

You can configure NVMe over Fibre Channel (NVMe/FC) on hosts running Windows Server 2019 for operation with ONTAP LUNs..

About this task

You can use the following support with the NVMe/FC host configuration for Windows 2019. You should also review the known limitations before starting the configuration process.

You can use the configuration settings provided in this procedure to configure cloud clients connected to [Cloud Volumes ONTAP](#) and [Amazon FSx for ONTAP](#).

Support available:

Beginning with ONTAP 9.7, NVMe/FC is supported for Windows Server 2019.

For a list of supported FC adapters and controllers, see the [Hardware Universe](#). For the current list of supported configurations and versions, see the [Interoperability Matrix Tool](#).

Known limitations:

Windows Failover Cluster isn't supported with NVMe/FC because ONTAP doesn't currently support persistent reservations with NVMe/FC.

Broadcom ships an external driver for Windows NVMe/FC that is a translational SCSI ⇌ NVMe driver and not a true NVMe/FC driver. The translational overhead doesn't necessarily impact performance, but it does negate the performance benefits of NVMe/FC. As a result, NVMe/FC and FCP performance is the same on Windows servers, unlike other operating systems such as Linux, where NVMe/FC performance is significantly better than that of FCP.

Enable NVMe/FC

Enable FC/NVMe on the Windows initiator host.

Steps

Install the Emulex HBA Manager utility on the Windows host.

On each of the HBA initiator ports, set the following HBA driver parameters:

EnableNVMe = 1

NVMeMode = 0

Reboot the host.

Configure the Broadcom FC adapter

The Broadcom initiator can serve both NVMe/FC and FCP traffic through the same 32G FC adapter ports. For FCP and FC/NVMe, you should use the Microsoft device-specific module (DSM) as the Microsoft Multipath I/O (MPIO) option.

A `hostnqn` is associated with each host bus adapter (HBA) port for the Broadcom adapter with FC/NVMe in a Windows environment. The `hostnqn` is formatted as shown in the following example:

```
nqn.2017-01.com.broadcom:ecd:nvmf:fc:100000109b1b9765  
nqn.2017-01.com.broadcom:ecd:nvmf:fc:100000109b1b9766
```

Enable MPIO for NVMe devices

You need to enable MPIO for NVMe devices to complete the NVMe configuration on the Windows host.

Steps

Install [Windows Host Utility Kit 7.1](#) to set the driver parameters that are common to both FC and NVMe.

Open the MPIO properties.

From the **Discover Multi-Paths** tab, add the device ID listed for NVMe. MPIO becomes aware of the NVMe devices, which are visible under disk management.

Open **Disk Management** and go to **Disk Properties**.

From the **MPIO** tab, select **Details**.

Set the following Microsoft DSM settings:

PathVerifiedPeriod: **10**

PathVerifyEnabled: **Enable**

RetryCount: **6**

RetryInterval: **1**

PDORemovedPeriod: **130**

Select the MPIO Policy **Round Robin with Subset**.

Change the registry values:

```
HKLM\SYSTEM\CurrentControlSet\Services\mpio\Parameters\PathRecoveryInterval DWORD -> 30
```

```
HKLM\SYSTEM\CurrentControlSet\Services\mpio \Parameters\UseCustomPathRecoveryInterval DWORD-> 1
```

Reboot the host.

Validate NVMe/FC

Verify that the NVMe subsystems have been discovered and the ONTAP namespaces are correct for the NVMe-oF configuration.

Steps

Verify that "Port Type" is FC+NVMe:

```
listhba
```

```
Port WWN      : 10:00:00:10:9b:1b:97:65
Node WWN      : 20:00:00:10:9b:1b:97:65
Fabric Name    : 10:00:c4:f5:7c:a5:32:e0
Flags         : 8000e300
Host Name     : INTEROP-57-159
Mfg           : Emulex Corporation
Serial No.    : FC71367217
Port Number    : 0
Mode          : Initiator
PCI Bus Number : 94
PCI Function   : 0
Port Type    : FC+NVMe
Model         : LPe32002-M2
```

```
Port WWN      : 10:00:00:10:9b:1b:97:66
Node WWN      : 20:00:00:10:9b:1b:97:66
Fabric Name    : 10:00:c4:f5:7c:a5:32:e0
```

```
Flags          : 8000e300
Host Name      : INTEROP-57-159
Mfg           : Emulex Corporation
Serial No.    : FC71367217
Port Number   : 1
Mode          : Initiator
PCI Bus Number : 94
PCI Function  : 1
Port Type     : FC+NVMe
Model        : LPe32002-M2
```

Verify that the NVMe/FC subsystems have been discovered:

nvme-list

```
NVMe Qualified Name :
nqn.1992-08.com.netapp:sn.a3b74c32db2911eab229d039ea14
1105:subsystem.win_nvme_interop-57-159
```

```
Port WWN      : 20:09:d0:39:ea:14:11:04
Node WWN      : 20:05:d0:39:ea:14:11:04
Controller ID : 0x0180
Model Number  : NetApp ONTAP Controller
Serial Number : 81CGZBPU5T/uAAAAAAB
Firmware Version : FFFFFFFF
Total Capacity : Not Available
Unallocated Capacity : Not Available
```

```
NVMe Qualified Name :
nqn.1992-08.com.netapp:sn.a3b74c32db2911eab229d039ea141105:subsy
stem.win_nvme_interop-57-159
Port WWN      : 20:06:d0:39:ea:14:11:04
Node WWN      : 20:05:d0:39:ea:14:11:04
Controller ID : 0x0181
Model Number  : NetApp ONTAP Controller
```

```
Serial Number      : 81CGZBPU5T/uAAAAAAB
Firmware Version   : FFFFFFFF
Total Capacity     : Not Available
Unallocated Capacity : Not Available
Note: At present Namespace Management is not supported by NetApp
Arrays.
```

```
nvme-list
```

Show example

```
NVMe Qualified Name :
nqn.1992-08.com.netapp:sn.a3b74c32db2911eab229d039ea141105:subsy
stem.win_nvme_interop-57-159
Port WWN            : 20:07:d0:39:ea:14:11:04
Node WWN            : 20:05:d0:39:ea:14:11:04
Controller ID       : 0x0140
Model Number        : NetApp ONTAP Controller
Serial Number       : 81CGZBPU5T/uAAAAAAB
Firmware Version    : FFFFFFFF
Total Capacity      : Not Available
Unallocated Capacity : Not Available
```

```
NVMe Qualified Name :
nqn.1992-08.com.netapp:sn.a3b74c32db2911eab229d039ea141105:subsy
stem.win_nvme_interop-57-159
Port WWN            : 20:08:d0:39:ea:14:11:04
Node WWN            : 20:05:d0:39:ea:14:11:04
Controller ID       : 0x0141
Model Number        : NetApp ONTAP Controller
Serial Number       : 81CGZBPU5T/uAAAAAAB
Firmware Version    : FFFFFFFF
Total Capacity      : Not Available
Unallocated Capacity : Not Available
```

Note: At present Namespace Management is not supported by NetApp Arrays.

1. Verify that the namespaces have been created:

```
nvme-list-ns
```

2. **Show example**

Active Namespaces (attached to controller 0x0141):

SCSI		SCSI	SCSI
NSID	DeviceName	Bus Number	Target Number
OS LUN			

0x00000001	\\.\PHYSICALDRIVE9	0	1
0			
0x00000002	\\.\PHYSICALDRIVE10	0	1
1			
0x00000003	\\.\PHYSICALDRIVE11	0	1
2			
0x00000004	\\.\PHYSICALDRIVE12	0	1
3			
0x00000005	\\.\PHYSICALDRIVE13	0	1
4			
0x00000006	\\.\PHYSICALDRIVE14	0	1
5			
0x00000007	\\.\PHYSICALDRIVE15	0	1
6			
0x00000008	\\.\PHYSICALDRIVE16	0	1
7			

