feature a variety of connection ports that are compatible with popular devices. We also work with connectivity standards organizations and our manufacturing partners to incorporate new connectivity methods into our products.

Knowing how to match up the connectivity ports on your monitors and devices will help you get more value out of these technologies—from impressing clients and customers with exceptional presentations at work to enjoying the full excitement of video games and movies at home.

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