# Congestion control for Ethernet traffic on IBM Spectrum Virtualize

Prioritize and manage different types of Ethernet traffic

# **Table of contents**

Priority flow control on IBM Spectrum Virtualize
End-to-end configuration for congestion control on IBM SVC 8.2.x.x or earlier
End-to-end configuration for congestion cotrol on IBM Spectrum Virtualize 8.3.0.0 onwards
Configuring PFC for host attach traffic on IBM Spectrum Virtualize
Configuring PFC for system or clustering traffic on IBM Spectrum Virtualize
Configuring PFC for storage traffic on IBM Spectrum Virtualize 17
Validate and troubleshoot the configuration
Summary
Get more information
About the authors



#### Overview

#### Challenge

IBM Spectrum Virtualize supports various Ethernet traffic types or classes such as iSCSI host attach, iSCSI storage, iSER host attach, RDMA-based clustering for node-to-node communication and so on. Managing the entire traffic at a single Ethernet port needs prioritization of traffic based on traffic type.

#### Solution

IBM Storwize provides a mechanism that enables you to manage Ethernet traffic on every Ethernet port.

# **Priority flow control on IBM Spectrum Virtualize**

#### **Overview of PFC**

Priority flow control (PFC) is an Ethernet protocol that supports the ability to assign priorities to different types of traffic within the network. With PFC configured, administrators can reduce network disruption due to congestion by slowing down or pausing specific classes of traffic on ports, thus providing better bandwidth for more important traffic.

**IBM® Spectrum Virtualize systems** support priority flow control for iSCSI host attach traffic since the 7.5.0.0 release. Since then till release 8.2.x.x, PFC was supported on Emulex 10 Gb ports only.

In Spectrum Virtualize 8.3.0.0, IBM introduced PFC support for more traffic classes and for additional Ethernet adapters. PFC support has been added for new protocols such as iSER on the faster 25Gb Ethernet ports. Because 25Gb ports interoperate with 10Gb ports, mismatched speeds increase the chances of congestion on the fabric if not configured correctly. This paper includes configuration details for setting up PFC before and after version 8.3.0.0 along with troubleshooting tips.

#### Architecture

#### Software

- IBM Spectrum Virtualize7.5.0.0 onwards only for iSCSI
- IBM Spectrum Virtualize 8.2.1 onward for separate traffic classes

#### Hardware

List of IBM controllers that support PFC:

- IBM FlashSystem 9100, FlashSystem 9150, FlashSystem 200
- Storwize V7000 Gen2, Storwize V7000 Gen3
- SV1, SV2

#### Network

- DCBX supported switches
- LLDP enabled on switch

# End-to-end configuration for congestion control on IBM SVC 8.2.x.x or earlier

From release 7.5.0.0 till release 8.2.x.x PFC was supported only on Emulex 10Gb ports for iSCSI host attach traffic only. This section provides the steps to configure PFC for these releases explained as flowchart.



Figure 1. Flow chart depicting flow of settings required to configure PFC on IBM Storwize 8.2.x.x or earlier

- Configure IP addresses with virtual local area network (VLAN) on Spectrum Virtualize for host attach ports using the svctask cfgportip command.
  - **Note**: VLAN is compulsory to configure PFC.
- 2. Ensure that VLAN is correctly configured on the host ports.

# Things to remember:

- Port speed should be 10Gb or higher to configure PFC settings.
- To enable priority flow for host attachment traffic on a port, make sure that the host flag is set to yes on the configured IP on that port.
- To enable priority flow for storage traffic on a port, make sure that storage flag is set to yes on the configured IP on that port.
- PFC on RDMA over Converged Ethernet (RoCE) adapters will be supported only from version 8.4.0.0 onwards.

- 3. Ensure that VLAN is correctly configured on the switches and routers present in fabric by using vendor-specific commands.
- 4. Make sure that the host and storage connectivity is correct, and they can ping each other.
- 5. Enable Data Center Bridging Capability Exchange (DCBX) on switch (this is required for PFC to work).
- 6. Define and enable PFC for iSCSI traffic tag on the switch. Your switch must support iSCSI Type Length Value (TLV) to support PFC with SVC. Check vendor-specific guidelines for the correct steps.
- 7. Optionally, configure Enhance Transmission Selection (ETS) settings on switch according to the workload by using vendor-specific commands.

# End-to-end configuration for congestion cotrol on **IBM Spectrum Virtualize 8.3.0.0 onwards**

From 8.3.0.0 release, the steps to support PFC have changed from earlier. SVC now supports various types of traffic that can share the same port, for example, iSCSI host attach traffic, iSCSI storage traffic, iSER host attach traffic can now share a single Ethernet port.

In SVC, Ethernet traffic is divided in to three different traffic classes:

- Host attach •
- Storage
- Node-to-node communication (or clustering or system)

These traffic classes are system-wide and pertain to the function rather than the protocol. For example, once a priority class of service is assigned to host attach traffic, all iSCSI and iSER host attach traffic connected to PFC-enabled ports will use the same traffic class.

Perform the following steps to configure PFC 8.3.0.0 or later for the traffic classes explained as flow chart:



Figure 2. Flow chart depicting the flow of settings required to configure PFC on IBM Storwize for 8.3.0.0 or later versions

Steps that are different from releases before version 8.3.0.0 are highlighted using purple color. This section provides details about each step.

- 1. Configure IP addresses with VLAN on Spectrum Virtualize ports. **Note**: VLAN is compulsory to configure PFC.
- 2. Ensure that VLAN is correctly configured on the host ports.
- 3. Ensure that VLAN is correctly configured on the switches and routers by using vendor-specific commands.
- 4. Make sure that the host and storage connectivity is correct, and they can ping each other.
- 5. Configure the *Class of Service* values for different classes of traffic on SVC as described earlier by using the svctask

chsystemethernet command.

- 6. Enable DCBX on switch (this is required for PFC to work.
- 7. Define and enable PFC on the switch for the traffic classes defined in step 3.
- 8. Optionally, configure the ETS settings on the switch according to the workload by using vendor-specific commands.

# Configuring PFC for host attach traffic on IBM Spectrum Virtualize

This section explains the configuration steps to be done on IBM Spectrum Virtualize for configuring PFC for host attach traffic.

# Assign a new IP address for host attach traffic

You can assign a new IP address for host attach communicationif it is not set using the svctask cfgportip command. Along with IP, assign VLAN on the port.

CLI example: Assign a new IP on port 7 with VLAN 30 for host attach traffic

svctask cfgportip -node node1 -ip 192.X.X.X -mask 255.255.255.0 -gw 192.X.X.1 -vlan 30 -host yes 7

**Note**: If IPv6 is used then host\_6 and vlan\_6 parameters will be used instead of host and vlan.

GUI example:

1. Assign a new IP on port 7 with VLAN 30 for host attach traffic by clicking Settings → Network → Ethernet Ports.

Nonagement IP Addresses								Constitue Her	
Service IPs	Ethernet Ports The Ethernet ports can be a	sed for iSCSI or iSER (	SCSI) connections, host a	attachment, and remote o	ιργ	1	Autority V Print	Cookgare	Moreinto
Ethernet Connectivity	Name	Port 🕈	State	10	Spoed	Host Attach	IPv4 Remote Cepy	Storage Port IPv4	Storage P. III.
Ethernet Parts	vio_grp0								
	node1	1	A Unconfigured		1Gb/s	No	Disabled	Disabled	Disabled
Priority Flow Control	nodel	2	A Unconfigured			No	Disabled	Disabled	Disabled
	rodet	3	A Unconfigured			No	Disabled	Disabled	Disabled
iscsi	node1.		A Uncoefigured		250b/s	No	Disabled	Disabled	Disabled
Eltra Channai Cannarth du	node1.	5	A Unconfigured		25Gb/#	No	Disabled	Disabled	Disabled
The Chartes Connectively	rode1	.6	A Unconfigured		2505/8	No	Disabled	Disabled	Disabled
Pibre Channel Ports	ncde1	7	✓ Configured	192.168.11.71	25Gb/4	Yas	Copy Group 1	Enabled	Disabled
NVMe Connectivity									



2. Right click an unconfigured port for which you want to configure the IP and click **Modify IP Settings**.

### Things to remember:

- Set the priority tag in the range 0 to 7.
- For each supported traffic class, enable the same priority tag on the switch. For example, if you plan to have a priority tag 3 for host attach traffic, ensure that the priority tag 3 is enabled on the switch.
- If you are planning on using the same port for different types of traffic, ensure that the ETS settings are configured on the network.

≅ Actions +						Default ~ Conta	ins 🗸 Filter	74
Name	Port 🛧	State	IP	Speed	Host Attach	IPv4 Remote Copy	Storage Port IPv4	Storage P. I
∼io_grp0								
nodel	1	🛦 Unconfigu	▲ Unconfigured		No	Disabled	Disabled	Disabled
nodel	2	A Unconfigured			No	Disabled	Disabled	Disabled
nodel	3	🛦 Unconfigu	A Unconfigured			Disabled	Disabled	Disabled
nodel	4	A Unconfigu	red	25Gb/s	No	Disabled	Disabled	Disabled
nodel	5	A Unconfigu	red	25Gb/s	No	Disabled	Disabled	Disabled
node1	6	A Uncontig		of Sb/s	No	Disabled	Disabled	Disabled
nodel	7	🗸 Configuri	Modify VLAN Modify IP Settings	ib/s	Yes	Copy Group 1	Enabled	Disabled
			Modify Retrofe Copy Modify (SCSE Hoets Hodify Storage Ports					
			Modify Maximum Transmission Un					

Figure 4. Modify IP setting

- 3. Enter the IP and click **Modify**.
- 4. To use this IP for host attach traffic, right-click the IP and click **Modify iSCSI Hosts**.

node1	6	<ul> <li>Configured</li> </ul>	192.168.12.7	1 25Gh/s Yes	Disabled	Disabled	Disabled
nodel	7	✓ Configured	192.168.11.	Modify VLAN	Copy Group 1	Enabled	Disabled
				Modify IP Settings	The second design of the second		
				Modify Remote Copy			
			Modify ISCST Hosts				
				Modify Storage Ports			
				Modify Maximum Transmission Unit			



5. Make sure that the iSCSI host is enabled. If it is not, then select **Enabled** and click **Modify**.

IPv4 iSCSI hosts:	Enabled	•
IPv6 iSCSI hosts:	Disabled	*

Figure 6. Modify iSCSI hosts

# Assign VLAN on a port with already configured IP

If IPs are already assigned, but VLAN is not enabled then configure VLAN for the existing IPs using the svctask cfgportip command.

Exampe CLI: Assign VLAN 30 on port 7 for node1 of the storage controller

svctask cfgportip -node node1 -vlan 307

The svcinfo lsportip command can be used to verify the changes.

Example GUI: Assign VLAN 30 on port 7 for node1 of the storage controller using GUI

 In the IBM Spectrum Virtualize GUI, click Settings → Network → Ethernet Ports.

#### Things to remember:

- VLAN configuration is mandatory for PFC to function
- VLAN configuration must be used by all entities (such as nodes, hosts, backend nodes, and switches)
- Only DCBX capable switches can support PFC configuration
- DCBX enables switch and adapter ports to exchange parameters that describe traffic classes and PFC capabilities.
   For these steps in detail, check your switch documentation.

)→ C' @	🛈 🖲 🔒 https://9.113.56.53/gui#config-netv	vork-ethernet				⊠ ☆	:	± ⊪\ ⊡ 0
18M SAN Volume Controller	PR_SITE Network					👍 튆 Ø	superuser Securi	ty Administrator
Durkkennel	Management IP Addresses	Ethernet Ports						
	Service IPs	The Ethernet ports can be us	sed for iSCSI or iSER (S	CSI) connections, host a	ttachment, and remote or	ipy.		
	Ethernet Connectivity	Rame	Port 🕈	State	IP	Speed	Filter Host Attach	IPv4 Remo
	Ethernet Ports	√io_grp0						
	Priority Flow Control	node1	2	Unconfigured     Unconfigured		1Gb/s	No	Disabled
		nodel	3	▲ Unconfigured			No	Disabled
	iSCSI	node1	4	▲ Unconfigured		25Gb/s	No	Disabled
	Fibre Channel Connectivity	node1	5	▲ Unconfigured		25Gb/s	No	Disabled
		node1	6	▲ Unconfigured		25Gb/s	No	Disabled
Access	Fibre Channel Ports	node1	7	✓ Configured	192.168.11.71	25Gb/s	Yes	Copy Group
Settings	NVMe Connectivity							
		٤						
	_	- Read Viria		- Peed W	ita	- Read Write		
		Latency O ms 0 ms 0 ms		th OMEps OMEps O	MBps IOPS	0 0 0		

Figure 7: Identify ethernet port

2. Right-click the port and click **Modify VLAN**.

Management IP Addresses	Ethernet Ports						
Service IPs	The Ethernet ports can be u	used for ISCSI or ISER (S	CSI) connections, host a	ittachment, and remote co	юу.	Filter	2
Ethernet Connectivity	Name	Port 🛧	State	Ib	Speed	Host Attach	IPv4 Remo III.
Ethernet Ports	∼io_grp0						
A CONTRACT OF A CONTRACT OF	nodel.	1	▲ Unconfigured		1Gb/s	No	Disabled
Priority Flow Control	node1	2	▲ Unconfigured			No	Disabled
iSCSI	nodel	3	A Unconfigured			No	Disabled
	node1	4	▲ Unconfigured		25Gb/s	No	Disabled
Shee Channel Connection	node1	5	▲ Unconfigured		25Gb/s	No	Disabled
Fibre Channel Connectivity	nodel	6	▲ Unconfigured		25Gb/s	No	Disabled
Fibre Channel Ports	node1	7	Configured	192.168.11.71	25Gb/s	Yes	Copy Group 1
NVMe Connectivity			Modify VLAN Modify IP Settings Modify Remote Co Modify iSCS1 Hosts	py s			
	c		Modify Storage Po	rts .			,
			Modify Maximum 1	Transmission Unit			

Figure 8. Update VLAN

3. In the dialog box that is opened, select the **Enable** check box.

# Modify VLAN for port 7 on Node 1

VLAN: VLAN tag:	<ul> <li>Enable</li> <li>1 through 4094</li> <li>Apply change to the failover port too</li> </ul>
Need Help	Cancel Modify
Figure 9: Apply chang Specify the VLAN tag	es g and click <b>Modify</b> .
Modify	VLAN for port 7 on Node 1 ×
VLAN: VLAN tag:	<ul> <li>Enable</li> <li>30</li> <li>Apply change to the failover port too</li> </ul>
⑦ Need Help	Cancel Modify

Figure 10: Specify VLAN ID

4.

5. A warning message indicating that if you modify VLAN of an existing IP address then all connections through that IP will be lost is displayed. Click **Yes**.



# Assign COS value for host attach traffic on SVC

After the IBM Storwize ports are configured with the correct VLAN tag, configure the priority code point (PCP) value or the class of service (COS) value for host attach traffic on SVC using the chsystemethernet command.

# CLI example: svctask chsystemethernet -hostattachcos 4

GUI example: Defining priority tags for defined traffic classes using GUI

- 1. Click Settings → Network → Priority Flow Control.
- 2. Provide priority tag values to host attach host attach traffic and click **Save**.

Priority Flow Control	
Priority flow control lets you prioritize different types of traffic through Ether	net ports which have VLAN configured.
Ensure that VLAN is configured on the corrresponding Ethernet Port	ts. Go to <u>Ethernet Ports</u> .
Class of service	
System (Traffic between nodes within the system):	3 🔻
Host Attachment (Traffic between hosts and the system):	4 💌
Storage Virtualization (Traffic between backend storage and the system):	5 💌

Figure 12. Specify COS value

# Things to remember for PCP settings:

- Set the priority tag in the range 0 to 7.
- For each supported traffic class, enable the same priority tag on the switch. For example, if you plan to have a priority tag 3 for storage traffic, ensure that the priority tag 3 is enabled on the switch.
- If you are planning on using the same port for different types of traffic, ensure that the ETS settings are configured on the network.

Only single traffic class can also be assigned priority keeping others as 0. Rescanning or reestablishing iSER host attach sessions are required after changes are made for PFC tag settings.

# Configuring PFC for system or clustering traffic on IBM Spectrum Virtualize

This section explains the configuration steps to enable PFC for system or clustering traffic. (system or clustering traffic is often called as Remote Direct Memory Access (RDMA)-based node-to-node traffic).

# Assign a new IP address for node-to-node communication

New IP address for clustering between IBM Spectrum Virtualize nodes can be assigned, if it is not set using the satask chnodeip CLI, along with IP assign VLAN on the port.

Example CLI: Assign a new IP address with VLAN 30 on port 5 for node-to-node or system communication

satask chnodeip -ip 192.168.59.14 -gw 192.168.59.1 -mask 255.255.255.0 - vlan 30 -port\_id 5

This can be verified using the sainfo lsnodeip command:

IBM_2145:ibmclust	er:superuser≻sair	fo lsnodeip						
port_id rdma_t	ype port_speed vl	an link_state	state	node_IP_add	ress gateway	subnet_mask		
1	1Gb/s	active	unconfigured					
2	1Gb/s	active	unconfigured					
3		inactive	unconfigured					
4 ROCE	25Gb/s	active	configured	10.10.12.17	10.10.12.1	255.255.255	.0	
5 RoCE	25Gb/s 36	active	configured	192.168.59.	14 192.168.59.	1 255.255.255	.0	
6	10Gb/s	active	unconfigured					
7	10Gb/s	active	unconfigured					
IBM_2145:ibmclust	er∶superuser≻sair	fo lsnodeipco	nnectivity					
status 1	ocal_port_id loca	l_vlan local_	rdma_type loc	al_ip_addr r	emote_port_id re	mote_vlan rem	ote_rdma_type	remote_ip_addr
remote_wwnn	remote_panel_name	cluster_id	error_da	ta				
Connected:RoCE 4		RoCE	10.	10.12.17 4		RoC	E	10.10.12.18
500507680C008B01	78FNML0	0000020321C1	160C					
Connected:RoCE 5	30	ROCE	192	.168.59.14 5	30	RoC	E	192.168.59.13
500507680C008B01	78FNMLØ	0000020321C1	160C					
IBM_2145:ibmclust	er:superuser>							
Figure 13. (	Dutput of so	ainfo Isna	odeip					

Example GUI: To configure a system IP login to service assistance GUI:

IBM SAN VOIUME C	ontroller Service Assistant loc	ы
	Superuser Password:	
78HRCF0   node1	Lo	g in
If you arrived here unint	entionally, return to management GUI.	



1. On the left panel, click **Change Node IP**.

Home	selected node, click Modify	If you want to remove or clear the IP and	trues for a selected reade, dick Unconfigure.			
Collect Logo	View IP Addresses for: nod	41 (78-4034)				
Wandoor Settern	Node IP Address 1		Node JP Address 2		Node IP Address 3	
Receiver System		200	100	2	100	14.1
De instal Collecter	Part IC		PERIO	÷	POPLES	
The stocast avecting to	SDML Type:		RDMA Type:		RCHA Type:	
Update Manushy	Net speed	161/6	Port Speed		Port speed.	
Contigure Node	Lirk State:	Addres	Lew State:	Inactive	Link Statul	Diadove
Change Service IP	State:	Unconfigured	State.	Unconfigured	State	Unconfigured
Change Node IP	Node IP Addresser		Node IP Address		Node 3F Address	
Ethernot Connectivity	Subvet Mark		Submit Nask:		Subryit Mark:	
Configure CLI Access	Gateway		Gateways		Gabeways	
Restart Sonice	VLNP		VLAN		MLAN:	
	362220					
	Node IP Address 4		Node 1P Address 5		Node IP Address 6	
	1000	12	100 Th	2	10410	52 C
	1001		POR 21		POPLAR.	-
	interest regime.	NO.	and a street	KOCK .	allow type.	1 100 March 10
	Port Speed	2506/8	Port Speed	2308/9	Port Spont.	2506/8
	Link state:	Addivis	Line State:	Activo	Link State:	Active
	State	Unconfigured	State	Unconfigured	State	unconfigured
	Node IP Address:		No do IP Address :		Node 3P Address:	
	Submet Maski		Suboot Mask:		Subriet Mark	
	Gabewayi		Cateway:		Gabesrav:	
	VEAN:		VLAN		WLAN:	
	Node IP Address 7					

Figure 15 Select the Ethernet port

2. Select a port on which you want to configure system IP and click **Modify**.

Node IP Address 4	Cancel Save
Port ID:	4
RDMA Type:	RoCE
Port Speed:	25Gb/s
Link State:	Active
State:	Unconfigured
Node IP Address:	
Subnet Mask:	
Gateway:	
VLAN:	



3. Enter node IP, subnet, gateway, and VLAN details, and then click **Save**. Notice that the node IP details are updated.

Node IP Address 4	
Port ID:	4
RDMA Type:	RoCE
Port Speed:	25Gb/s
Link State:	Active
State:	Configured
Node IP Address:	192.168.50.14
Subnet Mask:	255.255.255.0
Gateway:	192.168.50.1
VLAN:	70

Figure 17. Set node IP

4. Similarly, configure the other ports as required.

#### Things to remember:

- VLAN configuration is mandatory for PFC to function.
- VLAN configuration must be used by all entities (such as nodes, backend nodes, hosts, and switches)
- Only DCBX-capable switches can support PFC configuration.
- DCBX enables switch and adapter ports to exchange parameters that describe traffic classes and PFC capabilities.
   For detailed steps, check your switch documentation.

# Assign VLAN on a port with an already configured IP

If IPs are already assigned but VLAN is not enabled, then configure VLAN for the existing IPs using the same CLI command.

Example GUI: To configure a VLAN on an existing system IP login to service assistance GUI

On the left panel, click **change Node IP**, and select the node IP details which you want to modify. In this example, modify port number 5 (as VLAN is not configured here).

Node IP Address 5						
Port ID:	5					
RDMA Type:	RoCE					
Port Speed:	25Gb/s					
Link State:	Active					
State:	Configured					
Node IP Address:	192.168.50.35					
Subnet Mask:	255.255.255.0					
Gateway:	192.168.50.1					
VLAN:						

Figure 18. Select port

Select the node IP and click **Modify**. Specify VLAN and click **Save**.

Je IP Address 5		
Port ID:	5	
RDMA Type:	RoCE	
Port Speed:	25Gb/s	
Link State:	Active	
State:	Configured	
Node IP Address:	192.168.50.35	
Subnet Mask:	255.255.255.0	
Gateway:	192.168.50.1	
VLAN:	70	

Figure 19. Update VLAN ID

# Assign COS value for node-to-node traffic on SVC

After configuring the IBM Storwize ports with the correct VLAN tag, configure the PCP value or the COS value for system traffic on SVC using the chsystemethernet command.

CLI example: svctask chsystemethernet -systemcos 3

GUI example: Defining priority tags for defined traffic classes using GUI

- 1. Click Settings → Network → Priority Flow Control.
- 2. Enter the priority tag values for system traffic and click **Save**.

Save

Priority Flow Control Priority flow control lets you prioritize different types of traffic through Ethernet ports which have VLAN configured.
• Ensure that VLAN is configured on the corrresponding Ethernet Ports. Go to Ethernet Ports.
Class of service
System (Traffic between nodes within the system):
Host Attachment (Traffic between hosts and the system):
Storage Virtualization (Traffic between backend storage and the system):

Figure 20. Specify COS value

### Note:

Only single traffic class can also be assigned priority keeping others as 0. Changing PFC COS value for system or clustering traffic requires re-establishing RDMA-based node to node sessions, after PFC tag settings are done on cluster and after any node joins the cluster. To re-establish the session, you must have at least two RDMA-based node-to-node sessions.

Once the pre-requites are met, close one of the sessions and open that session again, and then close the second session and then reopen it and so on. One way to open and close the session again is just by removing that node IP (using satask chnodeip -noip -port\_id <port id>) and configuring it back again.

# Configuring PFC for storage traffic on IBM Spectrum Virtualize

This section explains the configuration steps to be done on IBM Spectrum Virtualize for configuring PFC for back-end storage traffic.

# Assign a new IP address for back-end storage traffic

A new IP address for back-end storage traffic can be assigned, if it is not set using the svctask cfgportip command. Along with the IP, assign VLAN on the port.

Example CLI: Assign a new IP address on a port for only storage traffic with VLAN 40 on port 6

svctask cfgportip -node node1 -ip 192.X.X.X -mask 255.255.255.0 -gw

# Things to remember for PCP settings:

- Set the priority tag in the range 0 to 7.
- For each supported traffic class, enable the same priority tag on the switch. For example, if you plan to have a priority tag 3 for storage traffic, ensure that the priority tag 3 is enabled on the switch.
- If you are planning on using the same port for different types of traffic, ensure that the ETS settings are configured on the network.

### 192.X.X.1 -vlan 40 -storage yes 6

To enable both host and storage traffic on the same port, use following command:

svctask cfgportip -node node1 -ip 192.X.X.X -mask 255.255.255.0 -gw 192.X.X.1 -vlan 40 -host yes -storage yes 5

Example GUI: Assign a new IP address for configuring storage traffic

To configure a new host attach or storage IP, click Settings → Network → Ethernet Ports.

Nanagement IP Addresses	Ethernet Ports							Configure	Hore Info
Service IPs	The Ethernet ports can be u	ued for iSCSI or iSER (	SCSE) connections, host	attachment, and remote o	ιργ	i i	nateda y Costa	a. v	12
Ethernet Connectivity	Name	Port 🕈	State	1P	Spord	Host Attach	IPv4 Remote Cepy	Storage Port IPv4	Storage P-III.
Ethernet Ports	vio_grp0								
	node1	1	▲ Unconfigured		1Gb/s	No	Disabled	Disabled	Disabled
Priority Flow Control	node1	2	A Unconfigured			No	Disabled	Disabled	Disabled
	rode1	3	A Unconfigured			No	Disabled	Disabled	Disabled
ISCSI	node1.	34	A Unconfigured		250b/s	No	Disabled	Disabled	Disabled
Fibre Channel Connectivity	node1.	5	▲ Unconfigured		25Gb/s	No	Disabled	Disabled	Disab/ed
nere channe connecting	rode1	6	▲ Unconfigured		2505/8	No	Disabled	Disabled	Disabled
Pibre Channel Ports	ncda1	7	🗸 Configured	192.168.11.71	25Gb/4	Vas	Copy Group 1	Enabled	Disabled
NVMe Connectivity									



2. Right-click the port for which you need to configure the IP and click **Modify IP Settings**.

Actions -						Default V Conta	ins 🗸 Filter	74
Name	Port 🕈	State	IP	Speed	Host Attach	IPv4 Remote Copy	Storage Port IPv4	Storage P. I
∼io_grp0								
nodel	1	A Unconfigure	d	1Gb/s	No	Disabled	Disabled	Disabled
nodel	2	A Unconfigure	iđ		No	Disabled	Disabled	Disabled
nodel	3	A Unconfigure	d		No	Disabled	Disabled	Disabled
nodel	4	A Unconfigure	d	25Gb/s	No	Disabled	Disabled	Disabled
nodel	5	A Unconfigure	đ	25Gb/s	No	Disabled	Disabled	Disabled
node1	6	A Unconfig	2	of Sb/s	No	Disabled	Disabled	Disabled
nodel .	7	Configure	Modify IP Settings Modify Remains Copy Modify (SCSS) Hoets Modify Storage Ports	ib/s	Yes	Copy Group 1	Enabled	Disabled

Figure 22. Modify IP settings

3. Specify the IP and click **Modify**.

IPv4 address:	192.168.12.71
Subnet mask:	255.255.255.0
Gateway:	192.168.12.1
▶ IPv6	

4. To use this IP for storage connectivity, right-click the IP and click **Modify Storage ports**.



Figure 24. Set VLAN

5. If it is not enabled, select **Enabled** and click **Modify**.

Modify Stora	ge Ports ×
Storage port IPv4:	Enabled -
Storage port IPv6:	Disabled -
	Cancel Modify
Figure 25. Modify storage ports	

# Assign VLAN on a port with an already configured IP

If IPs are already assigned, but VLAN is not enabled, then configure VLAN for the existing IPs using the satask cfgportip command.

Example CLI: Enabling VLAN 30 on port 7 which is already being used for storage connections.

svctask cfgportip -node node1 -vlan 30 7

Example GUI: Configure VLAN on an existing host attach IP or storage IP using GUI

 In the IBM Spectrum Virtualize GUI, click Settings → Network → Ethernet Ports.

PR_SITE - Network × +								- 0	×
← → ♂ ☆	① 🖲 🔒 https://9.113.56.53/gui#config-netwo	ork-ethernet				⊡ ☆	2	Ł II\ © €	9 ≡
1814 IBM SAN Volume Controller	PR_SITE Network					👍 🖥 🖗	superuser Securit	y Administrator	~
A Darkhand	Management IP Addresses	Ethernet Ports							
	Service IPs	The Ethernet ports can be used	lor iSCSI or iSER (SC	SI) connections, host at	tachment, and remote co	py.			
	Ethernet Connectivity	III Actions -	Port 🛧	State	TP	Sneed	Filter Host Attach	TPv4 Remo	7. . III.
	Ethernet Ports	∼io_grp0							
	Priority Flow Control	node1	1	Unconfigured		1Gb/s	No	Disabled	-
		nodel	3	▲ Unconfigured			No	Disabled	
	ISCSI	nodel	4	▲ Unconfigured		25Gb/s	No	Disabled	
	Fibre Channel Connectivity	node1	5	Unconfigured		25Gb/s	No	Disabled	
	Fibre Channel Ports	node1	7	✓ Configured	192.168.11.71	25Gb/s	Yes	Copy Grou	p1
Settings	NVMe Connectivity								
		¢							>
			_					_	
		Latency O ms 0 ms 0 ms		h O MEps O MEps O M	tBps IOPS				
O Type here to search	0 🛱 🔛 😆	🌯 e 🛢 🔒 🦃	🕀 🛃 (	D 🖩 🕨	📧 🛷	Ŕ	× ~ 100 ∉ 4×	ENG 01:50 PM 29-08-2019	-

Figure 26. Select Ethernet port

# 2. Right-click the port and click **Modify VLAN**.

Management IP Addresses	Ethernet Ports						
Service IPs	The Ethernet ports can be	used for ISCSI or ISER (SC	51) connections, host a	ttachment, and remote co	ipγ.	Filter	8
Ethernet Connectivity	Name	Port 🛧	State	IP	Speed	Host Attach	IPv4 Remo II
Ethernet Ports	~io_grp0						
	nodel	1	A Unconfigured		1Gb/s	No	Disabled
Priority Flow Control	nodel	2	▲ Unconfigured			No	Disabled
	nodel	3	A Unconfigured			No	Disabled
ISCSI	node1	4	▲ Unconfigured 25Gb/s			No	Disabled
Educ Channel Consectivity	node1	5	A Unconfigured		25Gb/s	No	Disabled
Pibre Channel Connectivity	node1	6	▲ Unconfigured 25Gb/s			No	Disabled
Fibre Channel Ports	node1	7	Configured	192.168.11.71	25Gb/s	Yes	Copy Group 1
			Modity VLAN				
NVMe Connectivity.			Modify IP Settings				
			Modify Remote Cop	<i>w</i>			
			Modify iSCSI Hosts				
	<		Modity Storage Por	ts			,
			Modify Maximum T	ransmission Unit			

Figure 27: Modify VLAN

3. In the dialog box that is displayed, select the **Enable** check box.

# Modify VLAN for port 7 on Node 1 \*

VLAN:		Enable
VLAN tag:		1 through 4094
	<b>~</b>	Apply change to the failover port too
⑦ Need Help		Cancel Modify
Figure 28. Specify VL	AN ID	

### 4. Specify the VLAN tag and click **Modify**.

#### Things to remember:

- VLAN configuration is mandatory for PFC to function
- VLAN configuration must be used by all entities (such as nodes, backend nodes, hosts, and switches).
- Only DCBX capable switches can support the PFC configuration.
- DCBX enables switch and adapter ports to exchange parameters that describe traffic classes and PFC capabilities.
   For detailed steps, check your switch documentation.

# Modify VLAN for port 7 on Node 1

VLAN: VLAN tag:	<ul> <li></li> <li></li> </ul>	Enable Apply change to th	30 ne failover port	too
⑦ Need Help			Cancel	Modify

Figure 29. Apply settings

Note that if you modify VLAN of an existing IP address then all connections through that IP will be lost.



# Assign COS value for storage traffic on SVC

After configuring the IBM Storwize ports with the correct VLAN tag, you can configure the PCP value or the COS value for storage traffic on SVC using the svctask chsystemethernet command.

CLI example: svctask chsystemethernet -storagecos 5

GUI example: Defining priority tags for defined traffic classes using GUI

- 1. Click Settings → Network → Priority Flow Control.
- 2. Specify the priority tag values for storage traffic and click **Save**.

Priority Flow Control Priority flow control lets you prioritize different types of traffic through Ethernet ports which have VLAN configured.					
ts. Go to <u>Ethernet Ports</u> .					
3 💌					
4 🔻					
5 💌					

Figure 31. Set COS value

Save

- A working VLAN configuration is mandatory.
- Rescanning and reestablishing iSER host attach sessions are required if any changes are made for PFC tag settings.
- Rescanning and reestablishing RDMA-based node-to-node traffic sessions are required if any changes are made for PFC tag settings.
- PFC will work only for Ethernet ports with 10G or more speed.

Note: Only single traffic class can also be assigned priority, keeping others as 0.

# Validate and troubleshoot the configuration

This section provides detailed steps to validate if PFC is working or not, along with the steps to fix issues (if any).

svcinfo lsportip <port id>lists a detailed view of the overall configuration of the specified port.

You need to consider the following parameters for PFC configuration:

### dcbx\_state

This is the most basic parameter that you should check before configuring or validating PFC. This should be *enabled*. If it is disabled, then check the switch settings. It should have DCBX and Link Layer Discovery Protocol (LLDP) enabled. If it is *unsupported*, then that means that the port does not accept PFC configuration from the switch port, even if the switch is DCBX-capable. All ports that are less than 10 Gbps have this value.

### Lossless parameters for all traffic classes

Lossless parameters indicate whether PFC is enabled on not on an Ethernet port. There are five fields:

- **lossless\_host\_attach** or **lossless\_host\_attach6**: Indicates whether PFC is enabled or not for host attach traffic on that port.
- **lossless\_system**: Indicates whether PFC is enabled or not for system traffic on that port.
- **lossless\_storage** or **lossless\_storage6**: Indicates whether PFC is enabled or not for storage traffic on that port.

### pfc\_enabled\_tags

This field displays a list of priority tags that are enabled on the switch. If no priority tags are enabled on the switch, this field is blank. If priority tags are enabled on the switch but PFC is not enabled for those priority tags, this field is blank.

# Frequently asked questions (FAQs)

# How a correct configuration for host attach look like?

If all the settings of PFC are correctly done for an IP address, then lossless\_hostattach (or lossless\_hostattach6 for IPv6) field will be

Management IP Addresses	Ethernet	Ethernet Ports				
Service IPs	The Ethernet ports can be used for iSCSI or iSER (SCSI) connections, host attachment, and remote copy.			ent, and remote copy.	HOLETHIO NOTNOW	
Ethernet Connectivity	i≣ Action	•		Default ~ Contains ~	Filter 5	
Ethernet Ports	tote Copy	Host Port Group	Host Priority Flow Control IPv4	Storage Priority Flow Control IPv4	RDMA Type	
		0				
Priority Flow Control		0				
ISCSI		0				
		0			ISER (RoCE)	
Fibre Channel Connectivity		0			ISER (WARP)	
Fibre Channel Ports		1	On	On	ISER (IWARP)	
NVMe Connectivity						
	5					

displayed. Refer to one such following example from GUI:

Figure 32. Displaying PFC as ON for host attach and storage traffic

From CLI, it can be checked using the lsportip command:

```
bash# lsportip 3 | grep lossless_host_attach
lossless_host_attach on
lossless_host_attach6
lossless_host_attach6
lossless_host_attach6
lossless_host_attach6
lossless_host_attach6
lossless_host_attach6
lossless_host_attach6
```

#### How to check and make priority flow control work for host attach traffic?

Refer to the flow chart in the following figure to check if PFC is enabled for host attach traffic for an IPv4 address. This flow chart also guides you through the steps to make priority flow work for that IPv4 address.

**Note**: For IPv6 address, check the lossless\_hostattach6 field instead of lossless\_hostattach and follow the same flow chart. Your switch must support iSCSI Type Length Value (TLV)



Figure 33: Steps for checking if PFC for host attach and storage traffic is enabled

Add the storage system to ISM X Management IP Addresses Ethernet Ports More Info Not Now The Ethernet ports can be used for iSCSI or iSER (SCSI) or te coov Service IPs 2 E Actions \* Ethernet Connectivity v6 Remote Copy Host Port Group Host Priority Flow Control IPv4 Storage Priority Flow Control IPv4 RDMA Type Ethernet Ports sabled Priority Flow Control sabled sabled iSCSI sabled 0 ISER (RoCE) VLAN is not configured. 0 ISER (RoCE) nabled Fibre Channel Connectivity sabled Off Off ISER (WARP) ISER (/WARP) Fibre Channel Ports sabled On NVMe Connectivity

Figure 34 shows that PFC status as **Off** and **VLAN is not configured** for host attach traffic. Follow the process in the flow chart in figure 33 to correct it.

Figure 34: Displaying that PFC is ON for host attach and storage traffic

### How a correct configuration for storage looks like?

If all the settings of priority flow control are correctly done for an IP address, then the lossless\_storage (or lossless\_storage6) field will be dispalyed. Refer Figure 34 for one such example from GUI:

Management IP Addresses	Ethernet Ports The Ethernet ports can be used for iSESI or ISER (SESI) connections, host attachment, and remote copy.				Add the stocage system to IBM X Storage Insights     More Info     Not Now	
Service IPa						
	= Action	18		Default ~ Contains ~	Filter	×
Ethernet Connectivity	iote Copy	Host Port Group	Host Priority Flow Control IPv4	Storage Priority Flow Control IPv4	RDMA Type	II.
Ethernet Ports						
		0				
Priority Flow Control		0				
		0				
iSCSI		D			ISER (RoCE)	
The Course of Course of Course		0			ISER (RoCE)	
Pible character connectivity		0			iser (WARP)	
Fibre Channel Ports		1	0n	On	ISER (IWARP)	
NVMe Connectivity						
	5					,

Figure 35. PFC is ON for host attach and storage traffic

From CLI, it can be checked using lsportip:

bash# lsportip 3 | grep lossless\_storage lossless\_storage **on** lossless\_storage6 lossless\_storage6 lossless\_storage6 lossless\_storage6 lossless\_storage6 lossless\_storage6 lossless\_storage6

Figure 36 shows that the PFC status is **Off** and **VLAN is not configured** for the host attach traffic. Follow the process in the flow chart to correct it.



Figure 36. PFC is Off for both host and storage traffic

#### How to check and make PFC work for storage traffic?

You must follow the steps shown in the flow chart (in Figure 36) to check if PFC is enabled for storage traffic for an IPv4 address. This flow chart also guides you through the steps to make priority flow work for that IPv4 address.

**Note**: For the IPv6 address, check the lossless\_storage6 field instead of lossless\_storage and follow the steps in the flow chart.



Figure 37. Steps to check if PFC for host attach and storage traffic is enabled

#### How a correct configuration for clustering traffic looks like?

If all the settings of PFC are correctly done for an IP address then the lossless\_system field will be displayed. From the GUI, validate that PFC is enabled on the clustering ports.

#### Ethernet Ports

The Ethernet ports can be used for iSCSI or iSER (SCSI) connections, host attachment, and remote copy.

$\equiv$ Actions $\checkmark$				
Name	Port	Speed	System Priority Flow Control	↑ RDMA Type
∕io_grp0				
node1	1	1Gb/s		
node1	2			
node1	3			
node1	4	25Gb/s		iSER (RoCE)
nodel	5	25Gb/s		iSER (RoCE)
node1	6	25Gb/s	On	iSER (iWARP)
nodel	7	25Gb/s	On	iSER (iWARP)

Figure 38. PFC is On for system or clustering ports

From the CLI, it can be checked using lsportip:

# lsportip 5 |grep lossless\_system
lossless\_system on
lossless\_system on

#### How to check and make PFC work for clustering traffic?

Follow the steps in the flow chart (shown in Figure 38) to check if priority flow control is enabled for clustering (system) traffic for an IPv4 or IPv6 address. This flow chart also guides you through the steps to make priority flow work for that IP address.



Figure 39. Steps to check if PFC for system or clustering traffic is enabled

# **Summary**

This paper helps in configuring and managing different Ethernet traffic of IBM Spectrum Virtualize. It contains separate sections for each traffic type explaining the configuring steps in detail.

Also, it provides a section of validation and troubleshooting that can help in identifying a problem faced during the configuration with flow charts for better understanding.

# **Get more information**

To learn more about IBM Spectrum Virtualize, refer to the following websites: IBM Storwize V7000 Support page ibm.com/storage/support/storwize/v7000 IBM Storwize V7000 Knowledge Center ibm.com/support/knowledgecenter/ST3FR7 iSCSI Implementation and Best Practices on IBM Storwize Storage Systems https://www.redbooks.ibm.com/redbooks/pdfs/sg248327.pdf

# About the authors

**Aakanksha Mathur** leads the test effort for IBM Spectrum Virtualize product chain at IBM System Labs, India. She has been working in the storage domain for more than 12 years including 9 years with IBM System Labs. She can be reached at <u>aamathur@in.ibm.com.</u>

**Bharti Soni** is a senior system staff software engineer in the SVC development team at IBM Systems Labs, India. She holds a master's degree in Computer Science from IIT Roorkee. You can reach Bharti at: <u>bharsoni@in.ibm.com</u>.



© Copyright IBM Corporation 2020 IBM Systems 3039 Cornwallis Road RTP, NC 27709

Produced in the United States of America

IBM, the IBM logo and ibm.com are trademarks or registered trademarks of the Internal Business Machines Corporation in the United States, other countries, or both. If these and other IBM trademarked items are marked on their first occurrence in the information with a trademark symbol (® or ™), these symbols indicate U.S. registered or common law trademarks owned by IBM at the time this information was published. Such trademarks may also be registered or common law trademarks in other countries. A current list of IBM trademarks is available on the web at "Copyright and trademark information" at ibm.com/legal/copytrade.shtml

Other product, company or service names may be trademarks or service marks of others.

References in the publication to IBM products or services do not imply that IBM intends to make them available in all countries in the IBM operates.

