



VMTN | vBrownBag TechTalk at VMworld 2018 US, August 30 2018 12pm-12:30pm

What you need to know about running VMware w U.2, M.2, M.3 & PCIe NVMe SSDs [VMTN5611U]

Paul Braren



VMware vExpert 2014-2018
VMware vExpert vSAN 2017
VMware VCP #2681 earned in 2005
Founder of TinkerTry.com, LLC
Sr. Solutions Engineer, vSAN/HCI at VMware
[@paulbraren](https://twitter.com/paulbraren)

[TinkerTry.com/contact](https://www.tinkertry.com/contact)

Today's presentation is available at bit.ly/nvmeonesxi

Outline

VMWORLD US
LAS VEGAS, AUG 26-30, 2018

VMWORLD 2018 US CONTENT CATALOG

Session rooms are now finalized and you can now export your schedule to an .iCal or VCal. In addition, the waitlist feature is disabled. If you would still like to attend a session that is full, you may go to the session and queue in line. ✕

Sessions My Schedule FAQ Contact Us

Paul Braren ▼

FILTERS

CLEAR

VMTN5611U

SEARCH

Show Favorites Only Show Enrolled Only

Recently Added ▶

1 to 1 of 1 results found

Data Center And Cloud ▶

▼ What you need to know about running VMware w U.2, M.2, M.3 & PCIe NVMe SSDs [VMTN5611U] ★

Feeling a bit confused about the differences between these form factors, and how you connect, configure, and update them? Stop by to see some samples of each, from Micron, Samsung, and Intel. Curious about hot swap U.2 drives? You'll also see an Intel Optane SSD featuring all-new 3D XPoint non-volatile memory, great for workloads that require extremely low latency.

Networking And Security ▶

Digital Workspace ▶

With sample hardware on hand, Paul will help you become knowledgeable about these newer storage technologies. Finally, SATA, SAS, and 3.5" spinning rust drives are becoming old-school, as new flash storage technology benefits home labs and datacenters alike.

Next Gen Trends ▶

SPEAKERS

Paul Braren, Founder/Owner, TinkerTry.com, LLC

Leading Digital Transformation ▶

Session Type: VMTN TechTalk

Industries ▶

Products & Topics: vSphere, vSAN, Pulse IoT

Products & Topics ▶

Persona: Practitioners/Specialists

Level: 300

Persona ▶

SCHEDULED

Thursday, Aug 30, 12:30 p.m. - 1:00 p.m. | VMTN Theater in the VMTN Lounge

AdChoices

Outline

What you need to know about running VMware w U.2, M.2, M.3 & PCIe NVMe SSDs [VMTN5611U]

Feeling a bit confused about the differences between these form factors, and how you connect, configure, and update them? Stop by to see some samples of each, from Micron, Samsung, and Intel. Curious about hot swap U.2 drives? You'll also see an Intel Optane SSD featuring all-new 3D XPoint non-volatile memory, great for workloads that require extremely low latency.

With sample hardware on hand, Paul will help you become knowledgeable about these newer storage technologies. Finally, SATA, SAS, and 3.5" spinning rust drives are becoming old-school, as new flash storage technology benefits home labs and datacenters alike.

SPEAKERS

Paul Braren, **Founder/Owner, TinkerTry.com, LLC**

Session Type: VMTN TechTalk

Products & Topics: vSphere, vSAN, Pulse IoT

Persona: Practitioners/Specialists

Level: 300

Thursday, Aug 30, 12:30 p.m. - 1:00 p.m. | VMTN Theater in the VMTN Lounge

Thank you Alastair Cooke!



#vBrownBag ▾ Amazon ▾ Cisco ▾ VMware ▾ Tech ▾ Blog Podcast Sign Up Newsletter Sign Up

Author: Alastair Cooke



Supermicro Build Day Live Wrapup

Posted on August 22, 2018

Another, very educational, Build Day Live event completed, and I still find that each event feels different. The Build Day Live with Supermicro felt like I was learning a lot about the company and not so much about the specific product that we deployed. I already knew that Supermicro is a server vendor in their own category, not an all-encompassing behemoth like some of the other big vendors but not just an assembler of components like some lower cost vendors. I knew that Supermicro designs and manufacture their servers and that their engineering is top notch. What I didn't realize

was that the engineering and manufacturing happens in San Jose for products shipped to US customers. I didn't know how good Supermicro is at re-using engineering across product families using modular designs. I also had no idea that there are a complete range of Supermicro data center network switches.



[...]

Search ... 

SIGN UP FOR #VBROWNBAG LIVE!

Can't make it live? Get our newsletter and receive all of our updates!

Sign up for the US #vBrownBag
Sign up for the EMEA #vBrownBag
Sign up for the APAC #vBrownBag
Sign up for the LATAM #vBrownBag



SIGN UP FOR #VBROWNBAG LIVE!

Can't make it live? Get our newsletter and receive all of our updates!

My Convoluted IT Career Path

A variety of customer-facing rolls

- 1979 Atari 2600 - BASIC Programming cartridge
- 1980 Commodore VIC-20 – Programs I touch-typed in were saved on cassette tapes!
- 1986-1989 Tufts University – BS in Psychology and Philosophy
Also enjoyed optimizing IBM PS/2 Model 50 for Flight Simulator, and writing batch files that would extract games I zipped up to RAM disk (like PMEM today!)
- 1989-1993 Cornell University – PhD studies and IT Department (incomplete)
Silicon Graphics speed tuning, B&W video conferencing via modem, OS/2 user group
- 1993-1997 **IBM** Contractor (**pre-sales**, OS/2 training, VX-REXX development)
1997-2016 **IBM Senior Technical Consultant** (**post-sales** - implementation & support)
- 2017- present **VMware Sr. Solutions Engineer, vSAN/HCI** (**pre-sales** – sizing & planning)



Interfaces

SATA

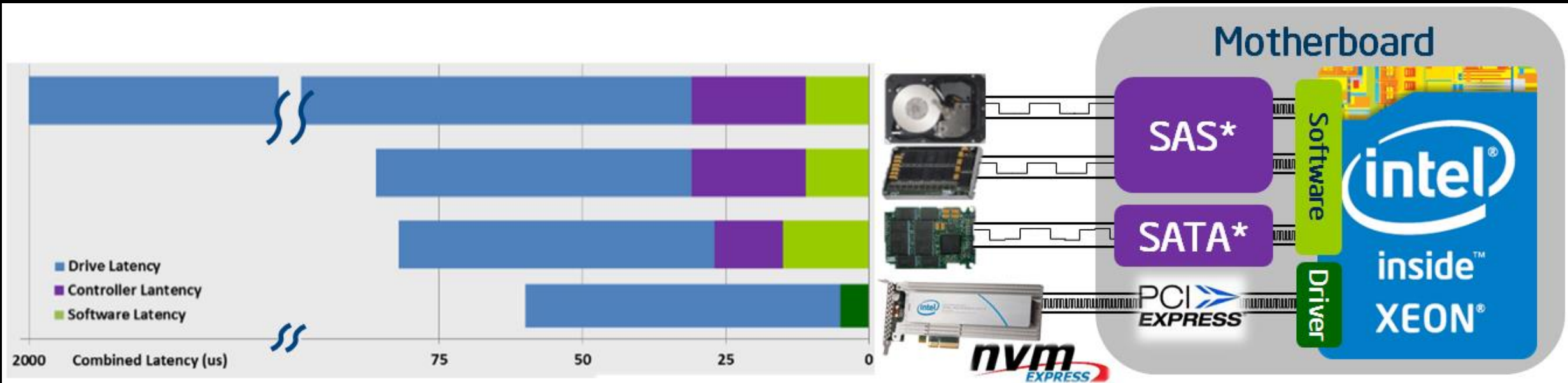
U.2 NVMe

PCIe 3.0 x 4
NVMe



NVMe

Non Volatile Memory express, see also [Intel SSD P3700 Series - NVMe Efficiency](#) where the picture below is fully explained



Interfaces

SATA III / SATA 3 – 6 Gbps - Serial Advancement Technology Attachment 6 Gbps at, max out at ~540MB/sec sequential read

e.g. [Micron 5200 ECO](#) 7.68TB SATA 3 SSD

SAS – Serial Attached Storage – 12 Gbps, max out at ~1550 MB/sec sequential read

e.g. [Dell TB Solid State Drive Serial Attached SCSI](#) 3.84 TB SSD based on Samsung PM1633a

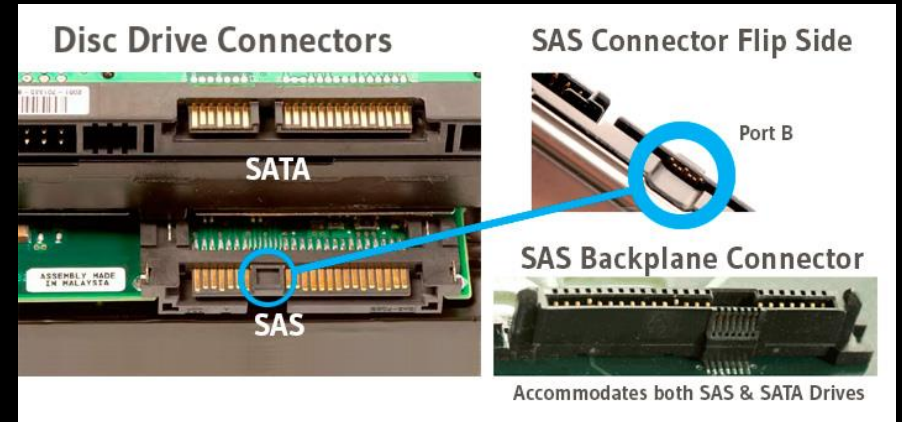


Image from [THEITBROS.com](#)

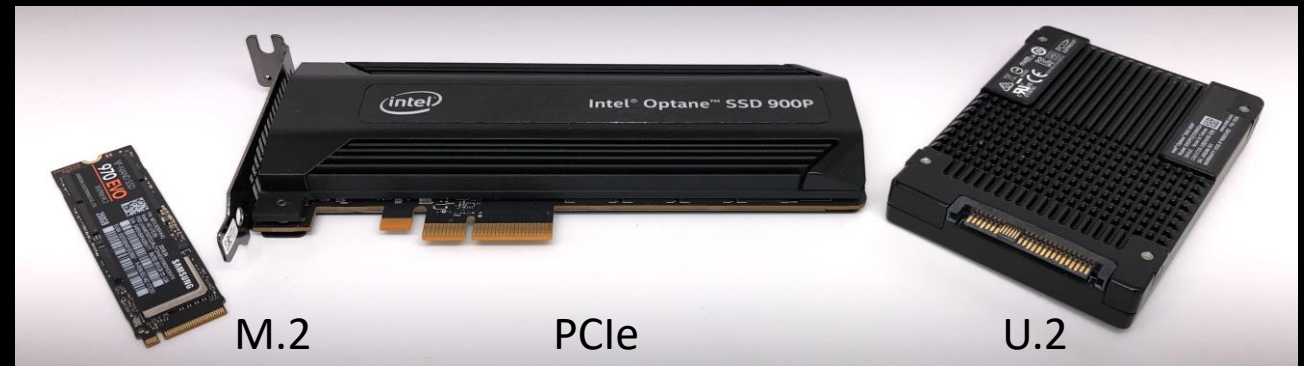
NVMe – Non-volatile Memory express

3500 MB/s sequential reads and 2500MB/s sequential writes

e.g. [Samsung 970 EVO](#) 2 TB NVMe PCIe 3.0 x 4 M.2 SSD

e.g. [Intel® SSD 760p Series](#) 2 TB NVMe PCIe 3.0 x 4 M.2 SSD

e.g. [Micron 9200 SSD with NVMe](#) 11 TB PCIe 3.0 x 4 U.2 SSD



NVMe - Samsung 970 EVO M.2, Intel 900P PCIe, Intel 900P U.2

Examples

SATA III



SAS

e.g. Dell TB Solid State Drive Serial Attached SCSI 3.84 TB SSD based on Samsung PM1633a



NVMe – Non-Volatile Memory express

e.g. Samsung 970 EVO 2 TB NVMe PCIe 3.0 x 4 M.2 SSD

e.g. Intel® SSD 760p Series 2 TB NVMe PCIe 3.0 x 4 M.2 SSD

e.g. Micron 9200 SSD with NVMe 11 TB PCIe 3.0 x 4 U.2 SSD

e.g. Intel Optane P4800X 750 GB PCIe 3.0 x 4



Form Factors, all are just PCIe 3.0 x4

M.2 – 2TB max capacity

Typically found in laptops and compact servers designed for IoT / Edge, usually 2280 (80 mm length), occasionally in 22110 (110 mm) lengths for servers, allows more space for supercapacitors/PLP (Power Loss Protection).

M.3 – 16TB max capacity

It's really M.2, judge a little pudgier/wider, more info at [STH here](#).

U.2 – Just another form factor for NVMe SSDs that is 2.5" like a laptop drive, but much thicker at 15mm

PCIe – Generally HHL (Half Height, Half-Length) with PCIe 3.0 spec and usually 4 lanes

Ruler – looks like a ruler, Intel's way to cram a petabyte into a 1U server, see [TinkerTry.com/ruler](#)

PCI Express* SSD Form Factor Evolution

M.2



M.2 initially designed for client and mobile use. Used in data center for boot or compute nodes, but lacks hotplug support and requires carrier cards / heatsinks to manage thermals

U.2



U.2 2.5in x 15mm and 7mm supports hotplug and serviceability, designed to share physical dimensions with HDDs for hybrid HDD/SSD server designs. Mainstream PCIe* SSD form factor

AIC



PCIe low profile add-in-cards have broadest compatibility with the most mature ecosystem and compliance. Shares same form factor with network cards, graphic cards, etc.

RULER



Built for data center racks
High capacity per drive and per server and per rack
Improved manageability and serviceability
Efficient thermal design
Integrated enclosure, latch, LEDs

* Other names and brands may be claimed as the property of others.

ESXi just sees them all the same way, as an NVMe storage controller

The screenshot shows the VMware ESXi management interface. The left sidebar (Navigator) is expanded to 'Storage', which contains 7 items. The main content area is titled 'Adapters' and displays a table of storage controllers. The table has columns for Name, Model, Status, and Driver. Three controllers are listed: vmhba0 (Lynx Point AHCI Controller), vmhba1 (NVMe SSD Controller SM961/PM961), and vmhba32 (USB Storage Controller). The vmhba1 row is highlighted in blue. Below the table, a detailed view for vmhba1 shows its model as 'NVMe SSD Controller SM961/PM961' and driver as 'nvme'. The interface also includes a search bar, 'Configure iSCSI', 'Rescan', 'Refresh', and 'Actions' buttons.

Name	Model	Status	Driver
vmhba0	Lynx Point AHCI Controller	Unknown	vmw_ahci
vmhba1	NVMe SSD Controller SM961/PM961	Unknown	nvme
vmhba32	USB Storage Controller	Unknown	usb-storage

3 items

vmhba1
Model: NVMe SSD Controller SM961/PM961
Driver: nvme

Form Factors, all are just PCIe 3.0 x4

Google


how tall is u.2

All Maps Shopping News Images More Settings Tools




About 461,000,000 results (0.83 seconds)

Bono / Height

5' 6"



People also search for

 The Edge 5' 10"	 Ali Hewson 5' 2"	 Eve Hewson 5' 1"
--	---	---

Feedback

Technologies

3D XPoint

Next generation storage tech from Micron and Intel that's slow replacing NAND flash we've been using for a decade

Optane

Intel's branding of 3D XPoint based SSDs

512e

It's what your HDDs probably are, widely compatible

4Kn

HGST He10 story to share, a 10GB Helium drive. 4Kn drives won't work on ESXi 6.5, but with some software trickery, they do work on ESXi 6.7. See also [What's new with vSphere 6.7 Core Storage](#) by Jason Massae on Apr 17 2018 at VMware Blogs Virtual Blocks.

ESXi boot devices

In order of preference for use with ESXi (this isn't VMware official, next page is)

USB

Convenient for home labs, easily cloned and backed up

E.g. SanDisk Ultra Fit 32GB

SD/MicroSD

Commonly found in proper servers, compact, see also Using SD cards for embedded ESXi and vSAN? by John Nicholson on Mar 01 2017

SATADOM

Less common, but better endurance, a little pricier, see also Virtual SAN and support for SATADOM by Duncan Epping at Yellow Bricks on Nov 02 2015

AHCI (SATA) M.2

Great write endurance, vSAN uses boot device for tracing, logging, and coredumps.

E.g., Dell PowerEdge Boot Optimized Storage (BOSS) for RAID1 (mirror) that doesn't take up valuable drive bays

ESXi boot devices

[M.2 SSD as Boot Device for vSAN](#) by Biswapati Bhattacharjee on Apr 5 2017 at VMware Blogs Virtual Blocks (VMware official)

Device	Price	Size	Endurance in TBW	Storing Logs	Storing Traces	Storing Core Dumps	Remarks – Pros & Cons for Use as Boot Device
USB/SD	\$	Min:4GB Recommended : 8GB	N/A – endurance too low to write traces or logs	No	Yes, RamDisk contents are written only on reboot	Yes, if ESXi memory <=512 GB	<ol style="list-style-type: none"> Endurance too low to write logs & traces Use syslog server & net dump collector
SSD	\$\$	Min: 30 GB	512-1024 TBW (Min: 130 TBW)	Yes, always	Yes, always	Yes, always	<ol style="list-style-type: none"> Endurance Requirements similar to SATADOM You lose a drive slot for vSAN consumption
HDD	\$\$	Min: 30 GB	NA	Yes, always	Yes, always	Yes, always	<ol style="list-style-type: none"> Like SSD, you lose drive slots.
SATA-DOM	\$\$\$	Min:30 GB	512-1024 TBW (Min: 130 TBW)	Yes, always	Yes, always	Yes, always	<ol style="list-style-type: none"> Logs, traces & dumps always stored. Expensive, drives up overall cost
M.2 SSD	\$\$	Min: 30 GB	512-1024 TBW (Min: 130 TBW)	Yes, always	Yes, always	Yes, always	<ol style="list-style-type: none"> Mirrored M.2 provides redundancy Provides controller separation for vSAN datastore and boot device.

Cables

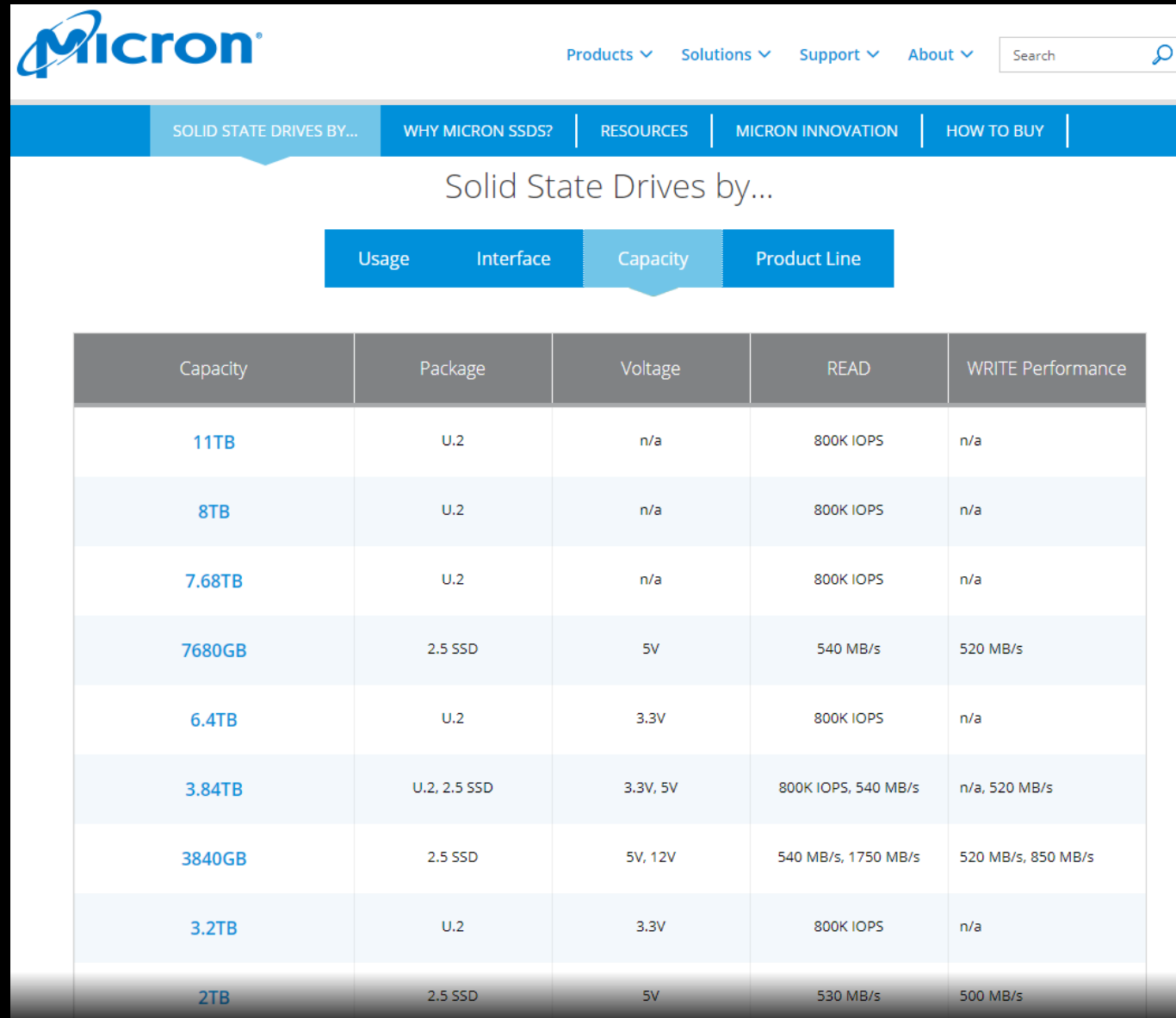
I plan to write something up about these soon, it gets a bit complicated, and rather tough to memorize anyway.

Things like compact OCuLink from Supermicro, MiniSAS and SlimSAS from GIGABYTE, SFF-8639 to SFF-8654 cables, and more.

Intel RST/RSTe/VROC

I plan to write something up about these soon too, as does Intel. It also gets a bit complicated, but generally, software or virtual RAID like these aren't support by ESXi. Intel Volume Management Device (VMD) is another matter, stay tuned.

You can see where we're headed



The screenshot shows the Micron website's navigation menu and a table of Solid State Drive (SSD) specifications. The navigation menu includes 'Products', 'Solutions', 'Support', and 'About'. The main navigation bar highlights 'SOLID STATE DRIVES BY...', with sub-links for 'WHY MICRON SSDS?', 'RESOURCES', 'MICRON INNOVATION', and 'HOW TO BUY'. Below this, the page title is 'Solid State Drives by...' and a secondary navigation bar highlights 'Capacity', with other options for 'Usage', 'Interface', and 'Product Line'.

Capacity	Package	Voltage	READ	WRITE Performance
11TB	U.2	n/a	800K IOPS	n/a
8TB	U.2	n/a	800K IOPS	n/a
7.68TB	U.2	n/a	800K IOPS	n/a
7680GB	2.5 SSD	5V	540 MB/s	520 MB/s
6.4TB	U.2	3.3V	800K IOPS	n/a
3.84TB	U.2, 2.5 SSD	3.3V, 5V	800K IOPS, 540 MB/s	n/a, 520 MB/s
3840GB	2.5 SSD	5V, 12V	540 MB/s, 1750 MB/s	520 MB/s, 850 MB/s
3.2TB	U.2	3.3V	800K IOPS	n/a
2TB	2.5 SSD	5V	530 MB/s	500 MB/s

Resources

- [Choose the Right Hard Disk Drive for Your Servers](#) - The IT BROS.com, Dec 14 2017
- [EASY SSD GUIDE: SATA, MSATA, M.2 AND U.2](#) – Republic of Gamers, Mar 21 2016
- [How to find NVMe SSD firmware versions in a VMware ESXi 6.5 Server](#) – TinkerTry, Aug 5 2017

The screenshot shows the TinkerTry website with a terminal window displaying the following output:

```
xd-1541-5028d.lab.local - PuTTY
[root@xd-1541-5028d:~] esxcli nvme device get -A vmhba1 | egrep "Serial Number|Model Number|Firmware Revision:"
Serial Number: S3EWNX0J510951K
Model Number: Samsung SSD 960 PRO 512GB
Firmware Revision: 2B6QCXE7
[root@xd-1541-5028d:~] esxcli nvme device get -A vmhba2 | egrep "Serial Number|Model Number|Firmware Revision:"
Serial Number: PHBT71610CW8032E
Model Number: INTEL MEMPEK1W032GA
Firmware Revision: K3110300
[root@xd-1541-5028d:~] esxcli nvme device get -A vmhba3 | egrep "Serial Number|Model Number|Firmware Revision:"
Serial Number: S3ETNX0HB07870X
Model Number: Samsung SSD 960 EVO 1TB
Firmware Revision: 2B7QCXE7
[root@xd-1541-5028d:~]
```

The article title is "How to find NVMe SSD firmware versions on VMware ESXi using ESXCLI". It is posted by Paul Braren on Aug 5 2017 (updated on Aug 25 2018) in ESXi, HomeServer, HomeLab, HowTo, Storage, Virtualization. The article content includes a link to the source article and a list of "New ESXCLI Commands in vSphere 6.5" by Florian Grehl at Virten.net, dated Nov 19 2016.

The website header includes navigation links (About, Archive, Advertise, Testimonials, Contact), social media icons, and a search bar. The main content area features a terminal window, a sidebar with a "Subscribe" form, a "Public Speaking Schedule" button, and several advertisements for NAKIVO, .vmlabs, and Virten.net.

Resources

- [VMworld 2018 US Solutions Exchange - vendor visit videos](#)

About Archive Advertise Testimonials Contact

TinkerTry IT@home
Efficient virtualization, storage, backup and more

FOREVER FREE VM BACKUP Cut down the complexities of Hyper-V and VMware backup. Take backups in **under 15 minutes**

ALTARO VM BACKUP
Free download

Efficiency Virtualization Storage Backup Podcasts Reviews Superguides Videos More



VMworld 2018 US Solutions Exchange - vendor visit videos
Posted by Paul Braren on Aug 28 2018 (updated on Aug 29 2018) in Presentation, Virtualization, VMworld

This article is a work in-progress, with more videos being added all week. Laptop editing and hotel WiFi aren't great for 4K video production and sharing, but the hardware close-ups will be worth the wait!

Video Index
Click or Tap the company name to jump down to the video.

1. **ATTO**
2. **Cisco**
3. **GIGABYTE**
4. **Intel**
5. **Micron**
6. **NAKIVO**
7. **Supermicro**

TinkerTry - Sensible datacenter technology in the IT Pro's home. My opinions here, not my employer's.

Paul Braren, VCP #2681 in 2005, vExpert since 2014, vExpert vSAN.

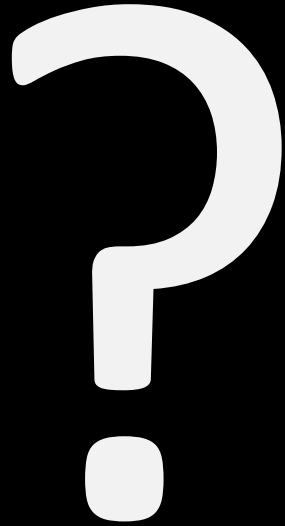
Veeam Vanguard 2015-2018.

email address **Subscribe**

Public Speaking Schedule

Download for FREE!

Questions



My favorite part, the questions. Got any? I hope so!

The end.