USB 3.1 Gen 2
vs. USB 3.1 Gen 1
vs. USB 2 vs. SATA vs. eSATA

by Francis Chao
fchao2@yahoo.com
Web Location for Presentations:

http://aztcs.org

Click on “Meeting Notes”
SUMMARY

• After a promising start in 2008, eSATA fell by the wayside with the universal availability of USB 3.0 in 2009. Then in 2013, USB 3.0 was renamed to "USB 3.1 Generation 1". Now, "USB 3.1 Generation 2" and its associated multi-talented "USB Type-C" connector standard is the emerging standard for both mobile devices and computers.
TOPICS

• TRENDS IN CABLE TECHNOLOGY
• SATA AND eSATA BASICS
• USB BASICS
• EMPIRICAL SPEED COMPARISON
• TESTING USB PORTS AND EQUIPMENT
TOPICS (continued)

• FUTURE-PROOFING EQUIPMENT PURCHASES
• USING CABLE EXTENSIONS
• FUTURE OF "USB 3.1 GEN 2" AND "USB 3.1 TYPE-C"
TOPICS (continued)

• ADDING USB 3.1 GEN 2 WITH TYPE-C OR USB 3.1 GEN 2 WITH "STANDARD B" TO AN EXISTING COMPUTER
TRENDS IN CABLING TECHNOLOGY

- Increasing data throughput speeds
- Decreasing size of connectors
- Increasing power for powering and charging devices
- Decreasing allowable cable lengths
- Increase complexity at both ends and inside the cables
SATA AND eSATA BASICS

- "SATA" means "Serial Advanced Technology Attachment"
- "eSATA" means "external Serial Advanced Technology Attachment"
- Serial ATA International Organization (SATA-IO) has a Web site at https://www.sata-io.org/
SATA AND eSATA BASICS (continued)

• Current SATA hard drives conform to standard called "SATA Revision 3" which runs at 6 Gigabits per second.

• "SATA III" is not a permitted term. When it is used, it is incorrectly used to refer to "SATA 2 running at 3 Gigabits per second which is now obsolete."
Almost everyone has "SATA Revision 3" technology in their computers: SATA hard drives are currently in 99 percent of consumer computers. Most computers purchased since 2005 have SATA hard drives connected to SATA connectors on the motherboard.
SATA AND eSATA BASICS
(continued)

• eSATA is essentially SATA with shielding and different tougher connectors

• "SATA" and "eSATA" is a 7-wire/7-pin technology

• eSATA and SATA have the same number of wires/pins and their signal formats are the same
eSATA was a momentary "flash in the pan" in 2009: Almost no one has eSATA in their computers. eSATA-only hard drives and enclosures are non-existent. Some USB hard drives and enclosures also have an eSATA port.
SATA AND eSATA BASICS (continued)

- Maximum cable length of 39.37 inches for SATA (1 meter)
- Maximum cable length of 6 1/2 feet (2 meters) for eSATA
SATA AND eSATA BASICS (continued)

- SATA and eSATA only works for hard drives:
  Cannot connect keyboard, mice, and other devices.
SATA only connects to internal hard drives that have a SATA connector.
eSATA only connects to external hard drives and enclosures that have an eSATA jack.
SATA AND eSATA AND BASICS (continued)

- Cheapest technology to add hard drives to an existing computer: Use passive SATA cable for SATA connections and use a passive SATA-to-eSATA bracket or cable for eSATA.
When purchasing SATA and eSATA cables and connectors, it is easy to confuse the two technologies:
SATA AND eSATA AND BASICS (continued)

- When purchasing SATA and eSATA cables and connectors, it is easy to confuse the two technologies:
SATA AND eSATA AND BASICS (continued)

• Two SATA data connections from motherboard to SATA hard drive:
Cables Unlimited FLT-6000-18 Cables Unlimited FLT-6000-18 18in Red Serial ATA Cable With Straight Connector - SATA - SATA - 1.5ft - Red

by Cables Unlimited
Be the first to review this item

Price: $6.99 + $2.30 shipping

In Stock.
Get it as soon as Feb. 2 - 7 when you choose Expedited at checkout.
Ships from and sold by cables4computer.

- Retail
- cables unlimited flt-6000-18 cables unlimited flt-6000-18 18in red serial ata cable with straight connector - sata - sata - 1.5ft - red
SATA AND eSATA AND BASICS (continued)

• SATA data connection from motherboard to an internal SATA hard drive:
SATA AND eSATA AND BASICS (continued)

• SATA power cable from power supply of a desktop computer to an internal SATA hard drive:
SATA AND eSATA AND BASICS (continued)

- eSATA connection: motherboard's SATA port connects to an SATA-to-eSATA adapter bracket which connects to an eSATA cable to which connects to an eSATA external hard drive enclosure:
Tripp Lite SATA to eSATA Transition Cable (7Pin/7Pin) 2-ft.(p952-002)

by Tripp Lite

⭐⭐⭐⭐⭐ 168 customer reviews  |  11 answered questions

List Price: $9.99

Price: $6.67 & FREE Shipping on orders over $49. Details

You Save: $3.32 (33%)

In Stock.

Want it tomorrow, Feb. 1? Order within 2 hrs 11 mins and choose One-Day Shipping at checkout. Details

Ships from and sold by Amazon.com. Gift-wrap available.
Monoprice 6ft SATA III 6.0 Gbps Shielded External (eSATA) Cable - Black

by Monoprice
Be the first to review this item

Price: $4.24 & FREE Shipping

In Stock.
Get it as soon as Feb. 7 - 10 when you choose Standard at checkout. Ships from and sold by Monoprice.

New (3) from $4.24 & FREE shipping.
Report incorrect product information.
Monoprice 6ft SATA III 6.0 Gbps Shielded External (eSATA) Cable - Black
by Monoprice
Be the first to review this item

Price: $4.24 & FREE Shipping

In Stock.
Get it as soon as Feb. 7 - 10 when you choose Standard at checkout.
Ships from and sold by Monoprice.

New (3) from $4.24 & FREE shipping.

Report incorrect product information.
SATA AND eSATA AND BASICS (continued)

• No solely eSATA hard drives enclosures are currently available for purchase as new items

• Vantec sells some hard drive enclosures that have both an eSATA port and a USB "Standard Type-A" port:
Vantec 3.5" SATA 6Gb/s to USB 3.0/eSATA HDD Enclosure (NST-366SU3-BK)

by Vantec

611 customer reviews | 58 answered questions

Available from these sellers.

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<td>NexStar 6G - usb 3.0/eSATA</td>
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<td>NexStar CX - USB 2.0</td>
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<td>NexStar CX - USB 2.0/eSATA</td>
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<tr>
<td>NexStar TX - USB 3.0</td>
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<td>(Updated version)</td>
</tr>
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- SATA III specification max 6Gbps (Backwards Compatible With SATA II/II)
- Maximum Transfer Rates for USB 3.0 and eSATA
Vantec 3.5" SATA 6Gb/s to USB 3.0/eSATA HDD Enclosure (NST-366SU3-BK)
by Vantec

Available from these sellers.

Style: NexStar 6G - usb 3.0/eSATA

NexStar 3.1 - USB 3.1
$30.56

NexStar 6G - USB 3.0(Black)
$22.99

NexStar 6G - usb 3.0/eSATA
from $35.99

NexStar CX - USB 2.0
$31.08
SATA AND eSATA AND BASICS (continued)

• References:
USB BASICS

• Standards organization: USB-IF = "USB Implementors Forum
  See http://www.usb.org

• USB specifications:
  USB 1.0, USB 1.1, USB 2.0, and USB 3.1, USB Type-C

• All USB specifications are available for free at
  http://www.usb.org/developers/docs/
USB BASICS (continued)

- USB data rates:
  Low-Speed = 1.5 Megabits/sec
  Full-Speed = 12 Megabits/sec
  High-Speed = 480 Megabits/sec
  Super Speed = 5 Gigabits/sec
  Super Speed+ = 10 Gigabits/sec.
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USB BASICS (continued)

• Reference for previous slide: http://www.logicsupply.com/explore/io-hub/usb-type-c-and-usb-3-1-explained/
USB 2.0:
- High speed USB
- Theoretical speed up to 480Mbps (practical speed up to 35/40MB/s)

USB 3.0:
- SuperSpeed USB
- Theoretical speed up to 5Gbps (practical speed up to 300MB/s)

USB 3.1 Gen 1:
- Formerly known as "USB 3.0" SuperSpeed USB
- Theoretical speed up to 5Gbps (practical speed up to 300MB/s)

USB 3.1 Gen 2:
- Next-generation USB specification SuperSpeed USB
- Theoretical speed of 10Gbps (or 1.2GB/s)
USB BASICS (continued)

• In April 2000, USB 2.0 was introduced
• USB 2.0 runs at 480 Megabits per second half-duplex
• At this time, "Standard Type-A", "Mini Type-A", "Micro Type-A", "Standard Type-B", "Mini Type-B", and "Micro Type B" connectors were defined
• High speed USB

• Theoretical speed up to 480Mbps (practical speed up to 35/40MB/s)
USB BASICS (continued)

• In November 2008, the USB 3.0 standard was released.
• USB 3.0 runs at 5 Gigabits per second full-duplex.
- SuperSpeed USB
- Theoretical speed up to 5 Gbps
  (practical speed up to 300 MB/s)
In July 2013, "USB 3.0" was retroactively renamed to "USB 3.1 Generation 1"

Most equipment specifications refer to it as "USB 3.1 Gen 1"

Like the superseded "USB 3.0" standard, "USB 3.1 Gen 1" runs at 5 Gigabits per second full-duplex.
USB 3.0

- SuperSpeed USB
- Theoretical speed up to 5Gbps (practical speed up to 300MB/s)

USB 3.1 Gen 1

- Formerly known as “USB 3.0” SuperSpeed USB
- Theoretical speed up to 5Gbps (practical speed up to 300MB/s)
• Also in July of 2013, "USB Type-C" standard was issued: It specifies oval USB Type-C connectors that are smaller than the legacy "Standard Type-A" and "Standard Type-B" connectors. The cables that conform to the Type-C specification are end reversible and each end is up-down reversible.
SuperSpeed USB

USB 3.0

- SuperSpeed USB
- Theoretical speed up to 5Gbps (practical speed up to 300MB/s)

USB 3.1 Gen 1

- Formerly known as "USB 3.0" SuperSpeed USB
- Theoretical speed up to 5Gbps (practical speed up to 300MB/s)
USB BASICS (continued)

• "USB Type-C is a versatile cabling specification that can be used for "USB 2.0", "USB 3.1 Gen 1", "USB 3.1 Gen 2", headset analog audio, "Thunderbolt 3", HDMI and many combinations of voltage and amperage for charging devices."
• At the same time in July 2013, the "USB 3.1 Generation 2" standard was issued
• Most equipment specifications refer to it as "USB 3.1 Gen 2"
• "USB 3.1 Gen 2" runs at 10 megabits per second
USB BASICS (continued)

• "USB 3.1 Gen 2" can run over EITHER Type-C cabling and connectors OR
"USB 3.1 Gen 2" can run over legacy Type-A cabling and connectors
USB BASICS (continued)

- When "USB 3.1 Gen 2" is operated over legacy Type-A cabling and connectors, the versatility of Type-C cabling such as analog audio transmission, PD "Power Delivery" options, and "Alternate Modes" will be missing.
USB 3.1 Gen 2

- Next-generation USB specification SuperSpeed USB
- Theoretical speed of 10 Gbps (or 1.2 GB/s)
USB BASICS (continued)

• The "practical speeds" that we get as computer users will improve as new models of the chip sets on both ends (and inside the cable in the case of USB 3.1 Generation 2) are released each year.

• Reference for the previous slides: https://www.kingston.com/en/usb/usb_30
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<td>Super Speed +</td>
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</table>
USB BASICS (continued)

• Reference for the previous slide: http://www.diodes.com/_files/articles/USB_Type_C.pdf
USB BASICS (continued)

• The "practical speeds" that we get as computer users will improve as new models of the chip sets on both ends (and inside the cable in the case of USB 3.1 Generation 2) are released each year.

• Reference for the previous slides: https://www.kingston.com/en/usb/usb_30
USB BASICS (continued)

- See
USB BASICS (continued)

- Physical configuration:
  "USB 1" is a 4-wire/4-pin technology
  "USB 2" is a 4-wire/4-pin technology
  "USB 3.1 Gen 1" is a 9-wire/9-pin technology
  "USB 3.1 Gen 2" is a 24-wire/24-pin technology
USB BASICS (continued)

- 16.4 feet (5 meter) limitation for "USB 2" cables
- 6 feet for "USB 3.1 Gen 1" cables running at "USB 3.1 Gen 1" speeds
- 3 feet for "USB 3.1 Gen 2" cables running at "USB 3.1 Gen 2" speeds
USB BASICS (continued)

• To extend the total cable length for a USB device, you can use passive USB extension cables or active USB extension cables

• To extend the cable length beyond the normal capabilities for a passive of USB cables, you have to use active USB hubs and active USB extension cables which will give you more cable length.
USB BASICS (continued)

- To extend a USB 3.1 Generation 2 device beyond about 3 feet from your computer, you will have to buy optical cables with chipsets inside them at both ends to convert from copper wires to optical fibers and each end of the cable.
- These optical-enhanced cables have not been designed yet.
USB BASICS (continued)

- See Section 3.1 (pages 27 and 28) of the USB Type-C Specification
CONFIGURATION OF A “USB 2” CABLE

PC SIDE SIDE:
"USB 2 TYPE-A" plug
---4 CONDUCTORS OF WIRE---

EQUIPMENT SIDE:
"USB 2 TYPE-B" PLUG

See
http://pinouts.ru/Slots/USB_pinout.shtml
http://en.wikipedia.org/wiki/USB
CONFIGURATION OF A "USB 3 A TO B" CABLE

PC SIDE SIDE:
"USB 3 TYPE-A" PLUG
---9 CONDUCTORS OF WIRE---

EQUIPMENT SIDE:
"USB 3 TYPE-B" PLUG

See
http://en.wikipedia.org/wiki/USB_3.0
CONFIGURATION OF A "USB 3" "STANDARD TYPE-B" CONNECTOR
PINOUT OF A "USB 3 "STANDARD TYPE-B" CONNECTOR

USB 3.0 Type B

Mating face of USB 3.0 type B female

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<td>5</td>
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</table>
PINOUT OF A "USB 3" "STANDARD TYPE-A" CONNECTOR

http://gadgetcircuits.com/usb-pinout
CONFIGURATIONS OF USB PERIPHERALS

PC SIDE                             EQUIPMENT SIDE
"USB 2 TYPE A" PORT

---->"USB 2 A to B" CABLE

---->"USB 2 TYPE-B PORT

(= PURE "USB 2")
CONFIGURATIONS OF USB PERIPHERALS

PC SIDE

"USB 3 TYPE A" PORT

------>"USB 3 A to B" CABLE

------>"USB 3 TYPE B" PORT

(= PURE "USB 3.1 GEN 1 OR GEN 2")
CONFIGURATIONS OF USB PERIPHERALS

PC SIDE

"USB 2 TYPE A" PORT

-----> "USB 3 A to B" CABLE

-----> "USB 3 TYPE B" PORT

(= FORWARD COMPATIBILITY
BUT YOU GET USB 2 SPEEDS)
CONFIGURATIONS OF USB PERIPHERALS

PC SIDE                                            EQUIPMENT SIDE

"USB 3 TYPE A" PORT

----->"USB 2 A to B" CABLE

----->"USB 2 TYPE B" PORT

 (= BACKWARD COMPATIBILITY
 BUT YOU GET USB 2 SPEEDS)
CONFIGURATIONS OF USB PERIPHERALS

PC SIDE                      EQUIPMENT SIDE

"USB 3 TYPE-A" PORT

------>"USB 2 A TO B" CABLE

------>"USB 3 TYPE-B" PORT

(= BACKWARD COMPATIBILITY
   BUT YOU GET USB 2 SPEEDS)
CONFIGURATIONS OF USB PERIPHERALS

• "USB 2 A to B" cables are forward compatible at both the "A" computer end and the "B" equipment end

• When you use a "USB 2 A to B" cable to attach to a "USB 3 Type-A" computer jack, you get “USB 2” speeds

• In order to get "USB 3.1 Gen 1 or Gen 2" speeds, the jack at the computer end, the cable, and the jack at the equipment end all have to be "USB 3 Type-"
FORWARD COMPATIBILITY OF "USB 2 A to B" CABLES AT BOTH THE COMPUTER END AND THE EQUIPMENT END

- You can use a “USB 2” cable to attach a “USB 3” device to a “USB 2” or “USB 3” port in a computer.
- You can use a “USB 2” cable to attach a “USB 2” device to a “USB 3” jack in a computer.
FORWARD COMPATIBILITY OF "USB 2 TYPE-A" PORTS AT THE COMPUTER END

"USB 2 Type-A" ports at the computer end are forward compatible:

- A "USB 2 Type A" port at the computer end will accept a "USB 3 Type A" plug at the computer end.
- You will get "USB 2" speeds if you do this.
BACKWARD COMPATIBILITY OF "USB 3 TYPE-A" PORTS AT THE COMPUTER END

A "USB 3 Type-A" port at the computer end will accept a "USB 2 A to B" cable’s "Type-A" connector.
BACKWARD INCOMPATIBILITY OF "USB 3 A TO B" CABLES AT THE EQUIPMENT END

"USB 3 A to B" cables are not backward compatible at the ("B") equipment end:

You cannot use a "USB 3 A to B" cable's "Type-B" plug to attach to a "USB 2 Type-B" port at the equipment end.
BACKWARD COMPATIBILITY OF "USB 3 TYPE B" PORTS AT THE EQUIPMENT END

A "USB 3 Type-B" port at the equipment end will accept the "Type-B" plug of a "USB 3 A to B" cable or the "Type B" plug of a "USB 2 A to B" cable.
AN EMPIRICAL SPEED COMPARISON BETWEEN SATA, eSATA, USB 2, USB 3.1 Gen 1, USB 3.1 Gen 2 (January 2017)
METHODOLOGY FOR COMPARING DATA SPEEDS OF "USB 2", "USB 3", AND "eSATA" DEVICES

The same 1-Terabyte Seagate "Barracuda" ST31000528AS" SATA hard drive was used for all tests. An Intel 1-Terabyte "SSD5" solid state drive was used for the comparison between USB 3.1 Gen 1 and Gen 2 ports.
METHODOLOGY FOR COMPARING DATA SPEEDS OF "USB 2", "USB 3", AND "eSATA" DEVICES

Software Used:
64-bit version of "Portable Edition" of "CrystalDiskMark 3" version 3.0.2 freeware
FREE "CRYSTALDISKMARK" SOFTWARE FOR BENCHMARKING HARD DRIVES

Use the 64-bit "Portable Edition" of "CrystalDiskMark" since it is malware-free.

Do not use the non-portable version of "CrystalDiskMark" since some versions of it install the "OpenCandy" adware malware into your "Windows" computer. 93
The 64-bit version of "Portable Edition" of "CrystalDiskMark 3" is safe, malware-free freeware from http://crystalmark.info/download/index-e.html
Download Center

[2016/02/10] Removed Ads (OpenCandy) from Installers of CrystalDiskInfo & CrystalDiskMark.

All of my softwares are freeware. A part of my software is distributed under The MIT license. I would appreciate it if you could do development support.
[2017/01/01] CrystalDiskInfo 7.0.5 - History

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Manual / History / Download / Review / Report

[2017/01/01] CrystalDiskMark 5.2.1 - Disk Benchmark

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Manual / History / Download / Review / Report

*1: Windows 10 Ver. 1607~

[2015/04/01] CrystalDiskMark 3.0.4

- Shizuku Edition (zip)
- Portable Edition (zip)
- Source Code

[2014/10/30] CrystalCPUID 4.15.5.452e
**[2017/01/01] CrystalDiskMark 5.2.1 - Disk Benchmark**

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*Manual / History / Download / Review / Report*

*1: Windows 10 Ver. 1607~*
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<td>4K Q32T1</td>
<td>123.7</td>
<td>62.28</td>
</tr>
<tr>
<td>Seq</td>
<td>0.6005</td>
<td>0.5556</td>
</tr>
<tr>
<td>4K</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
RAW TEST RESULTS

TEST 1:
SATA 3 at 6 Gigabits per second is equivalent in speed to eSATA 3 at 6 Gigabits per second:

"SATA 3 at 6 Gigabits per second for Seagate 1-TB mechanical HD"

```
<table>
<thead>
<tr>
<th></th>
<th>Read [MB/s]</th>
<th>Write [MB/s]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seq</td>
<td>121.0</td>
<td>120.4</td>
</tr>
<tr>
<td>4K Q32T1</td>
<td>0.9999</td>
<td>1.063</td>
</tr>
<tr>
<td>Seq</td>
<td>123.5</td>
<td>122.9</td>
</tr>
<tr>
<td>4K</td>
<td>0.07</td>
<td>1.169</td>
</tr>
</tbody>
</table>
```

"eSATA 3 at 6 Gigabits per second for Seagate 1-TB mechanical HD"

```
<table>
<thead>
<tr>
<th></th>
<th>Read [MB/s]</th>
<th>Write [MB/s]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seq</td>
<td>121.5</td>
<td>120.4</td>
</tr>
<tr>
<td>4K Q32T1</td>
<td>0.968</td>
<td>0.908</td>
</tr>
<tr>
<td>Seq</td>
<td>123.3</td>
<td>123.3</td>
</tr>
<tr>
<td>4K</td>
<td>0.07</td>
<td>1.072</td>
</tr>
</tbody>
</table>
RAW TEST RESULTS

TEST 2:

SATA 3 at 6 Gigabits per second was equivalent to USB 3.1 Generation 1 at 5 Gigabits per second:

"SATA 2 at 3 Gigabits per second for Seagate 1-TB mechanical HD

| Seq Q32T1 | 121.0 | 120.4 |
| 4K Q32T1  | 0.9999| 1.063 |
| Seq       | 123.5 | 122.9 |
| 4K        | 0.007 | 1.169 |

"USB 3.1 Gen 1 at 5 Gigabits per second for Seagate 1-TB mechanical HD

| Seq Q32T1 | 123.8 | 123.8 |
| 4K Q32T1  | 0.659 | 1.124 |
| Seq       | 123.5 | 123.7 |
| 4K        | 0.004 | 1.063 |
RAW TEST RESULTS

TEST 3:
USB 3.1 Gen 1 (formerly known as USB 3.0) is about 3 times faster than USB 2.0:

"USB 2.0 cable to connect to Seagate 1-TB mechanical HD"

<table>
<thead>
<tr>
<th>Read [MB/s]</th>
<th>Write [MB/s]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seq Q32T1</td>
<td>38.90</td>
</tr>
<tr>
<td>4K</td>
<td>0.637</td>
</tr>
<tr>
<td>Seq</td>
<td>38.38</td>
</tr>
<tr>
<td>4K</td>
<td>0.598</td>
</tr>
</tbody>
</table>

"USB 3.1 Generation 1 cable to connect to Seagate 1-TB mechanical HD"

<table>
<thead>
<tr>
<th>Read [MB/s]</th>
<th>Write [MB/s]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seq Q32T1</td>
<td>121.0</td>
</tr>
<tr>
<td>4K</td>
<td>0.999</td>
</tr>
<tr>
<td>Seq</td>
<td>123.5</td>
</tr>
<tr>
<td>4K</td>
<td>0.607</td>
</tr>
</tbody>
</table>
RAW TEST RESULTS

TEST 4:
USB 3.1 Generation 2 (=USB 3.0) is about 46 percent faster than USB 3.1 Generation 1:

"USB 3.1 Generation 1" "Standard-A" port connected to Intel 1-TB "SSD5"

<table>
<thead>
<tr>
<th></th>
<th>Read [MB/s]</th>
<th>Write [MB/s]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seq</td>
<td>379.1</td>
<td>368.4</td>
</tr>
<tr>
<td>4K</td>
<td>159.7</td>
<td>122.6</td>
</tr>
<tr>
<td>Seq</td>
<td>365.5</td>
<td>373.1</td>
</tr>
<tr>
<td>4K</td>
<td>20.14</td>
<td>40.26</td>
</tr>
</tbody>
</table>

"USB 3.1 Generation 2" "Standard-A" port connected to Intel 1-TB "SSD5"

<table>
<thead>
<tr>
<th></th>
<th>Read [MB/s]</th>
<th>Write [MB/s]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seq</td>
<td>555.4</td>
<td>471.5</td>
</tr>
<tr>
<td>4K</td>
<td>302.7</td>
<td>328.1</td>
</tr>
<tr>
<td>Seq</td>
<td>513.2</td>
<td>443.8</td>
</tr>
<tr>
<td>4K</td>
<td>324.7</td>
<td>130.0</td>
</tr>
</tbody>
</table>
TEST 5: RAW TEST RESULTS

No speed differences between USB Type-C ports and USB Standard Type-A ports for USB 3.1 Generation 2
TESTING USB PORTS AND EQUIPMENT

- To test USB ports, cables, and equipment, you can download and install the free "USBTreeView" software into a "Windows.." computer at
  http://www.uwe-sieber.de/usbtreeview_e.html#download
• If you do not have any "USB 3.1 Generation 2" equipment, download the "old" V2.0.2 version of USBTreeView since it is easier to use.

• Only use the "latest release" if you have a "USB 3.1 Generation 2" "USB A" or "Type C" port on your computer.
• When you have a USB 3.1 device attached to a USB 3.1 port and the port type changes from "3.0" to "2.0" or a USB 3 device disappears from view entirely, a failure of the attached USB 3 devices, or the connecting USB 3 cable or the USB 3 port is imminent. You can determine which of these three items is about to fail by means as substituting with a "known good" USB 3 port, a "known good" (or shorter) USB 3 cable, or a "known good" USB 3 device.
Operating System : Windows 10 Pro: NT10.0 Build 14393.693 Version 1607 SP0 type=1 suite=100
Computer Name : DESKTOE-32LSCSJ
Admin Privileges : no

UsbTreeView Version : 3.0.4.0 (x64)
USB Host Controllers : 5
USB Root Hubs : 5
USB Standard Hubs : 13
USB Peripheral Devices : 5
<table>
<thead>
<tr>
<th>Flags</th>
<th>0x03</th>
</tr>
</thead>
<tbody>
<tr>
<td>DevIsOpAtSsOrHigher</td>
<td>1    (Is operating at SuperSpeed or higher)</td>
</tr>
<tr>
<td>DevIsSsCapOrHigher</td>
<td>1    (Is SuperSpeed capable or higher)</td>
</tr>
<tr>
<td>DevIsOpAtSsPlusOrHigher</td>
<td>0    (Is not operating at SuperSpeedPlus or higher)</td>
</tr>
<tr>
<td>DevIsSsPlusCapOrHigher</td>
<td>0    (Is not SuperSpeedPlus capable or higher)</td>
</tr>
<tr>
<td>ReservedMBZ</td>
<td>0x00</td>
</tr>
</tbody>
</table>
TESTING USB PORTS AND EQUIPMENT (continued)

• If the "USBTreeView" window flashes a lot and/or it shows a certain device constantly switching between USB 3.1 Generation 1, USB 3.1 Generation 2, and/or USB 2.0, then you either have a bad USB device, a bad USB cable, or a bad USB port on your computer.
TESTING USB PORTS AND EQUIPMENT (continued)

• One USB device, cable, or port can affect other USB devices, resulting in a computer that appears very slow and/or very unstable to the computer user.
FUTURE-PROOFING USB EQUIPMENT PURCHASES

• Do not buy "USB 3.1 Gen 1"-only hubs that are "..Gen 1" at both the computer end and the equipment end

• No "USB hubs" are available that run at "..Gen 2" speeds at the equipment end
For compatibility with both Type-A and legacy Standard Type B ports at the computer end, buy only USB 3.1 hubs that have a Standard Type A port at the computer end. This type of hub will have a USB 3 Type-A to Type-C cable for the computer end.
FUTURE-PROOFING USB EQUIPMENT PURCHASES
(continued)

• Then buy a separate USB 3 Type-A to Type-A cable for connecting to legacy Standard Type-A ports on older computers.
AUKEY USB-C Hub with 7 USB 3.0 Ports and 5V/4A Power Adapter for MacBook Pro, ChromeBook Pixel and other Type-C Devices (Aluminum Alloy)

by AUKEY

★ ★ ★ ★ ★ - 51 customer reviews  |  7 answered questions

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- Provides the power adapter to avoid current shortage when plugging in large power consumption devices
- Compact and slim design effectively saves your desk space and expands your connectivity
- Easy and fast setup without installing any software or drivers
- Package Contents: AUKEY CB-C18 7-Port USB C Hub, USB 3.0 C to A Cable, Power Adapter, Colored Silicone Rings, User Manual
AUKEY USB-C Hub with 7 USB 3.0 Ports and 5V/4A Power Adapter for MacBook Pro, ChromeBook Pixel and other Type-C Devices (Aluminum Alloy)

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⭐⭐⭐⭐⭐ - 51 customer reviews | 7 answered questions

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- Easy and fast setup without installing any software or drivers
- Package Contents: AUKEY CB-C18 7-Port USB C Hub, USB 3.0 C to A Cable, Power Adapter, Colored Silicone Rings, User Manual
FUTURE-PROOFING USB EQUIPMENT PURCHASES (continued)

• A few of the models of this type of hub will have a Type-A to Type-C cable for the computer end:
The Type-C end of the Type-A to Type-C cable inserts into the Type-C port of your recent-model computer:
FUTURE-PROOFING USB EQUIPMENT PURCHASES (continued)

• The Type-A end of the Type-A to Type-C cable inserts into the Type-A port of the hub:
FUTURE-PROOFING USB EQUIPMENT PURCHASES (continued)

• Then buy a separate Type-A to Type-A cable for connecting to legacy Standard USB Type-A ports on older computers:
Superspeed USB 3.0 Type A Male to Type A Male 24/28AWG Cable 6 Feet, Blue
by Importer520

Price: $4.99 & FREE Shipping on orders over $49. Details

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- Premium quality SuperSpeed USB 3.0 Type A to A M/M device cables
- Double-shielded, twisted-pair data wiring minimizes cross talk for error free SuperSpeed data transfer rates
- Support data transfer rates up to 4.8Gbps
- Backwards compatible with computer USB 2.0 and USB 1.1 ports - these cables also allow connection of USB 3.0 devices to legacy USB 2.0 computers
- Accessory only.
Superspeed USB 3.0 Type A Male to Type A Male 24/28AWG Cable 6 Feet, Blue

by Importer520

3 customer reviews

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- Support data transfer rates up to 4.8Gbps
- Backwards compatible with computer USB 2.0 and USB 1.1 ports - these cables also allow connection of USB 3.0 devices to legacy USB 2.0 computers
- Accessory only.
USING CABLE EXTENSIONS:

• You can use active cable extensions to move your computer farther away from your monitor, keyboard, and mouse farther away from where you sit, as far as to the next room:
Active USB 3 extension cable (up to 32 feet for USB 2 devices)

HDMI cable with Redmere Technology (up to 35 feet)

Powered USB 3 hub

wall or sound-blocking furniture
USING CABLE EXTENSIONS:

• For our advice on using cable extensions to move your computer farther away from your monitor, keyboard, and mouse, see http://aztcs.org/meeting_notes/winhardwdsig/Redmere/redmere-etc.pdf
FUTURE OF "USB 3.1 GEN 2" AND "USB TYPE C"

• Audio Adapter Accessory Mode
• Alternate Modes
  • Thunderbolt Mode
  • DisplayPort Mode
• Thunderbolt 3 Use of Type-C
• e-Marker chips in e-Marked cables
• "PD" Power Delivery standards
In the very near future, we will see fiber optic "USB 3.1 Generation 2" cables that exceed 1 meter in length. These cables will have to convert repeater chips that convert the signal to fiber optics at each end.
ADDNG USB 3.1 GEN 2 WITH TYPE-C OR USB 3.1 GEN 2 WITH "STANDARD B" TO AN EXISTING COMPUTER

- The existing computer must have a free PCIe x4 slot or a free PCIe x8 slot or a free PCIe x16 slot
ADDING USB 3.1 GEN 2 WITH TYPE-C OR USB 3.1 GEN 2 WITH "STANDARD B" TO AN EXISTING COMPUTER (continued)

- The following two PCIe adapters work for both Windows and Linux computers:
SEDNA - PCIE USB 3.1 2 Port Type C Adapter (10 Gbps)
by Sedna
Be the first to review this item

Price: $41.90 & FREE Shipping on orders over $49. Details

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Sold by aticas-shop and Fulfilled by Amazon. Gift-wrap available.

- Bus type: PCIE 4X
- 2 x USB 3.1 10Gbps Type C external port
- Chipset: ASM1142
- Transfer Rate: 10Gbps, 5Gbps, 480Mbps
- Fully compatible with USB 3.1, usb 3.0, USB2.0
SEDNA - PCIE USB 3.1 2 Port Type C Adapter (10 Gbps)
by Sedna
Be the first to review this item

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ORICO USB3.1 PCI-E Network Card Gen 2 Superspeed 10Gbps External 2 Ports PCI-E Express to USB Expansion Adapter With 15PIN Power Connector Support PCI Express x4, x8 or x16 Slot PA31-2P

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Color: 2 Port/USB3.1

ORICO USB3.1 PCI-E Network Card Gen 2 Superspeed 10Gbps External 2 Ports PCI-E Express to USB Expansion Adapter With 15PIN Power Connector Support PCI Express x4, x8 or x16 Slot PA31-2P

by ORICO

5 customer reviews

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