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THE ULTIMATE GUIDE TO THE NEXT GENERATION OF AV DEVICE CONNECTIVITY

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USB TYPE-C FOR THE AV PROFESSIONAL

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INTRODUCTION

Laptops, tablets and smartphones have changed the world through their unique ability to allow huge amounts of information to be accessed from small devices in a convenient and (sometimes) intuitive manner. These devices have also been the source of much frustration because, even though all of humanity's combined knowledge might be only a click away, it's often quite difficult to get that content off the device and into an AV delivery system that supports real productivity.

SPECIAL KIND OF INTERFACE

Universal docking stations were created to turn the USB port of a computer into a special kind of interface. A dock, connected to your laptop computer by a single USB cable, may support multiple video displays, multi-channel audio, gigabit connectivity to the LAN, and a plethora of peripherals. Some docking stations are operating-system agnostic while others only work inside a specific family group. They may relieve us from the worry of finding ever-longer cables with which to connect our chosen device by providing a clear demarcation point, but they also bring compatibility problems. These problems include, but are not limited to, the hub or dock supporting the same charging method, the same power management standard, or how and which data can pass through to another device.

At its core, the docking station is a physical multimedia gateway that bridges portable and installed technology. A contemporary docking station is the interface where network LAN, AV, and peripheral device connectivity occurs, charging power is delivered, signals are transposed to desired formats which are then routed and distributed. The docking station is a powerful and important element of any good AV design.

For such an important piece of gear, it can be surprisingly difficult to select the right docking station for your application. Technology's been changing in fits and starts for what feels like an eternity. USB 2.0 was released in 2000, and ruled the roost until USB 3.0 made its appearance in late 2008. The challenge is that these formats didn't enjoy widespread application in the AV community until the proliferation of desktop conferencing and streaming media reached critical mass in 2010 and beyond. High performance AV applications for docking solutions have been playing catch-up ever since.

The ensuing decade saw the demand for ever greater transfer speeds bring us USB 3.1 Gen 1, then USB 3.1 Gen 2, and Thunderbolt 3.0. Soon we'll be calling all of this USB4. This alphabet soup of USB formats is empowered and enabled by a new physical connection that's been optimized for next-generation data and AV demands. USB Type-C is here and it will profoundly change the nature of docking systems.

WHAT IS USB TYPE-C

USB Type-C is one of the most sophisticated and comprehensive connectivity ports to ever exist. Unfortunately it is also one of the most misunderstood and confusing. There is no easy way to navigate the sea of change engendered by this connector other than vigilance combined with continuing education and experimentation. This is especially true in the case of docking solutions as they are the bridge between network, productivity, peripheral, and AV systems and solutions.

USB Type-C is a small, symmetrical connection that might be found on anything from smartphones and tablets to advanced solid state storage drives and virtual reality headsets. It enables a veritable gourmet menu of technical capabilities, including adaptive power and dynamically assignable channels that can support a smorgasbord of digital payloads.

Look at the following image of the USB Type-C connector pin-out. There are no less than two dozen connection points in a space just over 8mm wide. This sleek connector is tailored to fit mobile device product designs, yet robust enough for laptops and tablets. With a reversible plug orientation and cable direction, USB Type-C supports scalable power and performance to future-proof your solution. The well-designed docking station is where the versatility and performance promised by this advanced technology is concentrated. The challenge for AV professionals is identifying which docking stations are well-designed and which features are best deployed in a specific installation.

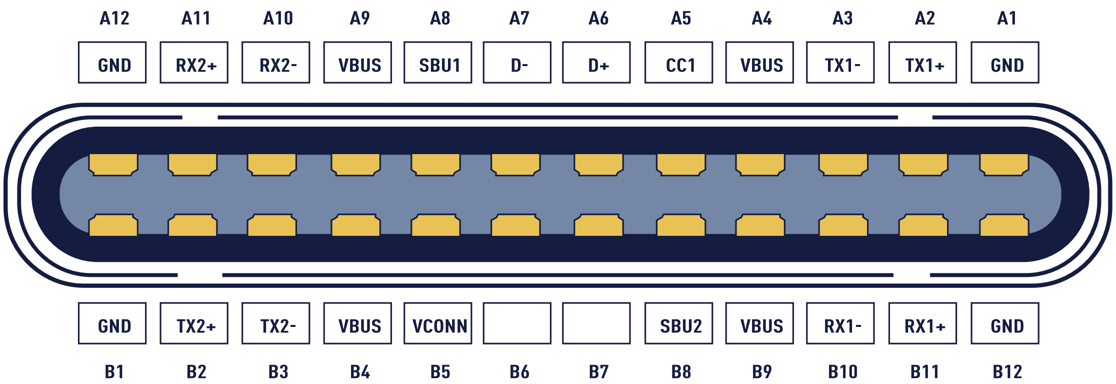


Illustration of USB Type-C connector pin configuration

USB Type-C links can support a nominal 40Gbit/s payload total transfer speed across a combination of four parallel Alternate Mode lanes. Each lane can individually support up to 10Gbit/s. Under the DisplayPort 2.0/Thunderbolt 3 interface, which is an emerging USB Type-C option, the total payload transfer speed can reach a breathtaking 20Gbit/s for each of the four lanes for a combined total of 80Gbit/s. The chart below will provide a comparison of transport metrics.

STANDARDS VERSION	TRANSFER SPEED NAME	TRANSFER SPEED
USB 1.1	Low Speed	1.5 Mbps
USB 1.1	Full Speed	12 Mbps
USB 2.0	High-Speed	480 Mbps
USB 3.0	SuperSpeed	5 Gbps
USB 3.1 Gen 1	SuperSpeed	5 Gbps
USB 3.1 Gen 2	SuperSpeed Plus	10 Gbps
USB 3.2 Gen 2 2x2	SuperSpeed “2 by 2”	20 Gbps
Thunderbolt 3	Thunderbolt 3	40 Gbps
USB4	DisplayPort 2.0 / Thunderbolt 3	80Gbps

Alternate Mode lanes are a new addition to the USB lexicon. Comprising four shielded-twisted-pairs, individual Alt Mode lanes can be associated with separate signals on a dynamic basis. For example, when connecting a laptop to a docking station, two lanes may support DisplayPort AV to serve two monitors a 4K signal, while a third lane provides connectivity to the LAN, and a fourth supports up to 10 Gbit/s of bulk data transfer to connected storage devices.

Power has been addressed in the most comprehensive, if not intuitive, manner in the USB Type-C world. The system is designed to deliver up to 100 watts of DC power (maximum 20 volts at 5 amps), through discrete power profiles. Devices negotiate with the power supply, host, and connecting cables through the use of electronic markers that ensure end-to-end functionality.

Let's take a closer look at each of these performance metrics.

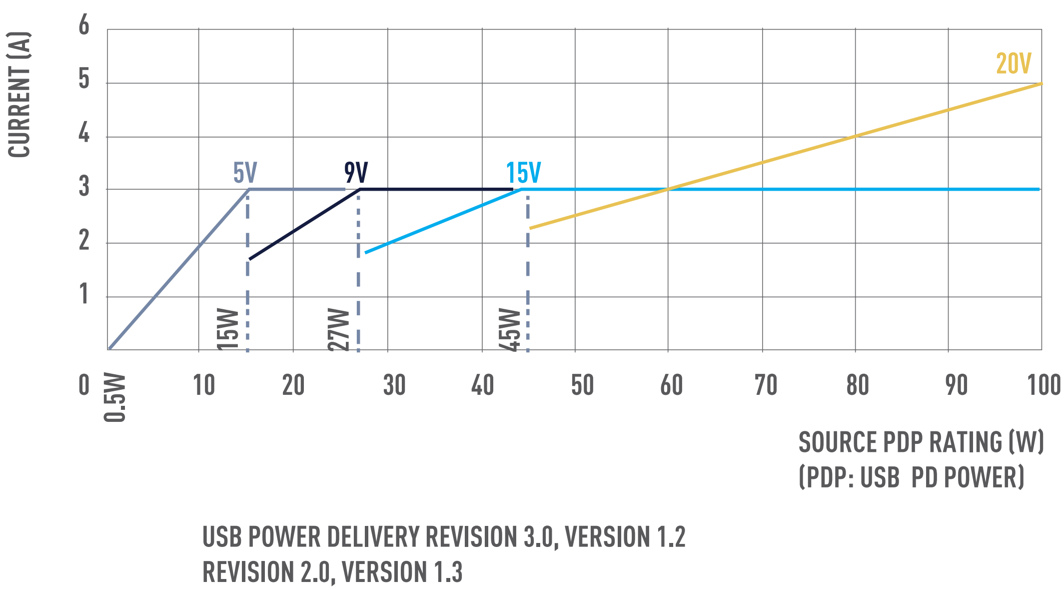
USB TYPE-C AS A POWER SOURCE

Without drilling down to granular details, our legacy USB system can deliver about 4.5 watts of power (5 volts at 900mA) when the link is transporting data, or 15 watts (5 volts at 3 amps, USB BC 1.2) for dedicated charging without data transfer. When a device is first connected to the USB network, it's given a USB network address (enumerated) and a certain minimal amount of power. The device then negotiates with the USB host for additional power, up to the maximum.

USB Type-C Power Delivery. via a Dual-Role-Power/Data (DRP/DRD) port, changes that completely. For the sake of legacy compatibility, USB Type-C enabled power sources will default to the traditional USB standard for devices and connections that don't "advertise" themselves as being capable of more. This is a revolutionary concept, not because a device needs to communicate its needs, but because the cable must also play a part!

USB Type-C uses the configuration channel (CC1 & CC2, pins A5 & B5 on the USB Type-C connector) for power negotiation. The system can support up to 100 watts (20 volts at 5 amps). Power transfer is transparent to any data transmission mode, and can therefore be used with any of them.

USB Power Delivery specification (USB PD 2.0), defines the voltage levels a USB Type-C power source may deliver and allows the supply to support any output power from 0.5 W to 100 W so long as it's within the ability of the source and the cable. Included in the specification is a cable ID function wherein the connecting cable must define its maximum performance parameters independently of the host and client. Despite its name, PD is not limited to just power negotiations Alternate Mode, and Data Role switching (swapping of up-stream and downstream facing ports and roles) is achieved through PD.



Graph of USB Power Delivery Protocol voltages and power

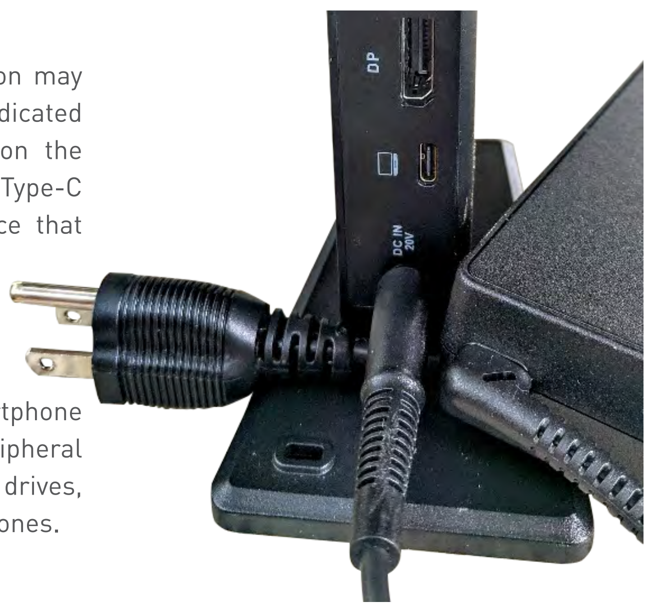
Familiarity with this new method of handling device power via a negotiated "intelligent" bus is critical when thinking about a docking station. The dock is designed to aggregate connections and to transpose and route signals. It's also an ideal power distribution center. It's important to think about power when selecting a docking station solution.

There are two ways a docking station can address power. The station may offer a charging port where a separate USB Type-C power supply may be connected. Quite often this would be the power supply that originally came with the laptop, tablet or smartphone. Conversely, this also opens the door to selecting a power supply from a third party vendor that better meets the needs of the installation.

USB Type-C inputs on a portable docking station labeled for data and charging respectively

Alternatively, the docking station may be mains-powered via a dedicated power supply. In this situation the power supply isn't a USB Type-C device, but a proprietary device that may offer 100 watts or more.

This is enough for the dock to quick-charge a computer and simultaneously charge a smartphone and provide power to peripheral devices such as portable drives, document cameras, or microphones.



Self Powered USB Type-C docking station showing proprietary power connection, USB Type-C monitor and DisplayPort ports.

Some desktop monitors with USB Type-C connectivity may offer a built-in docking station that source power from the robust supply feeding the LCD. The advantage in this design is that it may a single laptop, or it might have enough capacity to charge and service a laptop, a smartphone and even a tablet - all simultaneously.

Which should you select? The answer to that is really a question of portability. Is this docking station going to be a more or less permanent fixture in a huddle space, on a conference table, or on your desk? Then the power "brick" and its associated cable are less likely to be an issue and flexible charging capability a strong advantage. If the dock will go with the computer, then having a single power supply that can work directly with the device, or through the docking system, may be the better solution.

Finally, consider the demands of cable ID. In the USB Type-C ecosystem, cables, docks, devices, and computers identify their power and data limitations through data located on a chip in the cable, dock, or device. It is necessary to have a cable that matches the performance parameters demanded by the attached devices. A cable that doesn't support 20 volts at 3 amps isn't going to allow the 60 watts offered by the computer's power supply to get to the dock in the first place. The higher the power needed for the application, the shorter the properly rated USB Type-C cable will be.

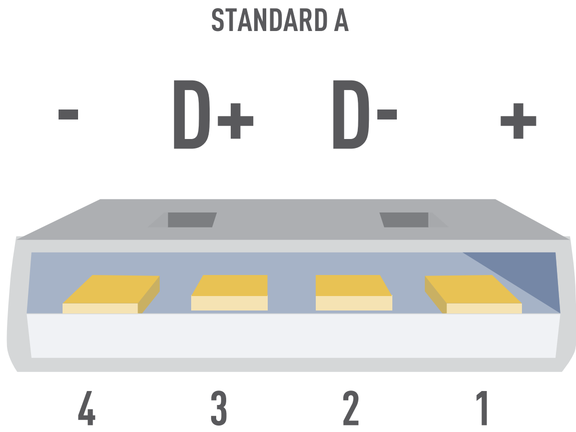
USB 1.1 AND 2.0 IS STILL IN THERE

USB 1.1 and 2.0 uses a total of four conductors. Pins 1 & 4 are used for +5V and GND. Pins 2 & 3 are a differential pair that transport the balanced digital payload from host to hub to function. It is an elegantly simple design.

In the USB Type-C pinout diagram above, locate pins A6 and A7. Those pins are connectors for a twisted pair that supports fully functional USB 2.0 connectivity. It's interesting to note that to maintain USB's near ideal backward compatibility across multiple generations, the USB Implementer's Forum (USBIF) opted to keep 1.1 and 2.0 communications in place over a single, serial data link and add parallel paths for upgraded performance. The A6 & A7 pins correlate to pins 2 & 3 on the traditional A & B connectors.

This single twisted-pair supports USB 1.1 low speed (1.5 Mbit/s), full speed (12 Mbit/s) and USB 2.0 high speed (480 Mbit/s) transfer rates.

This bus offers enough bandwidth to support human interface devices (HID). An HID is a type of computer device that takes input from humans or gives output to humans, such as a keyboard, mouse, or interactive touch monitor.

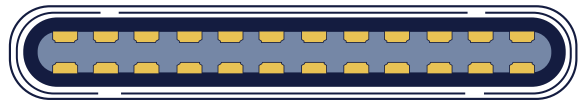


The link may also be used to support other peripherals and audio devices.

In USB Type-C, the older 1.1 and 2.0 standards may be fully implemented across this dedicated pathway. Generally speaking, this is true regardless of what the other pins are being asked to do. Only one application, an HDMI codec from Panasonic, disables this USB pathway and that application hasn't been implemented as of the writing of this article (April 2020).

THE MAGIC OF USB TYPE-C IS FOUND IN ALTERNATE MODE

A combination of very high speed and data bidirectionality make an ideal solution for connecting high definition conferencing cameras and video displays to mobile computers. Think about it like this; just one USB Type-C connection to a monitor can transport UHD 4K 4:4:4 video with embedded multi-channel audio and a USB 2.0 HID interface for a touch-screen to the monitor while also connecting a UHD camera and delivering power to the host computer simultaneously in one plug!



Illus USB Type-C Superspeed + 10Gbit/s port tration of USB Type-C connector pin configuration

Look again at the pinout of the USB Type-C connector. The four high-speed lanes (pins A/B 2 & 3, 10 & 11) and two side-band pins (A8 & B8) can be used for a system called "alternate mode" transmission. The modes are configured using vendor-defined messages (VDM) through the same configuration channel (CC1 & CC2) that's used for power negotiation (PD).

As we know, alternate mode is a packetized data transmission link, which is designed for very high speed data transfers. Most Type-C equipped devices support 5Gbit/s transfer speeds (the USB 3.0 standard). Superspeed Plus (SS+) is extending that capability to 10Gbit/s and beyond, which is sufficient for advanced 4K video payloads.

DisplayPort 2.0 was designed with USB Type-C Alt Mode in mind and extends video performance to 8K and increases consolidated data transfer speeds to a mind-boggling 80Gbit/s!

An important element of this connection is that it's bidirectional. Unlike a traditional AV connection, which allows a unidirectional flow of content from source to sink, a USB pathway allows data to flow in either direction. USB Type-C ports can support different kinds of payloads in different situations. It's easy to see how this can create a nightmare of similar looking cables that don't do the same things. Enter the smart cable, and unfortunately it doesn't help the situation.

EMCA'S, PASSIVE AND ACTIVE CABLES

An Electronically Marked Cable Assembly (EMCA) is a USB Type-C cable that uses a marker chip to communicate the cable's characteristics to the attached devices. Inside these cables is an IC chip that processes the Power Delivery communication protocols. The electronic marking allows for role switching, alternate mode selection, and enhanced power options.

USB Type-C EMCA cables

Depending on the design, a controller chip may be built into one or both ends of the cable. In all cases, the voltage rating of a cable is required to be higher than the "safe voltage" of 5V, so eMarkers aren't required to assume that any given cable is 20V capable. However, all connections exceeding 3 amps of current (which can be up to 60 watts in the case of a 20V supply), or requiring transfer speeds greater than 480Mbit/S (USB 2.0), require an electronically marked cable.

One more time for clarity. A USB Type-C to Type-C cable doesn't need a special e-marker to handle 20 volts, but it does need one to handle more than 3 amps of current or speeds beyond USB 2.0.

What does the cable communicate to the computer? There's a lot of information shared in an EMCA relationship. Here is a partial list of what might be included in the transaction:

- The current rating of the cable - how much power it will transfer
- The length of the cable
- Passive or active cable design
- The type of connector at each end - Type-C to Type-C, Type-C to Type-A, etc.
- The number of cable controllers in the cable: single or dual
- The type of USB signaling: USB 2.0, USB 3.1 Gen 1, USB 3.1 Gen 2, etc
- The vendor ID, which is a 16-bit ID that identifies the EMCA manufacturer
- The product ID, which is a 16-bit ID that identifies the EMCA product
- The product's ability to support Alternate Modes (e.g., DisplayPort, PCIe)
- Support for vendor-specific protocols (e.g., vendor-specific docking protocol)

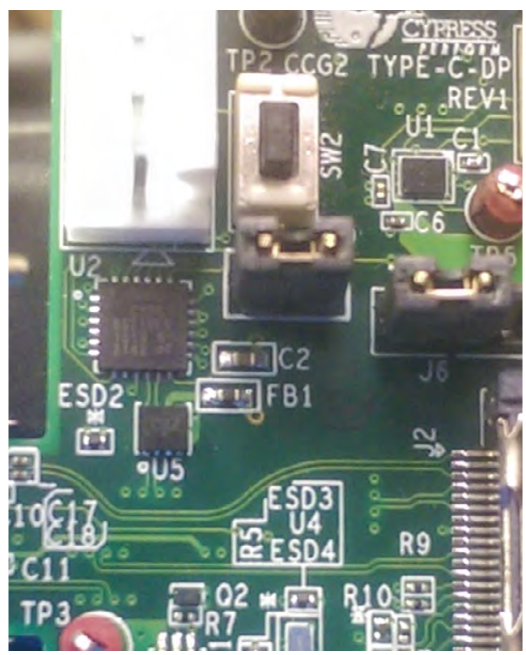
Don't confuse an EMCA with an active cable! EMCAs may be either passive or active.

All EMCAs carry all Type-C signals and are capable of running all USB 3.1 speeds. The distinction between active and passive status is associated with cable length. Like an HDMI cable, a USB Type-C cable has to deliver a clear eye pattern to the client. Maintaining a quality eye pattern becomes more challenging as the cable length grows, so active electronics are often added to create an active cable that will span a longer link than a passive cable without the active elements. The difference between an active and a passive EMCA is that the active cable offers signal conditioning of the SuperSpeed USB lanes, such as redriver or retimer functions, allowing the signal to traverse a greater distance.

DisplayPort, MHL, HMDI, and Thunderbolt may be supported via passive USB Type-C cables at transfer speeds up to 5Gbit/s (Superspeed) at lengths less than 2-meters, and up to 1-meter at 10Gbit/s (SuperSpeed+). For link lengths beyond 2-meters at 5Gbit/s, or 1-meter at 10Gbit/s, an active cable is required.

I THINK I SHALL NEVER SEE, A BILLBOARD AS LOVELY AS A TREE

Billboard chips are the next step up from an EMCA. Billboard chips are included on docking stations, devices and hubs and communicate the capabilities of the device to the USB host. The billboard has two main functions; negotiate power and negotiate alternate mode. Think of a billboard chip as the device equivalent of a marker chip in a cable.



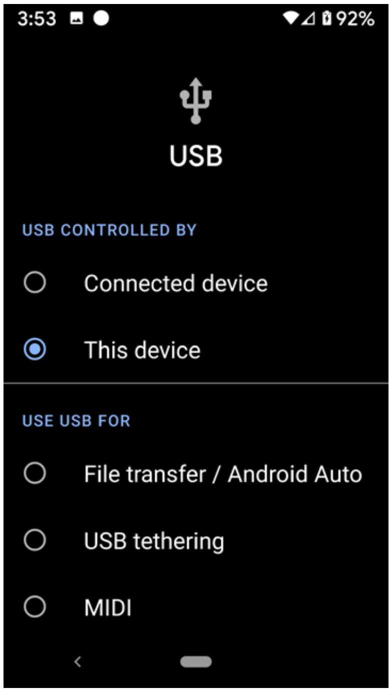
USB Billboard chip (below and right of U2 mark) in a Legrand docking station

All docking stations supporting anything beyond the simplest of USB 2.0 communications use a billboard chip. It's one of the key elements of the Type-C ecosystem.

As previously described, when a device is first connected to a computer or hub (docking stations are advanced forms of hubs) it is enumerated and given an amount of power.

The device will then negotiate with the host for more power and/or more capabilities. The EMCA-equipped cable has already told the host it supports 10Gbit/s and 100 watts, for example, so the peripheral device will now negotiate for optimal performance within that envelope.

In many instances the negotiation will be transacted machine-to-machine, without user action. If there are multiple choices, or if the end state isn't perfectly clear, the billboard's job is to advertise what it can do so correct operation might be selected. To do this, the chip provides user readable strings that can include a product description or user support information.



A typical USB Billboard menu

GETTING VIDEO OUT OF A DEVICE OVER USB TYPE-C

What's really involved in getting the signal out of the device? In the case of USB Type-C, the answer is complicated precisely because of the high performance and versatile nature of this connector.

There are three major "systems" that are used to transport video and audio content from a device to a display. Unfortunately, there isn't an industry-standard method of identifying which products support which standard - or even if they support an AV standard at all! This is likely to be one of the most confusing elements of the wholesale transition to the Type-C interface. It's imperative that AV system designers and owners be aware of how AV content is treated as a payload.

DISPLAYPORT OVER ALT MODE

DisplayPort is a video interface standard administered by VESA, the Video Electronics Standards Association. DisplayPort bills itself as the "world's highest performance and most versatile connection technology" and there's truth in that statement. DisplayPort 2.0, which uses Type-C as a native connection, has a maximum link rate to up to 20 Gbit/s per lane, and is the first standard to support 8K resolution (7680 x 4320) at 60 Hz refresh rate with full-color 4:4:4 resolution, including with 30 bits per pixel (bpp) for HDR-10 support!

C2G Thunderbolt docking station

At the time of this writing, DP2.0 is still several months in the future. Today's docking stations will likely support the more modest DisplayPort 1.4a performance, which can deliver an 8.1Gbit/s stream across four lanes simultaneously. Released in April of 2018, DP1.4a includes improvements for features and capabilities such as Display Stream Compression (DSC), Forward Error Correction (FEC) and enhanced MultiStream Transport (MST).

MST applies primarily to DisplayPort (1.4 and above) and to some HDMI applications (2.0 and above). MST allows for the transportation of multiple signals over the same cable. For example, you connect your laptop using a DisplayPort cable to the first monitor on your desk. From that monitor you connect a second monitor in a "daisy chain" configuration. One port on your computer will send a discrete signal to each of the two monitors, so that you can have an extended desktop experience (different content on each monitor) instead of a duplicated desktop (the same content on each monitor), and will do it over a single pathway.

MST may be implemented through a hub. An MST hub, like a USB hub, takes a single input signal and divides the content to multiple ports. A docking station with a built-in MST hub will have two DP outputs (for monitors 1 and 2 respectively). This is convenient and simple, but it does require that this ability be built into the device. Not all docking stations are MST compliant.

Conversely, what is SST? That's an acronym for Single Stream Transport and it describes what we normally think of as one cable, one signal.

The USB Promoter Group recently announced a new standard, "USB4", which combines the attributes of DP2.0, USB 3.1 Gen 2, USB PD 3.0, and Thunderbolt 3.0, allowing USB4 devices to be compatible with Thunderbolt devices. The advantage of USB4 is its dynamic allocation of bandwidth. USB4 can adjust the amount of resources that are available for sending both video and data over the same connection allowing a better balance in varying circumstances. This is a powerful feature.

While there are a lot of caveats in parsing Alt Mode performance, there are a few elements that make it just a little easier. One important piece of the puzzle is to remember that if a docking station supports Thunderbolt, it supports DisplayPort over Alt Mode.

A database of USB Type-C DisplayPort devices is published **here**.

DISPLAY LINK

DisplayLink is the oldest of the three technologies we'll explore here, having been founded in 2003. DisplayLink was originally designed to work with USB 2.0 connections. It's a driver-based host codec that's link aware. Link aware means the algorithm will automatically configure the payload to maximize quality based on the capacity of the connection between the source, dock, and display.

DisplayLink is a powerful codec found in many docking stations.

The USB Type-C connector standard mandates that no matter which standards the USB Type-C connector supports, core USB operability will always be supported. As DisplayLink only requires USB signals to operate, DisplayLink will transmit over any USB Type-A or Type-C connector.

DisplayLink technology does not install any hardware on the USB host device, therefore software (specifically a driver) is installed on a host. A hardware rendering engine (HRE) in the docking station converts the USB payload into one conditioned for an HDMI, DisplayPort link or VGA analog connection.

DisplayLink host software can run on Windows, macOS, ChromeOS, Android, and Linux. Most laptops and tablets come with the drivers in place.

Android smartphones may require the installation of an app, DisplayLink Desktop, which is available on the Google Play Store. Be aware that when some phones are connected over Type-C and are charging, the DisplayLink screens may not work. It appears that some Android devices do not go into USB host mode (so they can enumerate USB devices like DisplayLink) when they are being charged. To work around this, you can use a USB C to USB A adapter to connect to the phone, then use a USB A to USB C cable to connect to the DisplayLink dock. This will prevent USB C delivering power to the phone and allow it to enumerate the USB devices connected. Further, Android applications of DisplayLink are limited to one display operating at a maximum of 1080p/

iPhone users may have problems with iOS11, which doesn't support a DisplayLink driver as of the time of this article. Macbooks may experience issues with macOS Catalina 10.15, but some workarounds are posted on the DisplayLink web site.

MHL

Mobile High Definition Link (MHL) is a wired solution that supports the connection of mobile devices to displays. Under the new superMHL standard, it can support up to 8K video content. MHL is also capable of charging the mobile device (at up to 40 watts) and it can allow for remote control functions from the display to operate the source device. The superMHL connection was first demonstrated at the 2016 CES show.

MHL has primarily been deployed as a discrete input on a monitor or matrix switch. It uses an HDMI connector but it is not an HDMI signal and thus requires specific hardware be included in compatible devices. Using MHL, a passive cable with a USB (typically a micro USB Type-B) connection on one end and an HDMI connection on the other allowed the integration of mobile devices and fixed AV devices with excellent performance parameters.

MHL input port on a Sony XBR monitor

With an eye on the emerging USB Type-C ecosystem, the MHL Consortium developed and published the MHL Alt Mode spec for superMHL™ and MHL 1, 2 and 3 and specifications. MHL established a liaison with the USB 3.0 Promoters Group and USB-IF to ensure interoperability with USB Type-C, USB Power Delivery and USB Billboard specifications. In addition, USB-IF will be working in conjunction with MHL, LLC to establish complementary certification and compliance programs to properly support USB Type-C hosts and devices that incorporate MHL Alt Mode.

By some estimates there are over 200 million MHL-compliant devices in the world today. The MHL Consortium publishes a list of devices **here**.

As with DisplayLink, the biggest compatibility challenge when deploying a docking station for a unified communications and collaboration (UC&C) installation lies with smartphones. Some Android devices (Samsung, for example) deliver a high-performance and intuitive user experience. Other Android phones (Google Pixel, for example) and iPhones do not support the interface at all. Unfortunately, this isn't made very clear to the owners of those devices who may find it frustrating to connect what appears to be the right port to the right input but fail to get operational results.

SORTING THIS OUT

A dock can terminate an interface and/or peripheral, or it can pass a signal through without change. If the dock supports MHL, DisplayLink, or DP over Alt Mode and terminates the interface, it may grab the video stream and convert the signal to a format such as HDMI or VGA that can be routed, extended and connected in a traditional manner.

What if a docking station supports DP alt-mode, but not DisplayLink? Then the system will display the DP Alt Mode image correctly, but if the monitor doesn't include a DisplayLink Hardware Rendering Engine (HRE), then it won't support a DisplayLink image because neither the dock nor the sink has the ability to reconstruct that image.

What if a docking station supports DisplayLink, but not DP Alt Mode? Then it has the software drivers and HRE to display the DisplayLink image correctly, but it won't recognize the DP Alt Mode stream and devices that use that method to transport AV content won't be supported.

What if the docking station supports MHL? Since MHL over Type-C is carried via Alt Mode similarly to DisplayPort, then the burden of compatibility will fall to the display or downstream device. Remember that MHL uses an HDMI connector, but it's not an HDMI signal. Many displays already have this built-in MHL capability.

What about a universal docking station that does it all? Products attempting this level of utility are entering the market, but the serious differences in AV signal topology can make these devices expensive and complex to operate.

With all these caveats, the best answer today is to understand the systems primary use and the products with which it will interface and design accordingly.

WHAT ABOUT HDMI?

HDMI is not a native output from a USB Type-C enabled device such as a docking station. As previously noted, the Panasonic HDMI codec for Alt Mode has yet to find any product applications. Therefore we must learn to get the most from DisplayPort as the backplane for most AV docking station applications.

HDMI and DisplayPort are similar, but not the same. HDMI is far and away the more ubiquitous of the two. There are literally hundreds of products designed to support the extension of HDMI, but there are very few DisplayPort extension systems, nor is there a real need for them. Converting packetized, serial DisplayPort content to the TMDS-conditioned RGB HDMI format is relatively easy.

C2G DisplayPort to HDMI Adapter Dongle

Most docking stations that offer DisplayPort will likely have a built-in HDMI adapter, and will offer that signal duplicated on a HDMI port. Alternatively, a DP-to-HDMI dongle or converter may be deployed to make the conversion.

GETTING VIDEO INTO A DEVICE OVER A USB DOCK

We've discussed how to get AV content out of a docking station at some length. Why do we want to explore how to get video into a device? The answer is the camera. Whether it's a document camera or a conferencing camera, just because we have our device connected to a docking station and we have an image on the connected display, it doesn't mean the host is going to accept the input from a connected USB imaging device.

This is a pure USB problem. USB networks use device identification strings within USB drivers to connect to external cameras. It's not up to the docking station, but to the host device to support this feature. For example, Apple's iPhones and iPads don't support USB Video Class (UVC) drivers at this time, so you can't get a USB conference camera connected to a docking station to work with an iPad Pro, for example. The host device - the iPad Pro - doesn't have the necessary driver to recognize the imaging device.

This driver issue could be very confusing considering that a competing device, like a Samsung Note, may very well support those USB drivers and the failure of the dock to work the same way with the two products may be interpreted as a failure of the docking station.

IN CONCLUSION...

Docking stations are the unsung heroes of productivity installations. Whether we are deploying a docking station for mobile use or fixed in a huddle space, conference room or classroom there are a few things we should keep in mind:

- The dock is the bridge between the wired LAN, the electrical power supply, the desktop monitor(s), and the installed sound and video solutions in the space. Choose your docking solution based on what your needs will be tomorrow as well as today.

- USB Type-C is a powerful connection that is found on laptops, tablets, and smartphones across brands and around the world. USB Type-C is an evolving technology that can support legacy peripherals while facing an ultra-high definition future and its growing demand for greater and greater transfer speed.

- USB Power Delivery (PD 3.0) requires AV system designers and owners to clearly analyze the way power is used at the desktop. A solution that uses the power supply included with the laptop is easy, but we also have the option of larger supplies that can charge and power an assortment of productivity peripherals.

- To enjoy higher power and more performance, USB Type-C docking stations must be carefully paired with electronically marked cable assemblies (EMCA) that support the application.

- EMCA can be either active or passive depending on the desired link length.

- While almost any computer, using almost any operating system, will work with a universal USB Type-C dock, the same is not necessarily true of smartphones or tablets. Check the features of smartphones and tablets that might be used in the installation to ensure the system will perform as intended.

- USB Type-C Alternate Mode supports DisplayPort as an AV backplane system, as does Thunderbolt 3. USB4 is a new standard that combines much of USB 3.1 Gen 2, PD 3.0 and Thunderbolt 3.0.

- Thunderbolt docks support DisplayPort over Alt Mode, but not all DisplayPort docks support Thunderbolt.
- DisplayLink docks do not necessarily support Alt Mode DisplayPort or Alt Mode MHL and vice versa.
- DP over Alt Mode docks do not necessarily support DisplayLink
- MHL isn't widely implemented in Type-C docking station solutions, but if/when it is you might want to consider that MHL docking stations may or may not support DisplayLink and/or Alt Mode because that would make all of this too easy.
- USB Type-C Docking Stations are evolving.

This is just the beginning...

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