# **Configure VMQ on Windows Server 2019 on UCSC Server with VIC1400**

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## Introduction

This document describes how to configure and troubleshoot VMQ for Windows Server 2019 on C Series Servers with VIC 1400.

## Prerequisites

#### Requirements

There are no specific requirements for this document.

#### **Components Used**

The information in this document is based on these software and hardware versions:

- UCS C220M6
- VIC 1467
- CIMC 4.2(2a)
- Windows Server 2019
- 5.11.14.1 NENIC Driver

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, ensure that you understand the potential impact of any command.

## Configure

#### CIMC

From Cicso Integrated Management Controller (CIMC), start by navigating to **Networking > Adapter Card MLOM (1) > vNICs (2)** then select the virtual network interface card (vNIC) you would like to configure (3).

	<b>=</b>	Et cisc	🖫 Cisco Integrated Manager	ment Controller					
		♠ / / Ad	apter Card MLOM / vNICs 🕯	r					
Chassis	S	General	External Ethernet Interfaces 2vN	ICs vHBAs					
Compu	ite	* vNICs		<ul> <li>vNIC Properties</li> </ul>					
Networ	rking	- 3 eth0 eth1		▼ General					
Adapter	Card MLOM	eth2		Name:			Rate Limit:	OFF	
		eth3		CDN:	VIC-MLOM-eth0			0	0
Storage	e	•		MTU:	1500	(1500 - 9000)	Channel Number:		(1 - 1000)
Admin				Uplink Port:	0 *		PCI Link:	0	(0 - 1)
AGITIT				MAC Address:	O Auto		Enable NVGRE:		
					•		Enable VXLAN:		
				Class of Service:	0	(0-6)	Advanced Filter:		
				Trust Host CoS:			Port Profile	N/A	e l
				PCI Order:	0	(0 - 5)	Enable PXE Boot:		
				Default VLAN:	None		Enable VMQ:	¥	
					0	0	Enable Multi Queue:		
				VLAN Mode:	Truck	1	No. of Sub vNICs:	64	(1 - 64)
			Ú.				Enable aRFS:		
							Enable Uplink Failover:		
			U I				Failback Timeout:		(0 - 600)
				<ul> <li>Ethernet Interrupt</li> </ul>					

Use CIMC to Locate vNICS

Once here, ensure the **Enable VMQ** box is checked (4).

÷ dual	Cisco Integrated Manage							
<b>n</b> / / Ad	apter Card MLOM / vNICs	*						
General	External Ethernet Interfaces	vHBAs						
▼ vNICs		<ul> <li>vNIC Properties</li> </ul>						
eth0								
eth1		▼ General						
eth2			Name:			Rate Limit:	OFF	
eth3			CDN:	VIC-MLOM-eth0			0	0
			MTU:	1500	(1500 - 9000)	Channel Number:		(1 - 1000)
			Uplink Port:	0 🔻		PCI Link:	0	(0 - 1)
			MAC Address:	O Auto		Enable NVGRE:		
				•		Enable VXLAN:		
		c	lass of Service:	0	(0-6)	Geneve Offload: Advanced Filter:		
			Trust Host CoS:			Port Profile:	N/A 🐨	
			PCI Order:	0	(0 - 5)	Enable PXE Boot:		
			Default VLAN:	None		4 Enable VMQ:		-
				0	0	Enable Multi Queue:	2	
			VLAN Mode:	Trunk		No. of Sub vNICs:	64 (1	(-64)
						Enable aRFS: Enable Unlink Failover:		
		].				Failback Timeout:		(0 - 600)
						Tunbuk Intern		
		<ul> <li>Ethernet Interrup</li> </ul>	t					

Enable VMQ from the vNIC

Next is the queue structure definition. The queue structure is comprised of 4 main components from the CIMC perspective: Ethernet Interrupt, Ethernet Receive Queue (Rx Queue), Ethernet Transmit Queue (Tx Queue), and Completion Queue (CQ).

This is the white paper for the VIC 1400 series which outlines the calculation of the queue structures. It is recommended to read through this to get a better understanding of how these calculations are made.

#### Cisco UCS VIC 1400 Series Best Practices in Ethernet Fabric White Paper

However, the parameters are the most important take away:

- TX queue = Sub vNIC or vPort
- RX queue = 8 \* (Tx Queue)
- CQ = TX + RX
- Interrupt = Max of (RX queue or at least 2xCPU+4)

There is one value which is not calculated and must be decided on before running through the calculations. That is the Sub vNIC or vPorts. For the sake of this lab, 4 Virtual Machines are used which corresponds to 4vPorts. Therefore:

- TX queue = 4
- RX queue = 8 \* (4) = 32
- CQ = 4 + 32 = 36
- Interrupt = Max of (32 or at least 2x2+4 = 8 (32 is used as it is greater than 8)

Once you have the queue parameters from the calculations, scroll down on the vNIC page and enter Interrupt value into the **Ethernet Interrupt** (1) filed, the RX Queue value into the **Ethernet Receive Queue** (2) field, **Ethernet Transmit Queue** (3), and **Completion Queue** (4).

ai External Ethemet interraces VNICs VHBAs							
ICs Default VLAN:	None			Enable VMQ:	2		
eth0	0	0	Enable	Multi Queue:			
eth1 VLAN Mode:	Trunk 🔻		No. o	f Sub vNICs:	64		(1-64)
eth2			E	nable aRFS:			
eth3			Enable Up	ick Timeout:			(0 - 600)
<ul> <li>Ethernet Interrupt</li> </ul>							
Interrupt Count:	32	(1 - 1024)	Coalescing Time:	125		(0-65535us)	
Interrupt Mode:	MStx 🔻		Coalescing Type:	MIN	•		
Ethernet Receive Queue							
2 Count:	32	(1 - 256)					
Ring Size:	512	(64 - 4096)					
<ul> <li>Ethernet Transmit Queue</li> </ul>							
3 Count:	4	(1 - 256)					
Ring Size:	256	(64 - 4096)					
<ul> <li>Completion Queue</li> </ul>							
4 Count:	36	(1 - 512)					
Ring Size:	1						
Multi Queue							
RoCE Properties							

This is the most important part of the virtual machine multi queue (VMQ) configuration as if the queue structure is incorrectly calculated, VMQ is not going to work in Windows.



**Note**: If you are using a vSwitch with teamed NICs in Windows, you MUST configure all vNICs identically in CIMC.

#### Windows

From WIndows Server, you need to verify VMQ is enabled on the desired virtual machines. VMQ is enabled by default in most cases, but you must verify.

To ensure VMQ is enabled, press the Windows Key and search for Hyper-V Manager.

Once you are in Hyper-V Manager, **click on your local host** on the left hand side (1), and then **right click on the virtual machine** (2) which you want to verify VMQ is enabled on and click **Settings** (3).

🕈 🔶 🙇 📷 🖬 📷									
Hyper-V Manager	Virtual Mach	vines.						Actions	
	Name oertos2 nex4 New Vitu end 2 dom	A Machine Connect	State Of Of Of Running connect		CPU Usage Assigned Memory 0%. 4006 MB 0%. 4006 MB		Status	WWN-49KS59FH03D New https://www.line.com/ Hyper-V Settings Virtual Switch Man Virtual SAN Manag Edit Disk	* ^
	Checkpc	Turn Off Shut Down Save Pause Reset Checkpoint Move Export Pause		3 vitual nachine	has no checkpoints.		•	Inspect Disk Stop Service Kernove Server Refresh View Help ubunut Connect Stetings	•
	abunut Adapt Network Ad	Enable Replic Help apter (Dynamic M	ation SETaw		IP Addresses	Status OK (VMQ a	sive) Activate V	Turn Off Shut Down Shut Down Save II Pause II Pause II Pause II Checkpoint Move Export Export	

Once in settings, navigate to and expand **Network Adapter** (1). After expanding, click **Hardware Acceleration** (2). Finally, verify the **Enable Virtual Machine Queue** box is checked (3).

While here, you also need to **verify Enable SR-IOV is NOT checked** (4).



Next, ensure Microsoft Windows Platform Filtering is disabled on the Virtual Switch in use. To do this, navigate to the **Hyper-V Manager**, and click **Virtual Switch Manager** (1).

Virtual Machines						Actions		
Name	() and a	CBUUKasa	Arringed Manager	Unting	Chattage	WIN-49KS59FHO3D		
name	State	CPU Usage	Assigned Memory	Optime	Status	New	•	
new4	Off					💁 Import Virtual Machin.		
New Virtual Machine	Off					Hyper-V Settings		
emol	Running	0%	4096 MB	1.16:11:59	- 1	Virtual Switch Manage		
ubunut	Of					Virtual SAN Manager	_	
						Leda Diek		
						E lesset Dick		
N I I I I I					-			
Checkpoints					۲	stop service		
	The select	ted virtual machine	has no checkpoints.			X Remove Server		
						Help		
						Settings		
ubunut						Start		
				1.00		S Checkpoint		
Adapter	Connection	•	IP Addresses	Status		Move		
Network Adapter (Dyn	amic M SETsw					D Export		
						T Rename		
						Delete		
						Cresese		
				4	ctivate	Enable Replication		

From there, expand the switch (1) you are using, and click **Extensions** (2). Then uncheck **Microsoft Windows Platform Filtering** (3).

Virtual Switch Manager for WIN-49KS59FHO3D X Xirtual Switches Wrtual Switch Extensions 📩 New virtual network switch Switch extensions: 🖻 🚜 SETsw Cisco VIC Ethernet Interface #5 Name Type 2.3. Extensions Microsoft Windows Filtering Platform Filter 3 🗄 👗 New Virtual Switch Microsoft NDIS Capture Monitoring Cisco VIC Ethernet Interface #7 🗄 🚣 SETswitch **Cisco VIC Ethernet Interface** Global Network Settings MAC Address Range 00-03-00-40-07-08-08-08-08-4... Details for selected extension: WFP vSwitch Extension LightWeight Filter for Hyper-V Virtual Switch Filtering in. Company: Microsoft R Version: 10.0.17763.1554 Activate Windows Cancel OK.

Disable Microsoft Windows Filtering Platform



**Note**: If you are using a vSwitch with teamed NICs in Windows, you MUST configure all vNICs identically in CIMC.

Also, ensure Receive Side Scaling (RSS) is enabled for each interface you want VMQ enabled on. To do this, press the **Windows Key** and search for **Device Manager**.

From device manager, locate **Network Adapters** (1), and select the **Properties** (2) for the Interfaces you want VMQ enabled on.

Hyper-V Ma	nager									-	0	×
File Action	View	Help	Hyper-V Set	ings for	WIN-49KS39FH03D			-		×		
**   2	A D	evice Manager					-		×			
🔛 Hyper-V M	File	Action View	Help							_		_
WIN-49	(a, a)		2 📼 💷 🖪	<b>X</b> (	0						0D	
	$\sim 3$	WIN-490339FH	010						A .			ъ
	>	💻 Computer								se	al Machine	
	>	<ul> <li>Disk drives</li> </ul>									tings_	
	2	Display adap	pters A f deixer								h Manana	_
	5	Human Inte	viace Devices								Manager	_
	>	📲 IDE ATA/AD	<b>VI controllers</b>									
		Keyboards										
		Monitors	ne period per	- CD							<b>_</b>	
	1	Phetwork ad	opters									
		Cisco Vi	C Ethernet Interfa	*B	Hardata deluza						S-EX	
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		Cisco Vi	C Ethernet Interfa		Helentell desire							•
		🖉 Hyper-V	Virtual Ethernet A	de								
		Hyper-V Montellini Hyper-V	Virtual Ethernet J Whenest Constantia	da 17. m	Scan for hardware changes							
		🖉 intel(R) i	Bhemet Controlle	2 2	Properties							
		🖉 WAN M	iniport (GRE)									
		🖉 WAN M	niport (IKEv2)									
		WAN M	niport (IP) iniport (IP-6)									
		🖉 WAN M	iniport (L2TP)									
		🖉 WAN M	iniport (Network I	lonitor)	)							
		MIN M	alaste (999(15)						-			
		11							_	l.		
						~	Acti	wate )	Wind	lows	Catholic	
						10	-60-10	Sattle	hered.	ACCOUNTS /	findows.	

Navigate to Advanced (1), then scroll down to locate Receive Side Scaling (2) and ensure it is Enabled (3).



## Verify

### CIMC

There is no verification that can be done from the CIMC perspective.

### Windows

The first place to check if VMQ is active is in Windows within Hyper-V manager.

Open **Hyper-V Manage** and click the virtual machine that you want to verify. Then click **Networking** (1) towards the bottom. Underneath Status (2), OK (VMQ Active) can be observed.

	Virtual Machines	Actions							
WIN-49KS59FHO3D	Name	State	CPU Usage	Assigned Memory	Uptime	Status	WIN-49KS59FHO3D	*	
	centos2	Off					New	,	
	New Vitual Machine	Off					Hyper-V Settings		
	emol 🗧	Bunning	0%	4096 MB	2.15:37:56		Virtual Switch Man		
	e ubunut	Off					Virtual SAN Manag		
							🥁 Edit Disk		
	<					>	Inspect Disk		
	Checkpoints					۲	Stop Service		
		The selected virtual machine has no checkpoints.							
		The selected virtual machine has no checkporits.							
							smol	4	
							- Connect	ī	
							Settings		
	smol				0		Turn Off		
					2		Shut Down		
	Adapter	Connection		IP Addresses	Status		Save		
	Network Adapter (Dynamic	M SETøw		10,1010.00.00.00	OK (VMQ as	tive)	II Pause		
							IÞ Reset		
							B Checkpoint		

Verify if VMQ is Active in Windows

If you only see OK under status and not OK (VMQ Active), then VMQ was not successfully configured and VMQ is not working.

The next place to verify if VMQ is active is in Powershell. Press the **Windows Key** and search for **Powershell**, then run these commands:

#### Get-NetAdapterVmqQueue

Get-vm | get-vmnetworkadapter | select vmname, vmqusage

× Administrator: Windows PowerShel Users\Administrator> Get ß VmqQueue QueueID MacAddress VlanID Processor VmFriendlyName lame 10 VIC-MLOM-eth0 2 1 0:14 2 /IC-MLOM-eth2 2 0:12 PS C:\Users\Administrator> get-vm | get-vmnetworkadapter |select vmname, vmqusage VNName VmqUsage centos2 0 New Virtual Machine 0 2 iew4 ø mol ubunut PS C:\Users\Administrator> \_

Verify VMQ is Active Via Powershell

There are two things to look for in the outputs. First, ensure multiple queues are being used under QueueID (1). When you see Queue IDs of 1 and 2, that means VMQ is working.

Second, verify the VmqUsage (2) is greater than 0. As long as the value is greater then 0, that means VMQ is in use.

## Troubleshooting

#### Windows

First, check if CIMC is presenting VMQ to Windows Server. Press the **Windows Key** and search for **Powershell**, then enter this command:

#### Get-NetAdapterVmq

S C:\Users\Administrator> Get-NetAdapterVmq										
Name	InterfaceDescription	Enabled	BaseVmqProcessor	MaxProcessors	NumberOfReceive Queues					
VIC-MLOM-eth0 2	Cisco VIC Ethernet Interface #5	True	0:2	16	64					
VIC-MLOM-eth3 2	Cisco VIC Ethernet Interface #8	False	0:0	8	0					
Onboard LAN2	Intel(R) Ethernet Controller#2	False	0:0	16	0					
VIC-MLOM-eth2 2	Cisco VIC Ethernet Interface #7	True	0:2	6	64					
VIC-MLOM-eth1 2	Cisco VIC Ethernet Interface #6	True	0:58	16	64					
Onboard LAN1	Intel(R) Ethernet Controller X550	False	0:0	16	0					

Then, you want to check the **Enabled** column. If VMQ is showing up as disabled, that means VMQ is not enabled at the hardware level. Navigate to the **vNIC configuration** in CIMC and ensure **VMQ** is enabled.

If VMQ shows enabled, but under the Networking tab in the Hyper-V Manager, you see a Status of OK, it is likely the VMQ Queue Parameters were improperly configured. Run through the calculations again and update your parameters.

Hyper-V Manager	Virtual Machines	Virtual Machines						
WIN-49KS59FHO3D	Virtual Machines Name centos2 new4 New Vitual Machine smol ubunut c Checkpoints	State Off Off Running Off	CPU Usage 0%	Assigned Memory 4096 MB	Uptime 00:01:36	WIN-49KS59FHO3D         New         Import Virtual Mac         Hyper-V Settings         Virtual Switch Man         Virtual SAN Manag         Virtual SAN Manag         Inspect Disk         Inspect Disk         Stop Service         Remove Server         Refresh         View         Help         smol	• ^ ^ · · · · · · · · · · · · · · · · ·	
	smol					Connect		
	Adapter Network Adapter (Dynami	Connection SETsw	IP A	ddresses S	Katus K	Turn Off     Shut Down     Save     Pause		
	Summary Memory Netwo	rking] Replication				Reset Checkpoint Move	-	

VMQ Not Active in Windows

Here is an example of a bad VMQ Queue Configuration. (Still based on 4 VMs):

Ethernet Interrupt

	Interrupt Count:	16	(1 - 1024)
	Interrupt Mode:	MSIx	
¥	Ethernet Receive Queue		
	Count:	4	(1 - 256)
	Ring Size:	512	(64 - 4096)
•	Ethernet Transmit Queue		
	Count:	4	(1 - 256)
	Ring Size:	256	(64 - 4096)
Ŧ	Completion Queue		
	Count:	8	(1 - 512)
	Ring Size:	1	

Here are the issues with this configuration:

- TX queue = 4 Starting off with a correct number
- RX queue = 8 \* (4) != 4 Miscalculation
- CQ = 4 + 4 = 8 While the math checks out, garbage in/garbage out. Because of the incorrect RX queue calculation, the CQ value is incorrect.
- Interrupt = Max of (RX queue or atleast 2xCPU+ 4) The entered value of 16 is not equal to the RX queue or (2x2cpus + 4).

To correct this, you would fix the RX Queue calculation which would be 32. The correct CQ and Interrupt counts can then be calculated.

## Conclusion

Properly configuring VMQ can be frustrating and difficult. It is imperative you ensure the VMQ Queue structure is properly configured in CIMC.