

VMware Storage



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Configuring NVMe-TCP

Configuring NVMe-TCP in vSphere is simple and doesn't require special hardware. NVMe-TCP uses standard Ethernet HW and can be converged with other traffic. Now, a best practice would be to dedicate NICs for NVMe-TCP for maximum performance but is not required. It should be noted NVMe-TCP or NVMe, in general, can utilize much, if not all, of the available bandwidth. Subsequently, converging NVMe-TCP with other traffic without enough bandwidth could impact other network traffic.

This article will detail the process of setting up NVMe-TCP in vSphere.

Network Requirements

Before you configure the storage piece, you first must configure the network. It is recommended you use port binding for NVMe-TCP. You will need to create a vmk for each subnet you are using. A vmhba/NIC pair can have multiple vmks associated with it.



Configuring NVMe over TCP on ESXi

If your array target controllers are on the same VLAN/subnet, you can use a single switch with multiple Portgroups. If your array target controllers are on separate VLANs/subnets, you can use a separate switch and separate portgroups for each VLAN/subnet or a single switch with multiple portgroups. Both configurations are supported with NVMe-TCP. The setup for NVMe-TCP is similar to iSCSI with the difference being the virtual NVMe adaptors. You will create a virtual NVMe adaptor for each NIC to be used for NVMe-TCP.

In this example, the array controllers are on the same VLAN/subnet as the vmhba/NIC pairs. As a result, I only needed to create a Portgroup for each uplink, within the existing vSwitch for NVMe-TCP. I am converging on a 10Gb link for the example, but again I want to remind you to make sure you have adequate bandwidth when converging network traffic.

If needed, you can use NIOC to manage bandwidth for specific traffic. NIOC is only available with certain vSphere levels.

Virtual Switch Examples

There are a few combinations of vSwitch/DVSwitch that are supported.





- Multiple Subnets, Multiples Switches, Multiple Portgroups.
- Multiple Subnets, Single vSwitch, Multiple Portgroups.
- Single Subnet, Single vSwitch, Multiple Portgroups

When configuring your NVMe-TCP connectivity, there will be a NIC-to-vmhba pair for every NIC used for NVMe-TCP.

Below are some examples of the supported configurations. Note the physical networking portion can vary depending on the customer's implementation. The physical aspect in these examples is one possible configuration.



More Advanced configurations

In cases where your array controllers are in different subnets/VLANs. There is a more advanced configuration needed ensure each NIC used has a path to each controller. In these configs, you will see there are two VMKs per NIC, one for each subnet/VLAN. When using these configurations, if you are NOT using VLANs to separate traffic, you should set a per VMK gateway to ensure proper routing.

Failover policy must be set for all 4 portgroups such that pg1 and pg3 bind to vmnic1 and pg2 and pg4 bind to vmnic2







Network Portgroup Configuration

Reviewing the Portgroup setup, you will see each NIC is explicitly active with no failover. For each vmk used, a Portgroup should be set up such that only one NIC is active and all other NICs are set to unused.



VMkernel Configuration

Once the Portgroups have been created, you can then set up your vmks for each NIC used. Under VMkernel adapters on your host, add new VMkernel.

Add Networking	Select connection type
1	Select a connection type to create.
1 Select connection type	
	VMkernel Network Adapter
	The VMkernel TCP/IP stack handles traffic for ESXi services such as vSphere vMotion, iSCSI, NFS, FCoE, Fault
	Tolerance, vSAN, host management and etc.
	🔿 Virtual Machine Port Group for a Standard Switch
	A port group handles the virtual machine traffic on standard switch.
	O Physical Network Adapter
	A physical network adapter handles the network traffic to other hosts on the network.

Select one of the Portgroups you created for NVMe-TCP. Remember you will do this for each NIC/vmhba pair used.



Add Networking	Select target device Select a target device for the new connectio	m.						
1 Select connection type	Select an existing network Select an existing standard switch	Select an existing network						
2 Select target device	New standard switch							
3 Port properties								
4 IPv4 settings	Name	NSX Port Group ID	Distributed Switch					
5 Ready to complete	 ○ △ DVPE-NVMe-TCP-P2 ○ △ △ DVPE-vMotionA 		DVS-PE DVS-PE					
			DVS-PE					
	○ 🛎 Nsted-1003		DVS-PE					
	O Sted-iSCSI-4047		DVS-PE					
			DVS-PF 18 items					
			io items					

Under the Port properties, you will select the NVMe over TCP under "Enable Services". On this screen, you can also change the default MTU depending on what your network uses.

Add Networking	Port properties		×
1	Specify VMkernel port settin	gs.	
1 Select connection type	Network label		
2 Select target device	IP settings	IPv4 ~	
3. Port properties	MTU	Get MTU from switch ~ 9000	
5 Port properties	TCP/IP stack	Default ~	
4 IPv4 settings	Available services		
5 Ready to complete	Enabled services	□ vMotion □ vSphere Replication ✓ NVMe over TCP □ Provisioning □ vSphere Replication NFC □ NVMe over RDMA □ Fault Tolerance logging □ vSAN □ Management □ vSphere Backup NFC	

On the next screen, you will enter your IP information for the vmk. Another best practice is not to route your traffic if possible, each hop can add latency.



Add Networking	IPv4 settings						
	Specify VMkernel IPv4 settings.						
1 Select connection type	Obtain IPv4 settings automatically						
2 Select target device	O Use static IPv4 settings						
3 Port properties	IPv4 address	e.g. 192.168.1.1					
4 IPv4 settings	Subnet mask						
5 Ready to complete	Default gateway	Override default gateway for this adapter					
		10.159.31.253					
	DNS server addresses	10.156.128.10 10.198.16.1					

Once you finish entering the data and click finish, you will have created a vmk for NVMe-TCP. Make sure to repeat this process for all NIC/vmhba pairs to be used for NVMe-TCP.

Summary	Monitor	Configur	re Permissions	VMs	Datastores	Networks	Updates	
Storage		~	VMkernel adap	ters				
Storage Ad	apters		ADD NETWORKIN	NG R	EFRESH			
Storage De	vices							
Host Cache	Configuration		Device		T			
Protocol En	idpoints		: >> 📼 vmł	(O		> Egress traff	fic shaping	
I/O Filters			: > vmł	d				
Networking		~	: >> = vmł	(2		> VLAN		
Virtual swite	ches		:	0		\checkmark Teaming an	d failover	
VMkernel a	adapters		• // 🖾 VIII			l oad balanc	ina	Lise explicit failover order
Physical ad	apters		: > = vmł	(4		Notwork fail	uro	Link status only
RDMA adap	oters		: >> == vmł	(5		detection	ure	Link status only
TCP/IP cont	figuration		: >> = vml	<u>ر</u> ه		Notify switc	hes	Yes
Virtual Machir	nes	~	• // 🖾 VIII			Failback		No
VM Startup	/Shutdown		: >> == vmł	7		Active uplin	ks	Uplink 1
Agent VM S	Settings		: > = vmł	(8		Standby upl	inks	
Default VM	Compatibility		: 💌 📼 vmł	(9		Unused upli	nks	Uplink 2
Swap File L	ocation		: >> == vmł	(10		\checkmark Monitoring		
System		~	11 items			NetFlow		Disabled

Configuring NVMe-TCP Adapters

After completing the vmk setup, you can now add the NVME over TCP adapters for each NIC to be used for NVMe-TCP. In the host configuration, under Storage Adapters, you ADD SOFTWARE ADAPTER selecting NVMe over TCP.



Summary	Monitor	Configure	Permissions	VMs	Datasto	res N	Networks	Update	s
Storage		~] :	Storage Adapt	ers					
Storage Ada	apters		ADD SOFTWARE A	DAPTER ~	REFRESH	H RESC	CAN STORAGE	RESC	ΑΝ ΑΓ
Storage Devi	ices								
Host Cache C	Configuration		Add iSCSI adap					T	Туре
Protocol End	points		Add NVMe ove	er RDMA ada	apter	dapter			Block
I/O Filters					1	lini			SAS
Networking		~	Add NVMe ove	er TCP adap	ter	Adapter			iSCSI
Virtual switch	nes								
VMkernel ad	apters		EXPORT						
Physical adap	pters								
RDMA adapt	ers								

On the Add Software NVMe over TCP adapter screen, you will select the NICs you configured for NVMe-TCP. Again, you will add an SW NVMe-TCP adapter for each NIC you configured previously.

Summary	Monitor	Configure	Permissions	VMs		Networks	Updat
		∽ St	orage Adapte	rs			
Storage	Adapters	A					
			Adapter	T Mode	2		T
			🔵 🔶 vmhba3	Dell	BOSS-S1 Adap	ter	
I/O Filter			🔵 🛛 🗇 vmhba0	Dell	HBA330 Mini		
Netwc Virti VMi Phy RDN TCP	Add Softwa adapter Enable softwar	are NVMe e NVMe adap	over TCP	w vs ed physica	1-pe-core-esx sanpe.vmware al network ad	e.com apter.	
Virtua VM Age Def Swap Fil	Physical Netwo	ork Adapter	vmnicO/ixgb vmnicO/ixgb vmnic1/ixgb vmnic2/igbr vmnic3/igbr vmnic4/nml	ben voen en n n x5_core x5_core	CANCEL	ок	ns selected
			vmnic8/1400 vmnic7/i400	en			

In this example, we configured two NICs to be used for NVMe-TCP so we will have two SW NVMe over TCP adapters.



Summary	Monitor	Configur	e Permissions	VMs	Datastores	Networks	Update	es	
Storage		~	Storage Adapt	ters					
Storage Ad	lapters		ADD SOFTWARE A	DAPTER ~	REFRESH	RESCAN STORAGE	RES	CAN ADAPTER	RE
Storage Dev	vices								
Host Cache	Configuration		Adapter	T Mod			T	Type	T
Protocol En	dpoints			Lew	ISDUIG SATA AF			BIOCK SCSI	
I/O Filters			🔾 🔤 🔆 vmhba2	2 Lew	isburg SATA AH	ICI Controller		Block SCSI	
Networking			🔿 🔅 vmhbað	65 VMv	ware NVME over	r RDMA Storage A	dapt	RDMA	
Networking		Ť	🔿 🛛 🔶 vmhba6	56 VMV	ware NVME over	r RDMA Storage A	dapt	RDMA	
Virtual swite	hes					TCD Charge A de			
VMkernel ad	dapters			D/ VMV	ware NVMe over	r TCP Storage Ada	apter	NVME over 1	ICP
Physical ada	apters		🔷 🛛 🔆 vmhba6	58 VMv	ware NVMe over	r TCP Storage Ada	apter	NVME over 1	ГСР
RDMA adap	ters								
TCP/IP conf	iguration		🔲 EXPORT 🗸						
Ter/IF COIII	iguration								
Virtual Machin	es	\sim	Properties De	vicos r	Dathe Name	Con	trallars		

Adding Storage Controller

Now that the network, NICs, vmks, and SW NVMe-TCP adapters have been created, we will add the storage controllers.

In this example, we are using an Infinidat Infinibox, so some of these steps may vary based on the array vendor you are using. Make sure to review your array vendor's documentation to ensure you set up the NVMe targets correctly.

Under the Storage Adapters configuration, select one of the SW NVMe-TCP adapters, then select Controllers. Under Controllers, you select ADD CONTROLLER.

Summary	Monitor	Configur	re Permissions	VMs	Datastores	Networks	Update	s	
Storage		~	Storage Adapter	s					
Storage Ac	lapters		ADD SOFTWARE ADA	PTER Y	REFRESH	RESCAN STORAG	E RESC	AN ADAPTER R	EMOVE
Storage De Host Cache	vices Configuration		Adapter T	Model	are in vime over	KUMA Storage	т	Type T RDMA	Status T
I/O Filters	apoints		🔿 😓 🔆 vmhba66	VMwa	are NVME over	RDMA Storage	Adapt	RDMA	Online
Networking		~	• <> vmhba67 ○ <> vmhba68	VMwa VMwa	are NVMe over are NVMe over	TCP Storage Ad TCP Storage Ad	lapter lapter	NVME over T NVME over T	Online Online
Virtual swite	ritches								
VMkernel a	dapters		EXPORT 🗸						
Physical ad	apters								
RDMA adap TCP/IP cont	oters		Properties Devic	es Pa	iths Name	espaces Cor	ntrollers		
Virtual Machir	nes	~	ADD CONTROLLER	REMOVE					

On the ADD CONTROLLER screen, you will see the Host NQN, this is similar to the iSCSI IQN, but for NVMe. Click COPY, you will need to add each SW NVMe-TCP host's NQN to the storage array. NOTE: the NQN is unique to the host, not the adapters. So you will only need to copy the NQN to the array from one of the SW NVME-TCP adapters for each host.



Add controller vmhba75									
Automatically Manual	ly								
Host NQN	nqn.2014-08.com.vmware.vsanpe:nvme:w1-p		COF	PΥ					
IP			Cer	ntral o	discovery controller				
	Enter IPv4 / IPv6 address								
Port Number									
	Range more from 0								
Digest parameter	Header digest Data digest								
DISCOVER CONTROLLERS									
Select which controller to	connect								
ld Y Subs	ystem NQN T Transport Type	τ I	P	T	Port Number	T			

Example of Storage Array Configuration

On the array side, you will create host groups/clusters similar to the way you would for iSCSI.

DO NOT use any of the iSCSI host groups for the NVMe targets or add an NVMe NQN to a SCSI target. NVMe is a completely different protocol/transport and mixing transports could result in data corruption.

Here you can see I've created a host profile for each host in the vSphere cluster.

0	W1-sabu-a30-infdt-01.eng.vmware.com	PERFORMANCE SAN 0 B/sec 0 IOPS NAS 0 B/sec 0 OPS HEALTH ●	Peak Health 🤰 Q 🚍
f	Hosts & Clusters > C3-NVMe-TCP		
•	C3-NVMe-TCP Hosts: 3	Mapped LUNs Hosts	
	Operating System N/A		ADD HOST
		wame w1-pe-core-esx-075-NVMe-TCP	DISCONNECTED
t,		w1-pe-core-esx-076-NVMe-TCP	DISCONNECTED
a		w1-pe-core-esx-077-NVMe-TCP	DISCONNECTED





For each host in the vSphere cluster that will be accessing the NVMe target, add that respective host's NQN to the corresponding profile on the array.

Select ADD PORT

0	W1-sabu-a30-infdt-01.eng.vmware.com	PERFORMANCE	SAN 5.1 MiB/sec	179 IOPS	NAS 0 B/sec	0 OPS HEALTH	🕨 🔍 Peak Health	<u>,</u> α	∣≡
♠	Hosts & Clusters > w1-pe-core-esx-075-NVMe-TCP								
	w1-pe-core-esx-075-NVMe-TCP	Mapped LUNs	Ports						
0	IP/Host name							ADD PORT	
	N/A	PROTOCOL		ADDRESS		CONNECTIVITY STATUS			۰
	Host readiness 😧				<empty< th=""><th>y></th><th></th><th></th><th></th></empty<>	y>			
t,	Host PowerTools Version N/A								
<i>(</i> h	Operating System								
8	N/A								
۶	Resiliency DISCONNECTED								
	Optimized Path Ves								

Choose NVMe-OF

0	W1-sabu-a30-infdt-01.eng.vmwa	re.com PERFORMANCE SAN 256.3 KiB/sec 55 IOPS NAS 0 B/sec 0 OPS	
	-	Add Ports	×
fi	Hosts & Clusters > w1-pe-core-esx-075-		
		Protocol Type	
	w1-pe-core-esx-075-NV Clustered to: <u>C3-NVMe-TCP</u>	NVMe-oF ~	
	IP/Host pame	FC	
	N/A	iSCSI	
		NVMe-oF	0
	Host readiness 🔞	Q Search	-

Depending on the array, it may already see the host's NQN, select the correct NQN for the host profile.





0	W1-sabu-a30-infdt-01.eng.vmwa	ITE.COM PERFORMANCE SAN 88.1 KiB/sec 7 IOPS NAS 0 B/sec 0 OPS	HEA
^	Hosts & Clusters > w1-pe-core-esx-075-	Add Ports	×
	w1-pe-core-esx-075-NV Clustered to: <u>C3-NVMe-TCP</u>	NVMe-oF	~
	IP/Host name N/A	Select from list Insert Manually	
	Host readiness @	Unassigned Ports	
	N/A	Q Search	
		nqn.2014-08.com.vmware.vsanpe:nvme:w1-pe-core-esx-075	
	N/A		
(1)		nqn.2014-08.com.vmware.vsanpe.nvme.w1-pe-core-esx-077	
	N/A		
	DISCONNECTED		
	Optimized Path 🔞	CANCEL	ADD
- 22	Yes		

Adding Controller Details

Back to the vSphere host, in the Add Controller setup, you will add the IP for the NVMe-TCP interface and then click on DISCOVER CONTROLLERS. If everything has been properly configured, it will populate all the controller interfaces in the adapter. Then click on OK to finish. You will repeat the adding controller portion for each SW NVMe-TCP adapter configured on each host. In this example, we have two SW NVMe-TCP adapters, and three hosts. So, I repeated the process 5 more times.



Add controller vm	nhba67				×		
Automatically Manual	ly						
Host NQN							
IP	192.168.3.60	Central discovery controller					
	Enter IPv4 / IPv6 address						
Port Number							
	Range more from 0						
Digest parameter	🗌 Header digest	🗌 Data digest					
DISCOVER CONTROLLERS							
Select which controller to	connect						
🗹 ld 🛛 🕇	Subsystem NQN 🛛 🕇	Transport Type T	IP T	Port Number 🛛 🔻			
✓ 65535	nqn.2020-01.com.inf	nvm	192.168.3.60	4420			
65535	nqn.2020-01.com.inf	nvm	192.168.3.61	4420			
65535	nqn.2020-01.com.inf	nvm	192.168.3.62	4420			
3 🖬				3 items			
				CANCEL	<		

Once completed, you will see the controllers listed under Controller for each SW NVMe-TCP adapter.



Summary	Monitor	Configu	ıre	Permissions	VMs	Datastores	Network	ks Upo	dates				
Storage		~	Sto	rage Adapte	ers								
Storage Ad	lapters		AD	D SOFTWARE A	DAPTER ~	REFRESH	RESCAN STO	DRAGE F	ESCAN ADAPTE	ER RE	MOVE		
Storage De	vices												
Host Cache	Configuration			Adapter	T Mod	el /Isdurg Sata A	ACCONTION	I	Type	T	Status	T	Identifie
Protocol En	dpoints							rago Adapt	PDMA		Oplino		
I/O Filters			\square				er RDMA Stor	age Auapi			Online		
Networking		~	\circ	│	5 VM	ware NVME ov	er RDMA Stor	rage Adapt	RDMA		Online		
				🧇 vmhba67	VM	ware NVMe ov	er TCP Storag	ge Adapter	NVME ove	er T	Online		
Virtual swite	ches		0	🛛 🗇 vmhba68		ware NVMe ov	er TCP Storag	ge Adapter	NVME ove	er T	Online		
VMkernel a	dapters												
Physical add	apters			EXPORT ~									9 ite
RDMA adap	oters												
TCP/IP conf	iguration		Prop	perties Dev	ices F	Paths Nam	nespaces	Controlle	rs				
Virtual Machir	nes	\sim											
VM Startup,	/Shutdown		AD	D CONTROLLER	REMOV								
Agent VM S	Settings					T		-	Transport	FUSE			1
Default VM	Compatibility			Name		Subsys	stem NQN	'	Туре	Suppor	rt 🛛	Model	
Swap File L	ocation			nqn.2020-01	.com.infini	dat: nqn.2	020-01.com.ir	nfinidat:	tcp	true		InfiniB	ox
System		~		nqn.2020-01	.com.infinie	dat: nqn.2	020-01.com.ir	nfinidat:	tcp	true		InfiniB	ox
Licensing				nqn.2020-01	.com.infinie	dat: nqn.2	020-01.com.ir	nfinidat:	tcp	true		InfiniB	ox
Host Profile													

You should verify the array is also connected to all the adapters as well.

	W1-sabu-a30-infdt-01.eng.vmware.com	PERFORMANCE SAN 0 B/sec 0 IOPS NAS 0 B/sec 0 OPS	HEALTH • Peak Health
_	Hosts & Clusters > C3-NVMe-TCP		
♠ DASHBOARD	C3-NVMe-TCP	Mapped LUNs Hosts	
	Operating System		
POOLS	N/A	NAME	RESILIENCY
0		w1-pe-core-esx-075-NVMe-TCP	FULLY CONNECTED
DATASETS		w1-pe-core-esx-076-NVMe-TCP	FULLY CONNECTED
88		w1-pe-core-esx-077-NVMe-TCP	FULLY CONNECTED
STS & CLUSTERS			

Mapping Volume

Now that the connectivity has been configured, you can create the map to a new NVMe volume for the hosts.

Again, this example is for an Infinibox and will vary from vendor to vendor.



0	W1-sabu-a30-infdt-01.eng.vmware.com	PERFORMANCE	AN 76.1 KiB/sec	: 11 IOPS	NAS 0 B/sec	0 OPS	HEALTH	Peak Health		2	৹ ≡
	Hosts & Clusters > C3-NVMe-TCP										
n dashboard	C3-NVMe-TCP	Mapped LUNs	Hosts								
8	Operating System	Volumes: 0 Tot	al Capacity: 0	GiB						MAP VO	.UME
POOLS	N/A	NAME .	T	MAP TYPE	SIZE	POOL	CC G	ONSISTENCY	LUN/NSID		۰
8						<empty></empty>					
DATASETS											
0	W1-sabu-a30-infdt-01.eng.vmware.com	PERFORMANCE	AN 364.1 KiB/s	ec 55 IOPS	NAS 0 B/se	c 0 OPS	HEALTH	🕨 😑 Peak Health		4	Q, I
	Hosts & Clusters > C3-NVMe-TCP										
ASHBOARD	C3-NVMe-TCP	Mapped LUNs	Hosts								
	Operating System N/A	Include Snapsl	nots d Volumes					c	Create Volume C	ANCEL	МАР
10005				т	SIZE	POOL	T	CONSISTENCY GROUP	LUN/NSI	•	0
DATASETS			-TCP-vol1		2 TiB	NVMe-Pool		N/A	Auto		~
_											

Once the volume has been mapped to the hosts, it will show up in the SW NVMe-TCP adapter's Devices. No storage rescan is required for NVMe.

Summary	Monitor	Configu	ure Permissions \	/Ms Data	stores Ne	tworks	Update	S			
Storage		~	Storage Adapters								
Storage Ad	lapters		ADD SOFTWARE ADAP	rer v 🛛 Refr	ESH RESCAI	N STORAGE	RESC	AN ADAPTER	REMOV	E	
Storage Dev	vices							-			
Host Cache	Configuration		Adapter T	Lewisburg :		troller	T	Type DIUCK SCOI	▼ Stat	us T	Identifier
Protocol En	dpoints		O i ⇔ vmhba65	VMware NV	ME over RDMA	Storage A	dapt	RDMA	Onl	ine	
I/O Filters				V/Muaro NIV		Storage A	dant	DDMA	00	ino	
Networking		\sim		viviware inv	ME OVER RDMA	Storage A	uapt	RDMA	On	ine	
Vietual ewite	hae		· · vmhba67	VMware NV	'Me over TCP S	torage Ada	pter	NVME over 1	ſ Onl	ine	
Villuar switc	dantere		🔘 🗢 vmhba68	VMware NV	'Me over TCP S	torage Ada	pter	NVME over 1	ſ Onl	ine	
Dhyrical add	antere										
PDMA adap	apters		EXPORT V								9 items
	iguration										
ICP/IP COIII	iguration		Properties Devices	Paths	Namespace	s Cont	rollers				
Virtual Machin	ies	~									
VM Startup/	/Shutdown		REFRESH ATTACH								
Agent VM S	Settings						-	-		-	-
Default VM	Compatibility		Name Name				•	LUN	Туре	T	Capacity ¹
Swap File Lo	ocation		NVMe TCP Disk	eui.0000000	000015246742	b0f00000	006d	10	disk		2.00 TB
System		~									

You can also see the Namespace details for the volumes.



Summary	Monitor	Configu	ure	Permissi	ons 🕚	VMs	Datasto	ores	Netwo	orks	Update	s					
Storage		~	Sto	rage Ac	lapters												
Storage Ac	lapters		AD	D SOFTWA	RE ADAP	TER 🗸	REFRES	ян і	RESCAN S	TORAGE	RESC	AN A	DAPTER	RE	MOVE		
Storage De	vices																
Host Cache	Configuration			Adapter	TIUaz	Mode	NI SDULY SAT		creontro	ller	T	Туре	ห อบอเ	T	Status	T	Identifier
Protocol En	dpoints		\cap		bba65	VM		Eovor		orago A	dant	PDN	4.0		Online		
I/O Filters				· 🤄 🗤	IDaos	VIVIV		E Over	RDMA SU	orage A	uapt	RDN			Online		
Notworking					hba66	VMv	vare NVM	E over	RDMA St	orage A	dapt	RDN	1A		Online		
Networking		~	0		hba67	VMv	vare NVM	e over	TCP Stor	age Ada	pter	NVN	IE over	т	Online		
Virtual swite	ches		\cap	A vm	bba68	VMu	varo NIV/M			ago Ada	ntor			т	Online		
VMkernel a	dapters				10400	V 141 V		e over	TCF Ston	age Aua	pter			1	Online		
Physical add	apters			EXPORT ~													9 ite
RDMA adap	ters																
TCP/IP conf	iguration		Prop	perties	Device	s P	aths	Name	spaces	Cont	rollers						
Virtual Machir	ies	~															
VM Startup,	/Shutdown		Nar	ne								T	Capacity	,			
Agent VM S	ettings			000000	0000152	467406		00640	<u> </u>				2 TD				
Default VM	Compatibility		eu	.0000000	0000152	467420	50100000	0060	5				216				
Swap File L	ocation																
System		~															

You can go into Storage Devices and you will see the NVMe-TCP disk and the details.

Summary	Monitor	Configure	Permissions	VMs	Datastores	Networks	Updates		
Storage		~ S	torage Devices						
Storage Ada	apters		REFRESH ATTACH	DETAG	CH RENAME			ERASE PARTITIONS	
Host Cache	Configuration		Name						T
Protocol En	dpoints			k (eui 000	000000001524	6742b0f0000	006d0)		
I/O Filters									
Networking		~		sk (naa.624	4893708007666	c13e4455b0001.	2107)		
Virtual swite	ches		🗹 1 💷 EXPORT 🗸						20 items
VMkernel ad	dapters								
Physical ada	apters	P	roperties Paths	s Parti	ition Details				
RDMA adap	ters								
T C D C C C									
TCP/IP cont	iguration		\checkmark General						
TCP/IP cont	iguration nes	~	∨ General Name		NVMe TCP Dis	k (eui.0000000	000015246742b0f0	000006d0)	
Virtual Machin VM Startup	iguration nes /Shutdown	~	 ✓ General Name Identifier 		NVMe TCP Dis eui.00000000	k (eui.0000000) 000015246742b0	000015246742b0f0 0f00000006d0	0000006d0)	
Virtual Machin Virtual Machin VM Startup/ Agent VM S	iguration nes /Shutdown iettings	~	∨ General Name Identifier Type		NVMe TCP Dis eui.00000000 disk	k (eui.0000000) 000015246742b(000015246742b0f0 0f00000006d0	0000006d0)	

Creating New Datastore

At this point, all configurations should be completed and you can now create a new VMFS Datastore. On one of the hosts, rightclick and select Storage, New Datastore.



vSphere Client	Actions - w1-pe-core-esx-075.vsanpe.vmware.com New Virtual Machine	
	& Deploy OVF Template	e.vmware.com :
<u>]</u> B; 🗐 Ø	⊘ New Resource Pool Et New vApp	rmissions VMs Datast
 ✓ jm-vcsa7.satm.eng. ✓ <u>□</u> DC1 	ត្រូវ Import VMs	
> (∰ C1 ∽ (ဤ C3	Maintenance Mode >	ldapter ▼ Model
w1-pe-core-w1-pe-core-	Power >	 vmhba65 vmhba65 vmhba66 vmhba66
🚦 w1-pe-core- > 🚼 vcsa2	Certificates	
♂ Infinidat-Hst ♂ JM-infinimet	Storage >	♀ vmhba68 VMware NVM ≧ New Datastore
儲 JM-NMBL-V 裔 im-pe-vh1	🚭 Add Networking	🗟 Rescan Storage

Then you will select the Namespace volume you created in the previous steps.

New Datastore	Name and	Name and device selection										
1 Туре	Name	Infinibox-NVM	e-TCP									
2 Name and device selection												
3 VMFS version	Name	Ŧ	LUN	▼ Capacity	Hardware Acceleration	τ _{Drive} τ ⊺ype	Sector Format	Clustere VMDK Support				
	O Local ATA	Disk (naa.55cd	0	111.79 GB	Not supp	Flash	512e	No				
		SI Disk (naa.624	249	100.00 GB	Supported	Flash	512n	No				
5 Ready to complete		SI Disk (naa.624	252	5.00 GB	Supported	Flash	512n	No				
	NVMe TC	P Disk (eui.000	10	2.00 TB	Supported	Flash	512e	No				
	O NVMe RD	MA Disk (eui.00	98984	200.00 GB	Supported	Flash	512e	No				
		iSCSI Disk (naa	12	953.67 MB	Supported	HDD	512n	No				
		SI Disk (naa.624	254	50.00 GB	Supported	Flash	512n	No				
		SI Disk (naa.624	250	8.00 GB	Supported	Flash	512n	No				
	EXPORT ~							8 items				
						CANCEL	ВАСК	NEXT				

Select VMFS6.



New Datastore	VMFS version	>
	Specify the VMFS version for the datastore.	
1 Туре	• VMFS 6	
2 Name and device selection	VMFS 6 enables advanced format (512e) and automatic space reclamation support.	
3 VMFS version	VMFS 5 enables 2+TB LUN support.	
4 Partition configuration		
5 Ready to complete		
	CANCEL	BACK

In the next screen, you can Use all available partitions or a subset of the space. Typically you would use all available partitions/space.

New Datastore	Partition configuration			×
	Review the disk layout and specify par	tition configuration details.		
1 Туре	Partition Configuration	l lse all available partitions 🗸		
2 Name and device selection				
2 VMES version	Datastore Size	•	2048 GB	
	Block size	<u>1 MB ~</u>		
4 Partition configuration	Space Reclamation Granularity	1 MB V		
5 Ready to complete				
1	Space Reclamation Priority	Low Y		
		Empty: 2.0 TB		
			CANCEL	ВАСК

Review the details for your new Datastore and click Finish.



New Datastore	Ready to comple	te	×
1 Type	Review your selections before volume and device selections before and device selections before selections and device selections and device selections before selections and device selections are selections and device selections are	pre finishing the wizard	
2 Name and device selection	Datastore name Disk/LUN	Infinibox-NVMe-TCP NVMe TCP Disk (eui.0000000000015246742b0f00000006d0)	
3 VMFS version	VMFS version		
4 Partition configuration	Version Partition configuration 	VMES 6	
5 Ready to complete	Datastore size Partition format	2.00 TB GPT	
	Block size Space reclamation	1 MB 1 MB	
	Space reclamation priority	Low: Deleted or unmapped blocks are reclaimed on the LUN at low priority	
		CANCEL BACK FINI	зн

Your new Datastore will be created and should be attached to all hosts configured with access. Notice the Drive type is Flash.

E Infinibox-NVMe-TCP : ACTIONS							
Summary Monitor	Configure Permissions Files Hosts VMs						
Alarm Definitions Scheduled Tasks General Device Backing Connectivity and Multipathing Hardware Acceleration Capability sets	Properties						
	Name	Infinibox-NVMe-TCP					
	> File system	VMFS 6.82					
	Drive type	Flash					
	Capacity	REFRESH	INCREASE				
	Total Capacity	2 ТВ					
	Provisioned Space	1.44 GB					
	Free Space	2 ТВ					
	Datastore Capabilities						
	Thin Provisioning	Supported					
	> Storage I/O Control	Disabled					
	Space Reclamation		EDIT				
	Space reclamation	Enabled at Low priority: Deleted or unmapped blocks are reclaimed on the LUN at low priority					

Summary

- Ensure you have adequate network bandwidth when converging NVMe-TCP with other vSphere traffic. If possible, dedicate NICs for NVMe-TCP to attain best possible performance.
- Make sure to complete the required host steps on **all** vSphere hosts connecting to the NVMeoF target volume (Namespace).
- Make sure you **DO NOT add any of the host's NQN to an existing iSCSI volume**! Create new NVMe specific host profiles for the NVMe target volume(s).
- You can connect to the same array via SCSI and NVMe at the same time. You just cannot connect to the same targets. For





example, you could have an iSCSI LUN Datastore and an NVMe-TCP Namespace Datastore from the same array connecting to the same set of hosts.

NVMeoF Resources

I've created and NVMeoF Resource page to help with many of the NVMeoF docs, KB articles and other resources.

NVMeoF Resources | VMware

@jbmassae



