

Configuring NVMeoF with RoCEv2 in ESXi

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Guidelines for using NVMe over Fabrics (NVMeoF) with RoCE v2 on ESXi

General Guidelines and Limitations:

- Cisco recommends you to check the UCS Hardware and Software Compatibility to determine support for NVMeoF. NVMeoF is supported on Cisco UCS B-Series, C-Series, and X-Series servers.
- Nonvolatile Memory Express (NVMe) over RDMA with RoCE v2 is currently supported only with Cisco VIC 15000 Series adapters.
- When creating RoCE v2 interfaces, use Cisco recommended Queue Pairs, Memory Regions, Resource Groups, and Class of Service settings. NVMeoF functionality may not be guaranteed with different settings for Queue Pairs, Memory Regions, Resource Groups, and Class of Service.
- RoCE v2 supports maximum two RoCE v2 enabled interfaces per adapter.
- Booting from an NVMeoF namespace is not supported.
- Layer 3 routing is not supported.
- Saving a crashdump to an NVMeoF namespace during a system crash is not supported.
- NVMeoF cannot be used with usNIC, VxLAN, VMQ, VMMQ, NVGRE, GENEVE Offload, ENS, and DPDK features.
- Cisco Intersight does not support fabric failover for vNICs with RoCE v2 enabled.
- The Quality of Service (QoS) no drop class configuration must be properly configured on upstream switches such as Cisco Nexus 9000 series switches. QoS configurations will vary between different upstream switches.

 During the failover or failback event, the Spanning Tree Protocol (STP) can result temporary loss of network connectivity. To prevent this connectivity issue, disable STP on uplink switches.

Downgrade Guidelines: Remove the RoCEv2 configuration first and then downgrade to the release version lower than Cisco UCS Manager release 4.2(3b) version.

ESXi Requirements

Configuration and use of RoCE v2 in ESXi requires the following:

- VMWare ESXi version 7.0 Update 3.
- Cisco UCS Manager Release 4.2(3b) or later versions.
- VIC firmware 5.2(3x) or later versions.
- The driver version, *nenic-2.0.4.0-10EM.700.1.0.15843807.x86_64.vib* that provides both standard eNIC and RDMA support with the Cisco UCS Manager 4.2(3b) release package.
- A storage array that supports NVMeoF connection.

Configuring RoCE v2 for NVMeoF on Cisco Intersight

Use these steps to configure the RoCE v2 interface on Cisco Intersight.

To avoid possible RDMA packet drops, ensure same no-drop COS is configured across the network. The following steps allows you to configure a no-drop class in System QoS policies and use it for RDMA supported interfaces.

Procedure

- Step 1 Navigate to CONFIGURE > Policies. Click Create Policy, select UCS Domain platform type, search or choose System QoS, and click Start.
- **Step 2** In the **General** page, enter the policy name and click **Next**, and then in the **Policy Details** page, configure the property setting for System QoS policy as follows:
 - For Priority, choose Platinum
 - · For Allow Packet Drops, uncheck the check box.
 - For MTU, set the value as 9216.

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0	Operate Servers Chassis	^	Policies > System QoS Create									
	Fabric Interconnects HyperFlex Clusters		General	Add policy details This policy is applicable only for U	JCS Doma	ains						ĺ
.0	Configure	^	2 Policy Details	Configure Priorities								
	Profiles Templates			Platinum 5	0 - 6	Weight 10	0 - 10	ow Packet ps	0	MTU 9216 ©	© 9216	
	Policies			Gold								
	POUIS			Silver								
N	ew Command Palette	×		Bronze								
to P	rigate Intersight with Ctrl+K or Help > Command Palette	go		Best Effort CoS Any	O	Weight 5		ow Packet ps	o	MTU 1500 ©	0	
				Fibre CoS Channel 3	© 0 - 6	Weight 5	0 - 10 0 - 10 Allo 0 - 10	ow Packet ps	0	1500 - MTU 2240 1500 -	© 9216	
			<	Cancel						Back	Creat	te

Step 3 Click Create.

Step 4 Associate the System QoS policy to the Domain Profile.

	UCS Domain C	onfiguration	
General	Select the compute	and management policies to be associated with the fabric interconnect.	
UCS Domain Assignment		Show Attached Policies (1)	
VLAN & VSAN Configuration	~ N	Management 0 of 4 Policies Configured	
Ports Configuration			
5 UCS Domain Configuration		NTP	Select Policy 🗐
6 Summary		Syslog	Select Policy 🗐
U Summary		Network Connectivity	Select Policy 🗐
		SNMP	Select Policy 🗐
	^ N	letwork 1 of 2 Policies Configured	
		System QoS *	× © 🖉 Domain-QoS-5GFI 🗐
		Switch Control	Select Policy

Note For more information, see *Creating System QoS Policy* in Configuring Domain Policies and Configuring Domain Profiles.

The System QoS Policy is successfully created and deployed to the Domain Profile.

What to do next

Configure the server profile with RoCE v2 vNIC settings in LAN Connectivity policy.

Enabling RoCE Settings in LAN Connectivity Policy

Use the following steps to configure the RoCE v2 vNIC. In Cisco Intersight LAN Connectivity policy, you can enable the RoCE settings on **Ethernet Adapter policy** for Linux configuration as follows:

Procedure

Step 1	Navigate to CONFIGURE > Policies . Click Create Policy , select UCS Server platform type, search or choose LAN Connectivity policy , and click Start .
Step 2	In the policy General page, enter the policy name, select the Target Platform as UCS Server (Standalone) or UCS Server (FI-Attached) , and click Next .
Step 3	In the Policy Details page, click Add vNIC to create a new vNIC.
Step 4	In the Add vNIC page, follow the configuration parameters to enable the RoCE v2 vNIC:
	a) In the General section, provide a name for virtual ethernet interface.
	b) Incase of a Standalone server, click the Consistent Device Naming (CDN) or click the Failover of a FI-attached server , and do the following:
	Click Select Policy under Ethernet Adapter.
	• In the Select Policy window, click Create New to create an Ethernet Adapter policy.
	• In the General page of the Ethernet Adapter Policy, enter the policy name and click Next.
	• In the Policy Details page of the Ethernet Adapter Policy, modify the following property setting:
	RoCE Settings
	• For Enable RDMA over Converged Ethernet , slide to enable and set the RoCE on this virtual interface.
	• For Queue Pairs, select or enter 1024
	• For Memory Regions, select or enter 131072
	• For Resource Groups , select or enter 8
	• For Version, select Version 2
	• For Class of Service, select 5
	Interrupt Settings
	• For Interrupts , select or enter 256 .
	• For Interrupt mode, select MSIx.
	• For Interrupt Timer, us, select 125.

- For Interrupt Coalescing Type, select Min.
- Receive Settings
 - For Receive Queue Count, select or enter 1.
 - For Receiving Ring Size, select or enter 512.

- Transmit Settings
 - For Transmit Queue Count, select or enter 1.
 - For Transmit Ring Size, select or enter 256.
- Completion Settings
 - For Completion Queue Count, select or enter 2.
 - For Completion Ring Size, select or enter 1.
 - For Uplink Failback Timeout(seconds), select or enter 5
- Click Create to create an Ethernet Adapter Policy with the above defined settings.

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 Øvervlew Øvervlet Øvervlet<	^	Dark theme is now available in Intersight. Policies > LAN Connectivity > Create Create Ethernet Adap.	To switch the theme go to the User Setti	ngs						
Fabric Interconnects HyperFlex Clusters Configure Profiles Templates Policies Pools	^	Original 2 Policy Details	Enable Virtual Externible LI Enable Network Virtualizati Enable Accelerated Receive Enable Accelerated Receive Enable Accelerated Receive Enable Advanced Filter Enable Interrupt Scaling Enable Interrupt Scaling Enable Interrupt Scaling	AN ⊙ m using Gen Flow Steerin col ⊙	rric Routing Encapsulation g ♥	All Platforms UC	CS Server	(Standalone)	UCS Server (FI-	-Attached)
Nor Command Palette Norgani Intergeti ulin Qetek or Helip > Command Palette	x po to	ć	RoCE Settings Exable RDMA over Conver Queue Pars 1024 Version 2 Cancel	ged Ethernet	© Memory Regions * 131072 Class Of Service 5	₿ 1 - 524288 ¥ Ø	Resou 8	rce Groups	Back	© ● 1 - 128 Create

- Click Add to save the setting and add the new vNIC.
- **Note** All the fields with * are mandatory and ensure it is filled out or selected with appropriate policies.
- **Step 5** Click **Create** to complete the LAN Connectivity policy with RoCE v2 settings.
- **Step 6** Associate the LAN Connectivity policy to the Server Profile.
 - **Note** For more information, see *Creating a LAN Connectivity Policy* and *Creating an Ethernet Adapter Policy* in Configuring UCS Server Policies and Configuring UCS Server Profiles.

The LAN Connectivity Policy with the Ethernet Adapter policy vNIC setting is successfully created and deployed to enable RoCE v2 configuration.

What to do next

Once the policy configuration for RoCE v2 is complete, configure RoCE v2 for NVMeoF on the Host System.

NENIC Driver Installation

Before you begin

The Ethernet Network Interface Card (eNIC) Remote Direct Memory Access (RDMA) driver requires nenic driver.

Procedure

Step 1 Copy the eNIC vSphere Installation Bundle (VIB) or offline bundle to the ESXi server.

Step 2 Use the command to install nenic driver:

esxcli software vib install -v {VIBFILE} or

esxcli software vib install -d {OFFLINE BUNDLE}

Example:

esxcli software vib install -v /tmp/nenic-2.0.4.0-10EM.700.1.0.15843807.x86 64.vib

Note Depending on the certificate used to sign the VIB, you may need to change the host acceptance level. To do this, use the command:

esxcli software acceptance set --level=<level>

Depending on the type of VIB installed, you may need to put ESX into maintenance mode. This can be done through the client, or by adding the *--maintenance-mode* option to the above *esxcli*.

What to do next

Configure the Host side for ESXi NVMe RDMA.

ESXi NVMe RDMA Host Side Configuration

NENIC RDMA Functionality

One of the major difference between RDMA on Linux and ESXi is listed below:

• In ESXi, the physical interface (vmnic) MAC is not used for RoCEv2 traffic. Instead, the VMkernel port (vmk) MAC is used.

Outgoing RoCE packets use the vmk MAC in the Ethernet source MAC field, and incoming RoCE packets use the vmk MAC in the Ethernet destination mac field. The vmk MAC address is a VMware MAC address assigned to the vmk interface when it is created.

• In Linux, the physical interface MAC is used in source MAC address field in the ROCE packets. This Linux MAC is usually a Cisco MAC address configured to the VNIC using UCS Manager.

If you ssh into the host and use the esxcli network ip interface list command, you can see the MAC address.



You must create a vSphere Standard Switch to provide network connectivity for hosts, virtual machines, and to handle VMkernel traffic. Depending on the connection type that you want to create, you can create a new vSphere Standard Switch with a VMkernel adapter, only connect physical network adapters to the new switch, or create the switch with a virtual machine port group.

Create Network Connectivity Switches

Use these steps to create a vSphere Standard Switch to provide network connectivity for hosts, virtual machines, and to handle VMkernel traffic.

Before you begin

Ensure you have nenic drivers. Download and install nenic drivers before proceeding with below steps:

Procedure

- **Step 1** In the vSphere Client, navigate to the host.
- Step 2 On the Configure tab, expand Networking and select Virtual Switches.
- Step 3 Click on Add Networking.

The available network adapter connection types are:

Vmkernel Network Adapter

Creates a new VMkernel adapter to handle host management traffic

Physical Network Adapter

Adds physical network adapters to a new or existing standard switch.

Virtual Machine Port Group for a Standard Switch

Creates a new port group for virtual machine networking.

Step 4 Select connection type **Vmkernel Network Adapter**.

Step 5 Select New Standard Switch and click Next.

- **Step 6** Add physical adapters to the new standard switch.
 - a) Under Assigned Adapters, select New Adapters.
 - b) Select one or more adapters from the list and click **OK**. To promote higher throughput and create redundancy, add two or more physical network adapters to the Active list.
 - c) (Optional) Use the up and down arrow keys to change the position of the adapter in the Assigned Adapters list.
 - d) Click Next.
- **Step 7** For the new standard switch you just created for the VMadapter or a port group, enter the connection settings for the adapter or port group.
 - a) Enter a label that represents the traffic type for the VMkernel adapter.
 - b) Set a VLAN ID to identify the VLAN the VMkernel uses for routing network traffic.
 - c) Select IPV4 or IPV6 or both.
 - d) Select an MTU size from the drop-down menu. Select Custom if you wish to enter a specific MTU size. The maximum MTU size is 9000 bytes.
 - **Note** You can enable Jumbo Frames by setting an MTU greater than 1500.
 - e) After setting the TCP/IP stack for the VMkernel adapter, select a TCP/IP stack.

To use the default TCP/IP stack, select it from the available services.

Note Be aware that the TCP/IP stack for the VMkernel adapter cannot be changed later.

- f) Configure IPV4 and/or IPV6 settings.
- **Step 8** On the **Ready to Complete** page, click **Finish**.
- **Step 9** Check the VMkernel ports for the VM Adapters or port groups with NVMe RDMA in the vSphere client, as shown in the Results below.

The VMkernel ports for the VM Adapters or port groups with NVMe RDMA are shown below.

Summary	Monitor	Configur	e Pe	rmissions	VMs	Resour	ce Pools	Datastores	Net	works	Update	s					
Storage		~ 1	VMk	ernel a	dapte	rs											
Storage Storage	Adapters Devices	- 1	ADD	NETWORKI	NG	REFRESH											
Host Cad	che Configuratio	on		Device		т	Network La	bel	т	Switch	т	IP Ad	dress	т	TCP/IP Stack	т	Enabled Services
Protocol	I Endpoints		:	>> vmk0			Managem	ent Network		vSwitch	0	10.19	3.176.52		Default		Management
I/O Filter	rs	_	:	>> vmk1			vmk284			vSwitch	1	50:2	84::210		Default		
Networkin	ng	~	:	>> vmk2			vmk283			vSwitch:	2	50.2	83.210		Default		
Virtual s	witches		<u> </u>														
VMkerne	el adapters																
Physical	adapters																
RDMA ad	dapters																
TCP/IP c	configuration	- 1															
Virtual Ma	chines	~															

The VRDMA Port groups created with NVMeRDMA supported vmnic appear as below.

Summary Monitor	Configur	e Permissions	VMs	Resource	Pools (Datastores	Net	works	Updates						
Storage	×	RDMA adap	ters												
Storage Adapters Storage Devices	- 1	Name	т	Driver	٠	State	٣	Paired Uplin	nk T	RoCE v1	۲	RoCE v2	۲	IWARP	۲
Host Cache Configuration	n	vmrdma0		nenic		Active		vmnic2		Disabled		Enabled		Disabled	
Protocol Endpoints	- 1	vmrdma1		nenic		Active		vmnic3		Disabled		Enabled		Disabled	
VO Filters	- 1														
Networking	~														
Virtual switches	- 1														
VMkernel adapters	- 1														
Physical adapters															
RDMA adapters															
TCP/IP configuration	- 1	RDMA Device: vmr	fma1												
Virtual Machines	~														
VM Startup/Shutdown		Properties Bo	und VM	ikernel Adapte	ers										
Agent VM Settings	- 1														
Default VM Compatibility		VMkernel Adapter	TC	VIP Stack	IP Address										
Swap File Location		vmk2	De	ault	50 2 83 210										
System	~														
Licensing															

What to do next

Create vmhba ports on top of vmrdma ports.

Create VMVHBA Ports in ESXi

Use the following steps for creating vmhba ports on top of the vmrdma adapter ports.

Before you begin

Create the adapter ports for storage connectivity.

Procedure

Step 1 Go to vCenter where your ESXi host is connected.

Step 2 Click on Host>Configure>Storage adapters.

Summary Monitor	Configu	re Permissions VMs Re	source Pools Data	stores	Networks U	Jpdates					
Storage	~ 1	Storage Adapters									
Storage Adapters	- 1	+ Add Software Adapter 😸 Refre	sh 🖾 Rescan Storage	6	Rescan Adapter X R	lemove					
Storage Devices		Adepter	v Type	٣	Stotus Y	Identifier	Y	Targets	Y Devices	Y Paths	¥
Host Cache Configuration		 Model: Ctsco 12G Modular Raid (controller with 2GB coche								
Protocol Endpoints	- 1	♦ vmhba5	SAS		Unknown			2	2	2	
VO Filters	- 1	 Model: Cisco UCS VIC Fnic Cont 	oller								
Networking	~	G vmhba0	Fibre Char	nel	Offine	10.00.2c#8.9b?9.8d.be 20.00.2c#8	90.79.8d.be	0	0	0	
Virtual switches	- 1		Rbre Char	nel	Offline	10:00:2c#8:9b:79:8d bf 20:00:2c#8	9b:79:8d.bf	0	0	0	
VMkernel adapters	- 1	♦ vmhba3	Fibre Char	nel	Offine	10.00.2c#8.9b/51.b3.3c 20.00.2c#8	9b:51:b3:3c	0	0	0	
Dhusical adapters	- 1	vmhba4	Rbre Char	nel	Offine	10.00.2c.f8.9b.51.b3.3d 20.00.2c.f8	9b.51.b3.3d	0	0	0	
DOMA adapters	- 1	 Model: Lewisburg SATA AHCI Co 	ntroller								
TCD/D configuration	- 1	vmhbat	Block SCS		Unknown	-		0	0	0	
Terrir comparation									00	opy All 8	3 items
Virtual Machines	×										
VM Startup/Shutdown	- 1										
Agent VM Settings	- 1										
Default VM Compatibility											
Swap File Location											

Step 3 Click +Add S	Software Adapter.	The following	dialog box	will appear
---------------------	-------------------	---------------	------------	-------------

Storage	Storage Adapt	ers						
Storage Adapters				_				
Storage Devices	Add Software Adapte	r 10.193.176.52		×		٣	Targets	
Protocol Endooin							2	
I/O Filters	A new software (CCC) etapler will	he added to the lat. After it has been	en added salect the adapter and use the Adapter				-	
Networking	Details section to complete the co	infiguration.	in added, select the adapter and use the Adapter		2c18.9b:79.8d.be		0	
Mintual caritebas					2c18:90:79:8d:bf		0	
VMkernel adapter	Add software NVMe over RDMA ad	lapter			2c:f8:96:51:b3:3c		0	
Physical adapters	Enable software NVMe adapter or	n the selected RDMA device.			2c:18:9b:51:b3:3d		0	
RDMA adapters								
TCP/IP configurat	RDMA device:	vmrdma0/	~				0	
Virtual Machines	O Add Software FCoE Adapter							
VM Startup/Shute	Discover software FCoE adapters	associated with the following physic	al network adapter.					
Agent VM Setting								
Default VM Comp	Physical Network Adapter:	vmnic0	~					
Swap File Locatio	VLAN ID:	0	Range: 0 - 4094					
System								
Licensing	Priority Class:	3	Range: 0 - 7					
Host Profile	Controller MAC Address:	2c;f8:9b:a1:4c:e6						
Time Configuratio								
Authentication Se				_				
Certificate			CANCEL OK					
Power Manageme								
Advanced System	Settings							

Step 4 Select Add software NVMe over RDMA adapter and the vmrdma port you want to use.

Step 5 Click OK

The vmhba ports for the VMware NVMe over RDMA storage adapter will be shown as in the example below

Summary Monitor	Configu	re Permissions VMs Resource	Pools Datastores	Networks U	ipdates			
Storage	~ [Storage Adapters						
Storage Adapters	- 1	+ Add Software Adapter 😨 Refresh 🔂	Rescen Storage G. R	lescan Adapter X R	emove			
Storage Devices	_	Adapter	v Type v	Status y	Identifier	v Targeta	Y Devices	γ Paths γ
Host Cache Configuration	·	 Model: Cisco 12G Moduler Reid Controlle 	r with 2GB ceche					
Protocol Endpoints		(+ vmhba5	SAS	Unknown	-	2	2	2
VO Filters		 Model: Cisco UCS VIC Fric Controller 						
Networking	~	@ vmPbi0	Fibre Channel	Offine	10 00 2c f8 9b 79 8d be 20 00 2c f8 9b 79 8d be	0	0	0
Virtual switches		G- vmPce2	Fibre Channel	Office	10:00 2c#8:95/79:8d:5f 20:00 2c#8:95/79:8d:5f	0	٥	0
Visional adapters		wrtoi3	Fibre Channel	Offine	10 00 2c f8 9b 51 b3 3c 20 00 2c f8 9b 51 b3 3c	0	0	0
Diverical adapters		G vmhos4	Fibre Channel	Offine	10:00:2cf8:9b;51:b3:3d 20:00:2cf8:9b;51:b3:3d	0	0	0
Physical adapters		 Model: Lewisburg SATA AHCI Controller 						
TOTA everyors		@ vminbat	Block SCSI	Unknown	-	0	0	0
CP/NP consiguration		 Model, VMware NVME over RDMA Store 	ge Adapter					
Virtual Machines	~	G vmbbo04	RDMA	Unknown	-	0	0	0
VM Startup/Shutdown	- 1	without 5	RDMA	Unknown	-	1	1	1
Agent VM Settings								
Default VM Compatibility								Constal Riterra
Swap File Location		Despecties Devices Daths Nam	eroscer Centroller					C copy and a series
System	~	Properces Devices Paths Nam	espaces controllers					
Licensing		ADD CONTROLLER REMOVE						
Host Profile		Name y Subsys	tem NON	Transport Type	FUSE Support	Model	Firmware Ver	sion

Displaying vmnic and vmrdma Interfaces

ESXi creates a vmnic interface for each nenic VNIC configured to the host.

L

Before you begin

Create Network Adapters and VHBA ports.

Procedure

Step 1 Use **ssh** to access the host system.

Step 2 Enter **esxcfg-nics -I** to list the vmnics on ESXi.

Name	PCI	Driver I	Link	Speed	Duplex	MAC Address	MTU	Description
vmnic0	0000:3b:00.0	ixgben (Down	OMbps	Half	2c:f8:9b:a1:4c:e6	1500	Intel(R) Ethernet Controller X550
vmnic1	0000:3b:00.1	ixgben (Up	1000Mbps	Full	2c:f8:9b:a1:4c:e7	1500	Intel(R) Ethernet Controller X550
vmnic2	0000:1d:00.0	nenic I	Up	50000Mbps	Full	2c:f8:9b:79:8d:bc	1500	Cisco Systems Inc Cisco VIC Ethernet NIC
vmnic3	0000:1d:00.1	nenic I	Up	50000Mbps	Full	2c:f8:9b:79:8d:bd	1500	Cisco Systems Inc Cisco VIC Ethernet NIC
vmnic4	0000:63:00.0	nenic I	Down	OMbps	Half	2c:f8:9b:51:b3:3a	1500	Cisco Systems Inc Cisco VIC Ethernet NIC
vmnic5	0000:63:00.1	nenic (Down	OMbps	Half	2c:f8:9b:51:b3:3b	1500	Cisco Systems Inc Cisco VIC Ethernet NIC

esxcli network nic list

Name	PCI Device	Driver	Admin Status	Link Status	Speed	Duplex	MAC Address	MTU	Description
vmnic0	0000:3b:00.0	ixgben				Half		1500	Intel(R) Ethernet Controller X550
vmnic1	0000:3b:00.1	ixgben	Up		1000	Full	2c:f8:9b:a1:4c:e7	1500	Intel(R) Ethernet Controller X550
vmnic2	0000:1d:00.0	nenic	Up		50000	Full	2c:f8:9b:79:8d:bc	1500	Cisco Systems Inc Cisco VIC Ethernet NIC
vmnic3	0000:1d:00.1	nenic			50000	Full	2c:f8:9b:79:8d:bd	1500	Cisco Systems Inc Cisco VIC Ethernet NIC
vmnic4	0000:63:00.0	nenic	Up			Half	2c:f8:9b:51:b3:3a	1500	Cisco Systems Inc Cisco VIC Ethernet NIC
vmnic5	0000:63:00.1	nenic	Up			Half	2c:f8:9b:51:b3:3b	1500	Cisco Systems Inc Cisco VIC Ethernet NIC

Step 3 Use **esxcli rdma device list** to list the vmrdma devices. When the enic driver registers with ESXi the RDMA device for a RDMA capable VNIC, ESXi creates a vmrdma device and links it to the corresponding vmnic.

root@S	R	ackServe	r:~] e	sxcli rdm	a device list	
lame	Driver	State	MTU	Speed	Paired Uplink	Description
/mrdma0	nenic	Active	4096	50 Gbps	vmnic1	Cisco UCS VIC 15XXX (A0)
/mrdma1	nenic	Active	4096	50 Gbps	vmnic2	Cisco UCS VIC 15XXX (A0)
root@S	R	ackServe	r:~] e	sxcli rdm	a device vmknic	list
)evice	Vmknic	NetStac	k			
/mrdma0	vmk1	default	TcpipS	tack		
/mrdma1	vmk2	default	TcpipS	tack		

Step 4 Use **esxcli rdma device protocol list** to check the protocols supported by the vmrdma interface.

For enic, RoCE v2 is the only protocol supported from this list. The output of this command should match the RoCEv2 configuration on the VNIC.



Step 5 Use **esxcli nvme adapter list** to list the NVMe adapters and the vmrdma and vmnic interfaces it is configured on.

[root@ESXi7U3esxcli nvme ada	pter list			
Adapter Adapter Qualified Name	Transport Type	Driver	Associated Devices	
vmhba64 aqn:nvmerdma:2c-f8-9b-79-8d-b vmhba65 aqn:nvmerdma:2c-f8-9b-79-8d-b [root@ESXi7U3	c RDMA d RDMA	nvmerdma nvmerdma	vmrdma0, vmnic2 vmrdma1, vmnic3	

Step 6 All vmhbas in the system can be listed using **esxcli storage core adapter list**. The vmhba configured over RDMA.

[root@ESX HBA Name	17U3 Driver	:~] esxcli s Link State	torage core adapter list UID	Capabilities	Description
vmhba0 vmhba1 vmhba2 vmhba3 vmhba4 vmhba5 vmhba64 vmhba65	nfnic vmw_ahci nfnic nfnic lsi_mr3 nvmerdma nvmerdma	link-down link-down link-down link-down link-n/a link-n/a link-n/a	fc. 10002cf89b798dbe:20002cf89b798dbe sata.wwhba1 fc. 10002cf89b798dbf:20002cf89b798dbf fc. 10002cf89b51b33c:20002cf89b51b33c fc. 10002cf89b51b33d:20002cf89b51b33d sas.5cc167e9732f9b00 rdma.wmic2:2ccf8:8b79:8dbbd rdma.wmic2:2ccf8:8b79:8dbbd	Second Level Lun ID Second Level Lun ID Second Level Lun ID Second Level Lun ID	(0000:1d:00.2) Cisco Corporation Cisco UCS VIC Fnic Controller (0000:00:11.5) Intel Corporation Lewisburg SATA ARCI Controller (0000:16:00:15) Cisco Corporation Cisco UCV CF Fnic Controller (0000:16:00:3) Cisco Corporation Cisco UCS VIC Fnic Controller (0000:16:00:0) Oradoco Cisco ICS VIC Fnic Controller (0000:13:00:3) Cisco Corporation Cisco UCS VIC Fnic Controller (0000:13:00:0) Frandoco Cisco ICS Modian Raid Controller with 2GB cache Whara NMb over RDMA Storage Adapter on wardmal

Note For vmhba64 and vmhba65, you may observe that the driver's Link State displays *link-n/a* instead of *Online*. This is a known issue in ESXi 7.0 Update 3. For more information, see Known Issues - ESXi.

NVMe Fabrics and Namespace Discovery

This procedure is performed through the ESXi command line interface.

Before you begin

Create and configure NVMe on the adapter's VMHBAs. The maximum number of adapters is two, and it is a best practice to configure both for fault tolerance.

Procedure

Step 1 Check and enable NVMe on the vmrdma device.

esxcli nvme fabrics enable -p RDMA -d vmrdma0

The system should return a message showing if NVMe is enabled.

Step 2 Discover the NVMe fabric on the array by entering the following command:

esxcli nvme fabrics discover -a vmhba64 -1 transport address

figure with esxcli nvme fabrics discover -a vmhba64 -1 50.2.84.100

The output will list the following information: Transport Type, Address Family, Subsystem Type, Controller ID, Admin Queue, Max Size, Transport Address, Transport Service ID, and Subsystem NQN

You will see output on the NVMe controller.

Step 3 Perform NVMe fabric interconnect.

esxcli nvme fabrics discover -a vmhba64 -l transport_address p Transport Service ID -s Subsystem NQN

- **Step 4** Repeat steps 1 through 4 to configure the second adapter.
- **Step 5** Verify the configuration.
 - a) Display the controller list to verify the NVMe controller is present and operating.

esxcli nvme controller list RDMA -d vmrdma0

[root@ESXi7U3]	ntroller list			Controller Number	Adapter	Transport Type	Is Online
ngn.2010-06.com.purestorage:flasharra	y.5ab274df5b161455#	258	vmhba64	RDMA	true		
ngn.2010-06.com.purestorage:flasharra	y.Sab274df5b161455#	259	vmhba65	RDMA			
Name	Controller Number	Namespace ID	Block Size	Capacity in MB			
eui.00e6d65b65a8f34024a9374e00011745	258	71493	512	102400			
eui.00e6d65b65a8f34024a9374e00011745	259	71493	512	102400			

b) Verify that the fabric is enabled on the controller through the adapter, and verify the controller is accessible through the port on the adapter.

```
[root@ESXiUCSA:~] esxcli nvme fabrics enable -p RDMA -d vmrdma0
NVMe already enabled on vmrdma0
[root@ESXiUCSA:~] esxcli nvme fabrics discover -a vmhba64 -1 50.2.84.100
Transport Type Address Family Subsystem Type Controller ID Admin Queue Max Size Transport
Address Transport Service ID Subsystem NQN
IPV4
                            NVM
RDMA
                                          65535
                                                        31
50.2.84.100
             4420
nq.210-06.com.purestorage:flasharray:2dp1239anjk1484
[root@ESXiUCSA:~] esxcli nvme fabrics discover -a vmhba64 -1 50.2.84.100 p 4420 -s
nq.210-06.com.purestorage:flasharray:2dp1239anjk1484
Controller already connected
```

Deleting the RoCE v2 Interface Using Cisco Intersight

Use these steps to remove the RoCE v2 interface.

Procedure

- **Step 1** Navigate to **CONFIGURE > Policies**. In the **Add Filter** field, select **Type: LAN Connectivity**.
- **Step 2** Select the appropriate LAN Connectivity policy created for RoCE V2 configuration and use the delete icon on the top or bottom of the policy list.
- **Step 3** Click **Delete** to delete the policy.

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Policies										
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	Pools	_lcp_policy1_20	021 UCS Server	LAN Connectivity	1 🔂	May 13, 2021 4:15 AM				
		C Internet	UCS Server	LAN Connectivity	1 🐻	May 12, 2021 5:31 AM				
Nev	W Command Palette ×		1 UCS Server	LAN Connectivity	1 🐻	Feb 12, 2021 12:12 PM				
Navi to He	gate Intersight with Ctrl+K or go elp > Command Palette		ra UCS Server	LAN Connectivity	0 📑	Feb 12, 2021 12:12 PM				
		Constant and	Show Selected Unselect All	LAN CONNECTIVITY	1 L0	R C 1	of 4 > >			

Step 4 Upon deleting the RoCE v2 configuration, re-deploy the server profile and reboot the server.