Introducing USB 3.1

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10Gbps
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New blazing fast 10 Gbps transfer speeds, a new smaller universal connector and what it all means.

The Connector

It has been over two years since Apple shocked the world and decommissioned their immensely popular 30-pin dock connector. The 30-pin connector was the Apple mobile interface standard ever since the first generation iPhone and the third generation iPod. This connector worked seamlessly for both the iPod and iPhone, and was so widely used that thousands of third parties developed their own brand of 30-pin connectors for the devices. Then in 2012 everything suddenly changed. The iPhone 5 was launched, and with it the came a brand new 8-pin connector. Apple named the new connector "Lightning" and said little else about the switch. In the meantime, the revised connector infuriated many Apple devotees and created a huge backlash against the new connector. This was bad news for the consumer who had amassed a collection of docks, charger cables and speakers. This was also bad news for the vendors who had stocked up on third party extras. Not to mention the developers that were creating new devices to run on the 30-pin. After almost a decade the connector was suddenly obsolete.

USB 3.1 to 3.1

USB 3.0 to 3.1

After the initial shock of the change wore off, the public realized that there were some benefits to this new connector. The upside of the Lightning connector was that it was completely reversible, meaning that it could be plugged in normally or upside-down. This was a revolutionary idea. One thing that plagued the USB A connection was that everyone inevitably tried to connect it the wrong way at least once. If Apple could yank the proverbial rug out from under their loyal customers and make a clean break with the 30-pin, then why couldn't USB produce a reversible iteration? After all, the transition to USB 3.0 was not supposed to supplant 2.0 for at least a year after the Lightning materialized. After the primer was set, surely USB would respond and delight the community. Alas, the 3.0 debut came and went, and USB went in the other direction. Not only had it not introduced a solution to the number one complaint, it had made two of the three connections larger than they were previously. Apparently USB had a change of heart or they finally checked their inbox because just two years after 3.0 launched we now have in our hands the new USB 3.1 dubbed "Type-C". It was certainly all the things that we were hoping for in 2013.

Small? Check. Powerful? Check. Fast? Check. Reversible? Double check. Let's take a closer look at the future of connectivity.

Universality

If there has been any product that we have seen in the last several years that has a true "all for one, one for all" spirit, this Type-C connector is it. This connector can be plugged into any orientation, allowing any vendor to approach the Alt Mode capability. This makes for a genuinely universal connector.

Plug Orientation

Plug and play has a new meaning with this Type-C connector. We were all victims of the "plug-fumble-replug-play" game that occurred with the USB A connector. This will no longer be an issue. Two dedicated pins were all it took to fix the issue. Now we can be assured that future generations will not have to feel the same pain that we did. The Configuration Channel pair CC1 and CC2 along with the MUX will detect which way to orient the lanes and make a signal path switch when necessary. Now you will be able to get plugged in correctly the first time, every time.

Alt Mode

As another useful addition, USB integrated a feature known as "Alt Mode" into the Type-C connector. It essentially allows vendors to be able to reconfigure pin duties to deliver the content that is important for their various applications. USB is working with vendors to show them how to configure a VDM (vendor defined message). With the advent of VDM, a vendor can repurpose four lanes of data for whatever they need. This will allow a vendor to utilize the cheap connector for many purposes, essentially allowing it to replace other types of connections entirely.

USB 3.1 Type-C Cable Receptical Pin Layout

GND	TX1+	TX1-	Vbus	CC1	D+	D-	SBU1	Vbus	RX2-	RX2+	GND
GND	RX1+	RX1-	Vbus	SBU2	D-	D+	CC2	Vbus	TX2-	TX2+	GND

Cable Ground	Cable Bus Power	USB Interface	High Speed Data Path
	Secondary Bus	Plug Config. Detect	High Speed Data Path

Video over USB

Video is definitely set to take hold of Alt Mode in the near future. Vesa, who is the governing body behind DisplayPort, has already outlined their intentions for VDM. VESA will be leveraging Alt Mode for their DisplayPort video, audio and data sending needs. In the outline, Display Port can purpose all four data lanes to pass a staggering 5120x2280 resolution while still carrying USB 2.0. Conversely VESA can send 4K UHD together with SuperSpeed USB and 100w of power. Think of your monitor using a single cable for UHD video, USB 3.0 hub and remote power. This is truly a big step for an 8.2x2.4mm reversible connector. MHL has also made use of Alt Mode and will be offering their full MHL 1,2 and 3 spec over USB 3.1. The MHL 3 version already specifies 4k video with multi-channel surround sound audio.

Need for Speed

The speed clearly has not taken a backseat to the connector design or Alt Mode. In spite of offering custom vendor modes and providing a slim and reversible connector, USB was able to add 100% more speed to their connector. The speed of USB 2.0 was 480 Mbps, the 3.0 was bumped to 10 times that amount at 4.8Gbps. Now the 3.1 Type-C will be a blistering 10Gbps. It is such a large amount of bandwidth it makes you wonder if it's merely a number for the sake of being a high number. After all, would users be able to get half that transfer speed? No. Then why build that huge data transferring highway if nothing that is out there can utilize it? It's obvious that USB had ambitions about this interconnect to utilize it as a data transfer, but also to be robust enough to handle video and audio duties as well. How does this speed stack up with the likes of Intel's Thunderbolt and Apple's Lightning?

Version	Speed	Bits/sec.	25GB HD Transfer
USB 1.1 LS	Low Speed	1.5 Mbps	Aprox. > 9.5 Hours
USB 1.1 FS	Full Speed	12 Mbps	Aprox. 9.5 Hours
USB 2.0	Hi-Speed	480 Mbps	Aprox. 14 Minutes
USB 3.0	SuperSpeed	5 Gpbs	Aprox. 70 Seconds
USB 3.1	SuperSpeed Plus	10 Gpbs	Aprox. 35 Seconds

Intel Thunderbolt

Thunderbolt is doing a terrific job with their interface. They are offering as much as 20Gbps and are looking to double that in the near future. Although it is rumored they are going to be switching the connector out from a Mini DisplayPort to something else. When compared to the Type-C, Thunderbolt certainly has the pants beat off it in the speed department, currently offering double of what Type-C has. Its topography is also quite impressive. Thunderbolt allows you to daisy chain devices in a way that you are creating a long chain of devices strung together using just one cable from the computer to your first device, from your first device to your second and so on. All while sending video to monitors, or data to storage. The Type-C does offer a slimmer connection, which will no doubt be showing up in a mobile device version. It also offers vendor customization and a reversible connector. As for Speed, 10Gbps is still quite impressive. It is after all version one of the Type-C. We can expect to see improvements over time.

Apple Lightning

Apple kicked things off in the area of reversibility with their Lightening connector. There were a few innovative things that Apple did when building this connector, but their closed ecosystem kept it from becoming anything more than an interface for their brand and their brand alone. To be certain of this Apple made a proprietary chip that is placed in every one of their cables, and without that chip the device will warn you that you are not using an official cable. Their aggressive tactics left the Lightning connection unfit for mass consumption. The connector itself has seen its fair share of faults as well. The number-one complaint among users is the fragility of the 8-pin connector. It seemingly was not designed for repeated plugging into mobile devices. Another top complaint is the nearly identical transfer rates in real world tests between the Lightning and the legacy 30-pin connection. Although it did add

USB OTG for the possibility to connect peripheral devices to your iPhone 5 and newer phones, which is a good feature to have, it has very little added benefit outside the reversible factor.

The Power

Assuming that USB truly wanted to develop a better iteration of a "Universal" Serial Bus product, the power output had to have been a key concern for the evolution of this immensely popular interface. Lets take a minute to reflect on the very first power numbers of the great grandfather of USB: USB 1.0. Initially the USB cable was supposed to replace your traditional serial and parallel connections. The average run-of-the-mill d-subminiature and Centronics connections had those giganto 9, 25 and 36 pin behemoths, as well as the smaller PS/2 for the mouse and keyboard. Now these are all primarily data focused operations and power was an afterthought. So to kick things off USB was a full three quarter watt power plant. 150mA at 5 V might power your keyboard caps lock light and not much else. Version 2.0 started to see the potential in powered operations, and there was a bump to 500 mA or 2.5W. This was an impressive improvement. We could now run our USB powered fans to keep our fingers cool as we put in long hours on PERL code lines. USB 3.0 gave us a bit more meat with our gravy and had us at almost a full Amp at 5V or 4.5 watts. At this point everyone was happy. We could charge phones faster and we could even start charging our tablets. Then 3.1 happened, and 100 watts just gave you enough juice to power a 42 inch LCD screen which will invariably bump your NPH (Netflix Per Hour) enough to get you throttled by your ISP. In fact, USB 3.1 can now support 5 V, 12 V, and 20 V with a maximum of 5 A.

This isn't the only improvement to the power spec either. Keep in mind that USB 2.0 had a "battery charging" mode that could give you 1.5 A at 5 V for 7.5 W but it would shut down all data transmission. 3.1 spec is giving you all of this power while still delivering full data transmission. Another revelation for the 3.1 was the ability to be bi-directional with power. Think of this, a tablet can be connected to the wall while in operation, and you have a cover for your tablet that is also a keyboard and a battery backup. While you are working off the wall outlet, it is powering/charging your tablet, as well as giving a charge to the battery on the keyboard. When you disconnect from the wall the keyboard power direction reverses and gives your tablet a spare source of power. The bi-directional power will allow you to charge in both directions and your devices will negotiate power all on their own.

The Hookup

Motherboard manufacturers are already updating many of their boards to start offering 3.1. Some come in the form of the actual Type C connections built directly onto the board. Others offer a card type that plugs into a PCIe expansion with a Type C. ASUS was one of the first out of the gates with a few of their Z-97 boards that offer the 3.1 interface, along with 2 other boards they bring you a total of 6 options as of present time. Another board option is the MSI branded Z97A GAMING 6 board that is one of their 12 board update. ASRock is set to debut at CeBit. With more and more vendors coming online every day I would predict that by the end of 2015 any consumer will have at least a couple dozen devices to choose from. This will include motherboards, hubs, cables, dock stations and monitors. For now here is a small look at what is on the horizon.

Overall the USB 3.1 has speed and power increases that will allow for faster data transfer

and faster charging. It will allow a greater degree of vender customization, and many more possibilities, including video as a standard. Although it has been a long time coming, the USB 3.1 and all of its improvements are great news for all of us, and a huge step forward for technology.

New USB 3.1 Hardware To Watch For in 2015

Manufacturer	Product Type	Released
AKiTiO	USB 3.1 Bridge Device	March
AVLAB Tech (SIIG)	USB 3.1 to SATA 2.5-Inch Enclosure	April
AVLAB Tech (SIIG)	USB 3.1 to SATA 2.5-Inch Enclosure Pro	Q2-Q3
AVLAB Tech (SIIG)	USB 3.1 to SATA 3.5-Inch Enclosure	April
GODO	2.5-Inch USB 3.1 Enclosures	March
HighPoint Technologies	USB 3.1 RAID Devices	March/April
Iomaster	2-Port USB 3.1 Host Card	March
Iomaster	USB 3.1 to SATA 2.5 Enclosure	March
Iomaster	USB 3.1 to SATA 2.5 and 3.5 Adapter	April
Iomaster	USB 3.1 to MSATA and M2 SSD Enclosure	March
Minerva Innovation	3.5-Inch SATA to USB 3.1 Enclosure	March
Minerva Innovation	2.5-Inch SATA to USB 3.1 Enclosure	March
Minerva Innovation	2.5-Inch SATA and SSD to USB 3.1 Enclosure	April
Speed Dragon	USB 3.1 to SATA 6G Cable Adapter	March
Speed Dragon	USB 3.1 PCI-Express Add-On Card	March
Speed Dragon	USB 3.1 PCI-Express Add-On Card	March
Speed Dragon	USB 3.1 to Dual SATA 6G HDD Enclosure	April
Super Talent Technology	USB3.1 Portable SSD	May
Sunrich Technology	USB 3.1 to SATA 6G Adapter	March/April
Sunrich Technology	USB 3.1 4-Port Hub	TBA
Sunrich Technology	USB 3.1 7-Port Hub	TBA
Sunrich Technology	USB 3.1 Docking Station	TBA
UNITEK	PCI Express to 2 Ports USB 3.1 (Type A x 2)	March
UNITEK	PCI Express to 2 Ports USB 3.1 (Type A x 1, C x 1)	March
UNITEK	USB 3.1 to SATA6G Enclosure	April
UNITEK	USB 3.1 to SATA6G Docking Station	April
UNITEK	USB 3.1 to 2.5-Inch Dual SATA6G Enclosure	April
UNITEK	USB 3.1 Active Extension Cable	June