Working with Clustered Shared Volumes on a Windows Server 2012, 2012 R2 or 2016 Host

The first three workflow tasks should be completed before beginning the other items that this section is focused on configuring. There are two methods that will be shown, (1) Using Graphical User Interfaces (GUI) for the FlashArray and Windows Server Disk Management and (2) Using Windows PowerShell and Pure Storage PowerShell SDK.

Steps to Create, Connect and Configure

1. Installing Multipath-IO
2. Configuring Multipath-IO
3. Setting the MPIO Policy
4. Create FlashArray Volume(s)
5. Connect FlashArray Volume(s) to a Host Group for Shared Storage (CSV)
6. Manage FlashArray Volume(s) from Windows Server Failover Cluster Manager

This section assumes that there is a Pure Storage FlashArray setup and configured with hosts and all SAN/Network fabric connectivity in place.

FlashArray Management GUI

Create FlashArray Volume(s)

The FlashArray Management interface is very simple to use. Follow the below steps to create a volume. Repeat the same actions to create a volume named ReFS (optional).

1. Create a new volume named NTFS.
Viewing the created NTFS volume.

<table>
<thead>
<tr>
<th>Connect FlashArray Volume(s) to Host (or Host Group)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Connect the NTFS volume to SERVER08.</td>
</tr>
</tbody>
</table>

Selecting the NTFS volume to connect to SERVER08.
Viewing the NTFS volume that is now connected to SERVER08.

Windows Server Disk Management

Manage FlashArray Volume(s) from Windows Server Host

1. Start Disk Management using **Start > Run > diskmgmt.msc**
2. Perform **Rescan Disks**.

3. Initialize disks by right-clicking on the Disk # and selecting **Initialize Disk**.

4. The Initialize Disk dialog will open and indicate all of the disks that need to be initialized. For this example there is Disk 1 (NTFS) and Disk 2 (ReFS) that will be initialized using GPT (Guid Partition Table). GPT is used to support disks larger than 2 TB.
5. Create a volume by right-clicking on the disk partition and selecting **New Simple Volume**.

6. The **New Simple Volume Wizard** will open, click **Next >**
7. Specify Volume Size, the default is used for use maximum size.

8. Assign Drive Letter or Path, the default is used of selecting the next available driver letter.
9. **Format Partition**, choose **NTFS** as the File system, **64K** Allocation unit size (cluster size) and set the **Volume label**.

(Optional) To create an ReFS volume choose **ReFS** as the File system.
10. Accept the settings from the wizard and click **Finish**.

The new volume(s) are now ready for use.

**Windows Server Failover Cluster Manager**

Regarding how to proceed updating the Pure code in a Clustered shared environment: If using CSVs in a Cluster, MS Cluster Manager Service manages disk connections. Therefore, when the hosts that did own a volume go offline for a reboot, it will do a heartbeat (host owner of a CSV loses its vol access) and find a new host owner on its own to online the volume, w/o manual intervention.
Create FlashArray Volume(s)

The volumes that will be used in the examples are based on the NTFS and ReFS file systems. The host that will be used is named SERVER01 and is running Windows Server 2016 with Windows PowerShell 5.0.

1. Start a new Windows PowerShell session or open the PowerShell Integrated Scripting Environment (ISE).

2. Create a connection to the FlashArray.

   ```powershell
   $FlashArray = New-PfaArray -EndPoint 10.1.1.1 -Credentials (Get-Credential) -IgnoreCertificateError
   PS C:\> $FlashArray
   Disposed   : False
   EndPoint   : 10.1.1.1
   UserName   : pureuser
   ApiVersion : 1.7
   Role       : ArrayAdmin
   ApiToken   : 58db6abf-1933-553f-1628-0c6e207aba1e
   ```

3. Create two new volumes named ReFS and NTFS.

   ```powershell
   New-PfaVolume -Array $FlashArray -VolumeName 'ReFS' -Unit T -Size 1
   New-PfaVolume -Array $FlashArray -VolumeName 'NTFS' -Unit T -Size 1
   ``
### Connect FlashArray Volume to Host (or Host Group)

1. Connect ReFS and NTFS volumes to SERVER01.

   ```powershell
   PS C:\> New-PfaHostVolumeConnection -Array $FlashArray -VolumeName 'ReFS' -HostName 'SERVER08'
   PS C:\> New-PfaHostVolumeConnection -Array $FlashArray -VolumeName 'NTFS' -HostName 'SERVER08'
   ```

<table>
<thead>
<tr>
<th>vol</th>
<th>name</th>
<th>lun</th>
</tr>
</thead>
<tbody>
<tr>
<td>ReFS</td>
<td>Server08</td>
<td>1</td>
</tr>
<tr>
<td>NTFS</td>
<td>Server08</td>
<td>2</td>
</tr>
</tbody>
</table>

   If the volumes need to be visible to a cluster of Windows Server hosts then they need to be connected to a Host Group. The following steps show how to create a Host Group, add a Host and then connect the volume to the Host Group.

   ```powershell
   PS C:\> New-PfaHostGroup -Array $f -Hosts 'SERVER08' -Name 'HOSTGROUP1'
   PS C:\> New-PfaHostGroupVolumeConnection -Array $f -VolumeName 'ReFS1' -HostGroupName 'HOSTGROUP1'
   PS C:\> New-PfaHostGroupVolumeConnection -Array $f -VolumeName 'NTFS1' -HostGroupName 'HOSTGROUP1'
   ```

<table>
<thead>
<tr>
<th>hosts</th>
<th>name</th>
</tr>
</thead>
<tbody>
<tr>
<td>SERVER08</td>
<td>HOSTGROUP1</td>
</tr>
<tr>
<td></td>
<td>HOSTGROUP1</td>
</tr>
<tr>
<td></td>
<td>HOSTGROUP1</td>
</tr>
</tbody>
</table>

   ```powershell
   PS C:\>Get-PfaHostGroupVolumeConnections -Array $f -HostGroupName 'HOSTGROUP1' | Format-Table -AutoSize
   ```

<table>
<thead>
<tr>
<th>vol</th>
<th>name</th>
<th>lun</th>
</tr>
</thead>
<tbody>
<tr>
<td>ReFS1</td>
<td>HOSTGROUP1</td>
<td>254</td>
</tr>
<tr>
<td>NTFS1</td>
<td>HOSTGROUP1</td>
<td>253</td>
</tr>
</tbody>
</table>

### Manage FlashArray Volume(s) from Windows Server Host

1. Rescan/update the Windows Server host, SERVER01 to see the new volumes.

   ```powershell
   PS C:\> Update-HostStorageCache
   ```

2. View the currently connected volumes to the Windows Server host.

   ```powershell
   PS C:\> Get-Disk
   ```

<table>
<thead>
<tr>
<th>Number</th>
<th>Friendly Name</th>
<th>Serial Number</th>
<th>HealthStatus</th>
<th>OperationalStatus</th>
<th>Total Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PURE FlashArray</td>
<td>45084F3508BF461400011ACB</td>
<td>Healthy</td>
<td>Online</td>
<td>1 TB RAW</td>
</tr>
</tbody>
</table>
3. Initialize the new volumes.

Set the -Number parameter from the output of Get-Disk. The Partition Style has been updated from RAW to GPT.
4. Create a new partition.

```
PS C:\> New-Partition -DiskNumber 1 -UseMaximumSize -AssignDriveLetter

    DiskPath: \?\mpio#disk&ven_pure&prod_flasharray&rev_8888#1&7f6ac24&0&3632344139337303435303842463463335303842463436313430303131414342#{53f56307-b6bf-11d0-94f2-00a0c91efb8b}

    PartitionNumber  DriveLetter Offset                      Size Type
    ---------------  ----------- ------                      ---- ----
        2            D       135266304                     1023.87 GB Basic
```

```
PS C:\> New-Partition -DiskNumber 2 -UseMaximumSize -AssignDriveLetter

    DiskPath: \?\mpio#disk&ven_pure&prod_flasharray&rev_8888#1&7f6ac24&0&3632344139337303435303842463463335303842463436313430303131414343#{53f56307-b6bf-11d0-94f2-00a0c91efb8b}

    PartitionNumber  DriveLetter Offset                      Size Type
    ---------------  ----------- ------                      ---- ----
        2            E       135266304                     1023.87 GB Basic
```

```
PS C:\> Get-Volume

    DriveLetter FileSystemLabel FileSystem DriveType HealthStatus OperationalStatus SizeRemaining      Size
    ----------- --------------- ---------- --------- ------------ ----------------- -------------      ----
        D                             NTFS Fixed     Healthy      Unknown                     0 B       0 B
        C                             NTFS Fixed     Healthy      OK                    117.59 GB 149.51 GB
        E                             ReFS Fixed     Healthy      Unknown                     0 B       0 B
```

5. Format volumes as NTFS and ReFS.

The below examples set the AllocationUnitSize (cluster size) to 64KB.

```
PS C:\> Format-Volume -DriveLetter D -FileSystem NTFS -NewFileSystemLabel 'NTFS' -AllocationUnitSize 64KB

    DriveLetter FileSystemLabel FileSystem DriveType HealthStatus OperationalStatus SizeRemaining      Size
    ----------- --------------- ---------- --------- ------------ ----------------- -------------      ----
        D                             NTFS NTFS Fixed     Healthy      OK                    1023.7 GB 1023.87 GB
```

```
PS C:\> Format-Volume -DriveLetter E -FileSystem ReFS -NewFileSystemLabel 'ReFS' -AllocationUnitSize 64KB

    DriveLetter FileSystemLabel FileSystem DriveType HealthStatus OperationalStatus SizeRemaining      Size
    ----------- --------------- ---------- --------- ------------ ----------------- -------------      ----
        E                             ReFS ReFS Fixed     Healthy      OK                    1018.03 GB 1023.81 GB
```

```
PS C:\> Get-Volume

    DriveLetter FileSystemLabel FileSystem DriveType HealthStatus OperationalStatus SizeRemaining      Size
```
Create Mounts Point(s) (Optional)

This is an optional step and shows how to create Partition Access Paths (mount points) for volumes.

1. Retrieve the partition details in order to see the PartitionNumber which is required for creating a PartitionAccessPath.

```powershell
PS C:\> Get-Partition

PartitionNumber  DriveLetter Offset  Size  Type
---------------  ----------- ------  ---- ----
1                  17408                        128 MB  Reserved
2                  D  135266304               1023.87 GB  Basic

PS C:\> Get-Partition

PartitionNumber  DriveLetter Offset  Size  Type
---------------  ----------- ------  ---- ----
1                  17408                        128 MB  Reserved
2                  E  135266304               1023.87 GB  Basic

PS C:\> Get-Partition

PartitionNumber  DriveLetter Offset  Size  Type
---------------  ----------- ------  ---- ----
1                  1048576                      500 MB  IFS
2                  C  525336576               149.51 GB  IFS
```

2. Create directory that will be assigned to the new volume.

```powershell
PS C:\> New-Item -Path 'C:\FlashArrayMounts\NTFS' -ItemType Directory

Directory: C:\FlashArrayMounts\NTFS
Mode LastWriteTime Length Name
---- ----------- ------ ----
d---- 5/23/2017 3:50 PM    NTFS
```
3. Add the mount points for the individual volumes. Use the PartitionNumber retrieved from Step 1 for the new drives (D and E).

```
PS C:\> Add-PartitionAccessPath -DiskNumber 1 -AccessPath 'C:\FlashArrayMounts\NTFS' -PartitionNumber 2
PS C:\> Add-PartitionAccessPath -DiskNumber 2 -AccessPath 'C:\FlashArrayMounts\ReFS' -PartitionNumber 2
``` 

4. View the new mount points.

```
PS C:\> cd C:\FlashArrayMounts\ 
PS C:\FlashArrayMounts> ls
```

Below is the view of the mount points from Windows Explorer.