Reduxio Best Practices for

Microsoft® Windows Server 2012 R2

For more information, refer to Reduxio website at http://www.reduxio.com.
If you have comments about this documentation, submit your feedback to docs@reduxio.com.

Revisions:	Descriptions
July 8, 2016	Initial version.
July 27, 2016	Added Appendix A – Manual Configuration.
Feb 27, 2017	Fixed PDF properties.

Reduxio Systems, Inc.
111 Pine Avenue
South San Francisco, CA, 94080
United States
www.reduxio.com

Contents

Overview

Introduction

Reduxio storage systems are an ideal match

Reduxio is a Microsoft® Storage Partner, and the Reduxio TimeOS™ is certified for Windows Server 2012. Reduxio storage systems are fully integrated with core Windows features - the Microsoft iSCSI Software Initiator and Microsoft MPIO (Multipath I/O). There are various settings required for proper operations as detailed below.

ALUA Support

Reduxio storage supports the Asymmetric Logical Unit Access (ALUA) standard, providing native path failover and load balancing. Microsoft DSM provided with the Windows operating system supports ALUA. No additional component is required, however minimal configuration is required to enable high-availability and load balancing for Reduxio storage.

Supported Windows Editions

The server class Windows operating systems include ALUA support and are supported:

- Windows Server 2008 R2
- Windows Server 2012, 2012 R2
- Windows Server 2016

The following client class operating systems do not include ALUA support and are not supported:

- Windows 7, 8, 8.1
- Windows 10

Note: This document is focused on Windows Server 2012 R2. However, the text applies as well to Windows Server 2016.

Configuration

Reduxio StorKit for Microsoft Windows Server (RSMS)

To simplify the configuration of Microsoft Windows Server and the Reduxio system, the Reduxio StorKit for Microsoft Windows Server provides the ReduxioWindows_HAT tool - a PowerShell-based tool that provides ability to configure the initial settings required for proper iSCSI operations with Reduxio storage, and to connect to a Reduxio system.

The steps and best practices provided in the following sections are automatically performed by ReduxioWindows_HAT, and are described here for reference only.

General Requirements

For proper operations, both iSCSI Initiator and Multipath-IO Windows features must be installed. This is performed automatically by the Reduxio StorKit for Windows

To start the iSCSI Initiator using PowerShell:

```
PS C:\> StartiSCSI
```

To install the Multipath-IO feature using PowerShell:

```
PS C:\> Install-WindowsFeature -Name Multipath-IO
```

Device Claiming

By default, iSCSI devices are not claimed by the Multipath-IO code.

To enable automatic claiming of Reduxio devices for MPIO using the command prompt:

```
PS I:\> mpclaim -n -i -d "REDUXIO TCAS"
Success, reboot required.
```

Load Balancing Policy

The recommended load balancing policy for the Reduxio system is Round-Robin With Subset. This policy performs round-robin on the Active/Optimized paths. The other paths will be tried on a round-robin basis if all Active/Optimized paths will fail.

To set the default load balancing policy to Round-Robin using PowerShell:

```
PS C:\> Set-MSDSMGlobalDefaultLoadBalancePolicy -Policy RR
```

Required Registry Settings

Table 1 describes the Windows Registry settings required for proper high availability operations with Reduxio systems.

Table 1 – Required Windows Registry settings

Key	Value	Explanation
NewPDORemovePeriod	360	Specifies a physical device object (PDO) removal period, in seconds. This period is the length of time the server waits after all paths to a PDO have failed before it removes the PDO.
NewPathVerificationPeriod	30	Specifies a path verification period, in seconds. This is the length of time for the server to verify every path. This parameter is not relevant unless the path verification state has a value of Enabled.
NewRetryCount	120	Specifies the number of times to retry an I/O request.
NewRetryInterval	3	Specifies a retry interval, in seconds. This is the length of time after which the server retries a failed I/O request.
NewDiskTimeout	60	Specifies the disk timeout value, in seconds. This value is the length of time the server waits before it marks the I/O request as timed out.
LinkDownTime	90	This value determines how long requests will be held in the device queue and retried if the connection to the target is lost.
MaxRequestHoldTime	90	Maximum time (in seconds) for which requests will be queued if connection to the target is lost and the connection is being retried. After this hold period, requests will be failed with "error no device" and device (disk) will be removed from the system.

To manually set the required parameters using PowerShell:

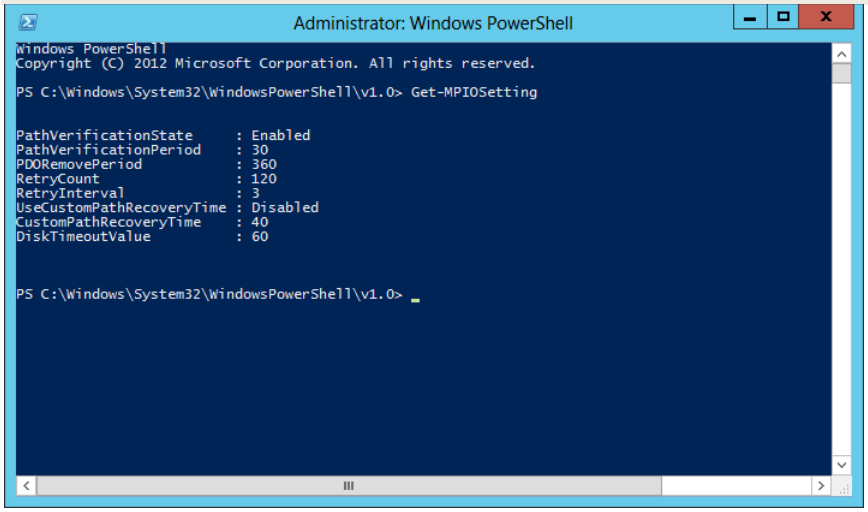
```
PS C:\> Set-MPIOSetting -NewPDORemovePeriod 360 PathVerificationState Enabled \
-NewPathVerificationPeriod 30 -NewRetryCount 120 -NewRetryInterval 3 -NewDiskTimeout 60
PS C:\> $R = "HKLM:\SYSTEM\CurrentControlSet\Control\Class\{4d36e97b-e325-11ce-bfc1-
08002be10318}"
PS C:\> New-ItemProperty -Path "Registry::\$R" -Name LinkDownTime -Value 90 -Force
PS C:\> New-ItemProperty -Path "Registry::\$R" -Name MaxRequestHoldTime -Value 90 -Force
```

Validation

Validate Registry Settings

To validate the settings using PowerShell:

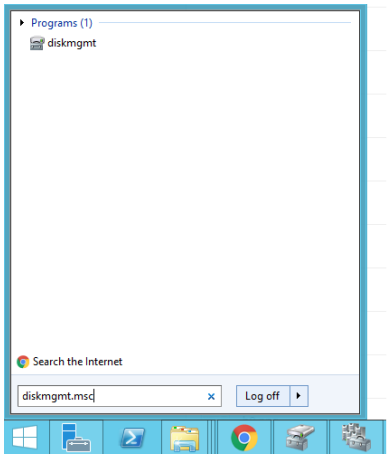
```
PS C:\> Get-MPIOSetting
```

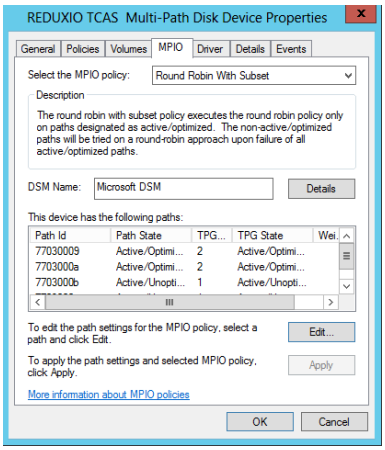


Get-ItemProperty "hklm:\SYSTEM\CurrentControlSet\Services\msdsm\Parameters"

Validate Multipath IO

To validate that multipathing is working as expected:

1. Identify an attached Reduxio disk	1. Click the Start button and search for diskmgmt.msc.  2. Right-click the left side of the Reduxio disk > Properties.

2. Review MPIO settings	1. Select the MPIO tab.  2. Validate that there are at least two Active/Optimized and two Active/Unoptimized paths.

Conclusion

The Reduxio StorKit for Microsoft Windows Server provides a PowerShell script to configure best practice settings required for proper high availability in Windows Server environments. It is important to perform these changes in hosts connected to Reduxio.

Reduxio Documentation

- Reduxio Support Portal - *Reduxio TimeOS™ Administration Guide*

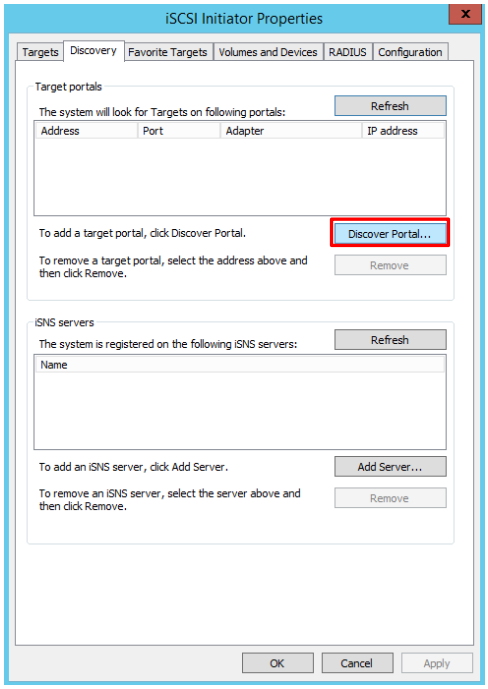
Microsoft Documentation

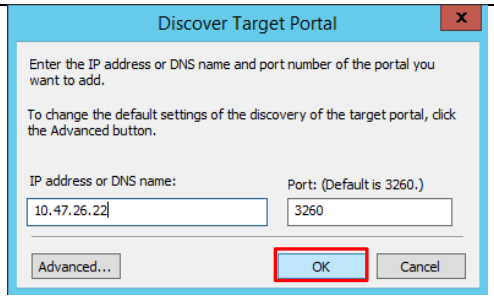
- TechNet - Microsoft Multipath I/O Step-by-Step Guide
- MSDN Blog - Updated Guidance on Microsoft MPIO Settings
- TechNet - Set-MPIOSetting

Appendix A – Manual Configuration

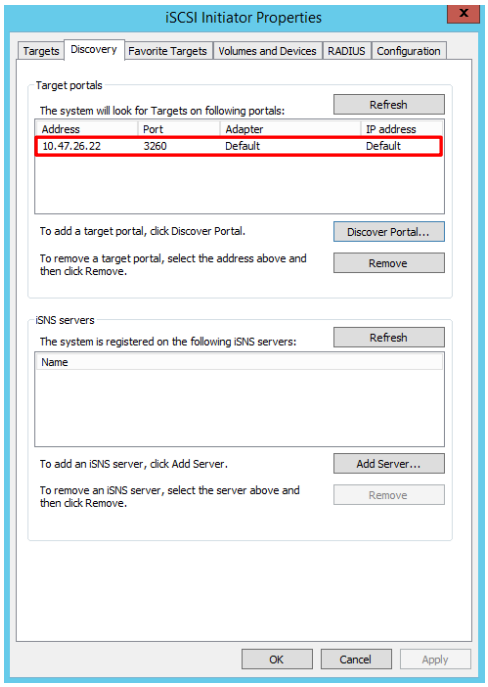
Manual Multipath Configuration

Multipath configurations are applied through the Reduxio StorKit script. To manually configure multipathing, perform the following steps:

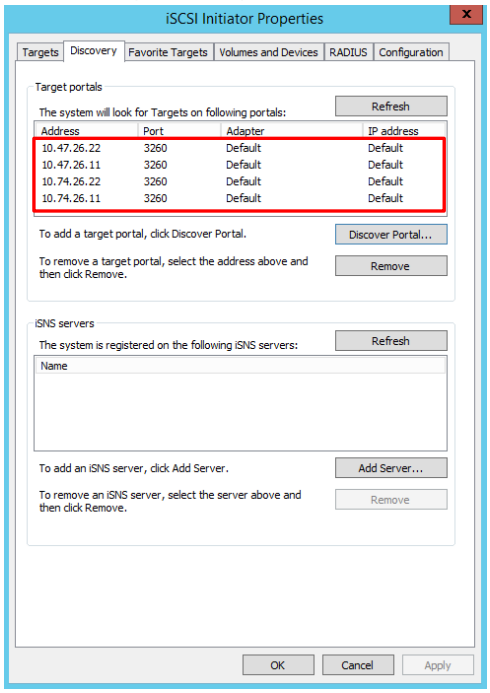
1. **Identify the Reduxio iSCSI IP addresses**	To locate the data interface IP addresses using Reduxio Storage Manager: 1. Select SETTINGS.  2. Select NETWORK CONFIGURATION. 3. Four iSCSI IP addresses are listed in the CONTROLLER 1 & 2, PORT 1 & 2 fields. 
2. **Configure iSCSI Initiator**	To initially configure iSCSI initiator on a windows 2012 R2 server or higher, connect using RDP to the server you would like to connect to Reduxio storage using RDP and Perform the following: 1. Open Control Panel > iSCSI Initiator 2. Click the **Discovery** tab and click **Discover Portal.**  3. Enter the first target's data IP you've discovered in the previous step and click **OK.**



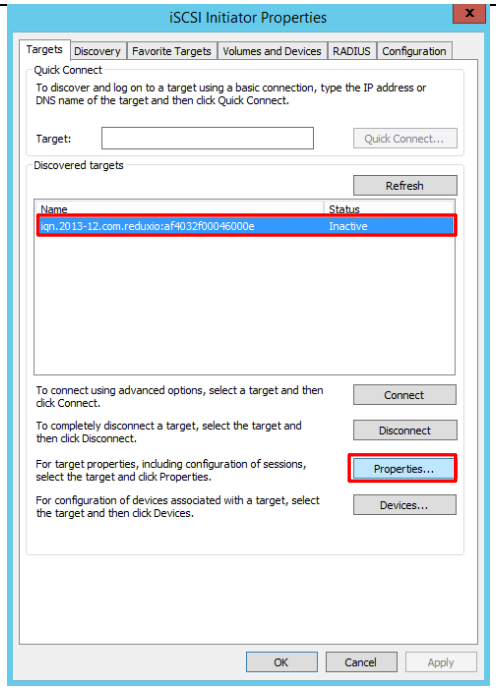
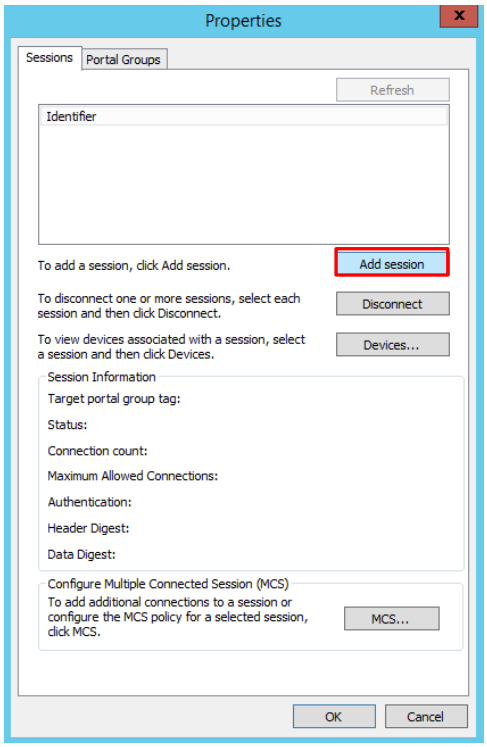
4. Notice that a new target was added to **Target portals**.

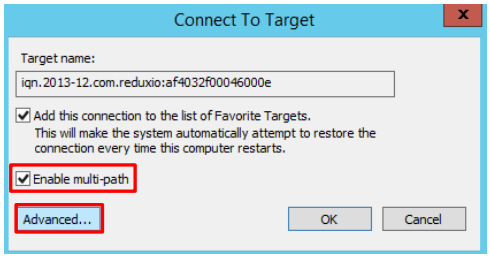


5. Repeat steps 3-4 for additional three target's data IPs.
6. After completion you'll see the following:

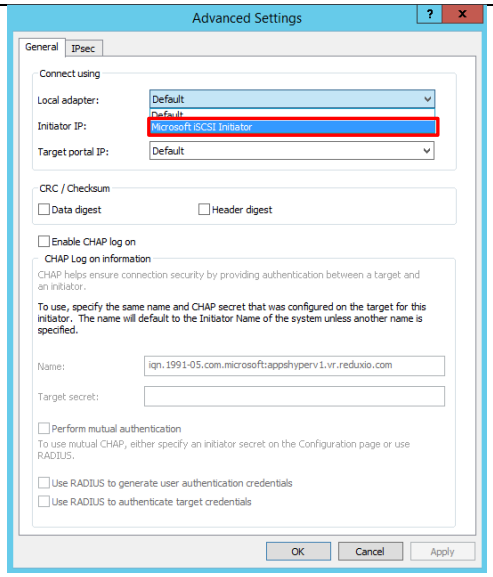


7. Navigate to **Targets** tab, click the discovered target > **Properties**.

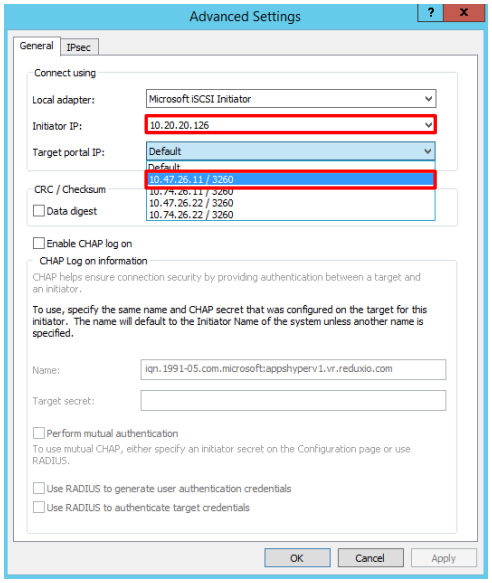
<table>
<tr>
<td></td>
<td> 
</td>
</tr>
<tr>
<td>3. Configure Multipathing</td>
<td>1. Click Add session.
 

2. Check Enable multi-path and click Advanced.
 

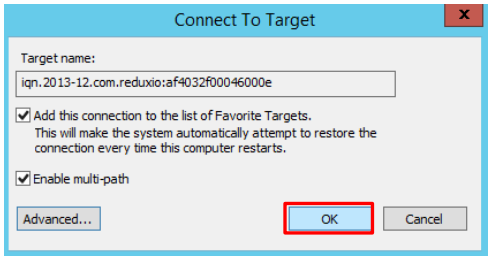
3. In Local Adapter choose Microsoft iSCSI Initiator.</td>
</tr>
</table>



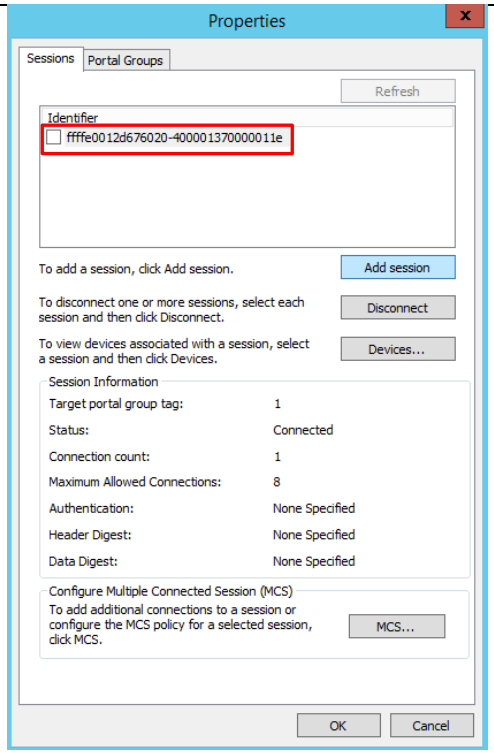
4. In **Initiator IP** choose **your** first ISCSI NIC.
5. In **Target portal IP** Choose **the first IP** and click **OK.**



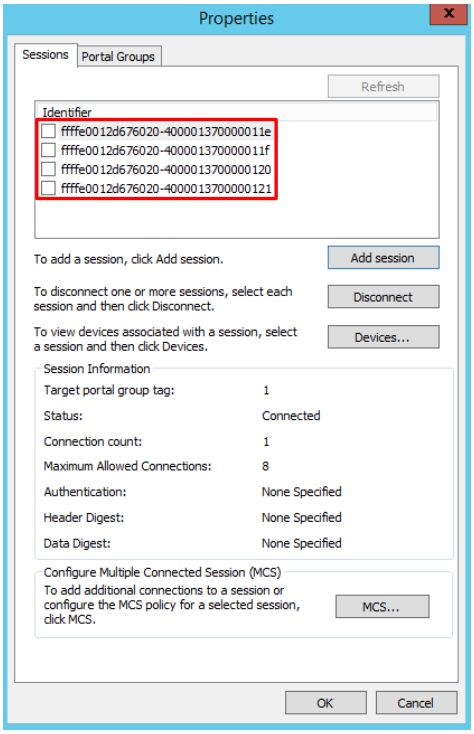
6. Click **OK.**



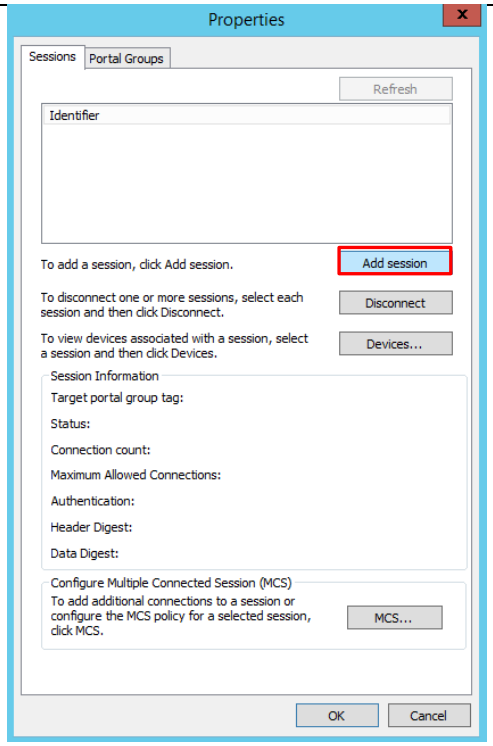
7. After clicking **OK** you'll see the following:



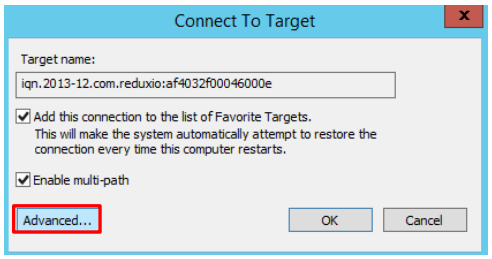
8. Repeat steps 9-14 for the other three target's data IP for the **first ISCSI NIC**. (Initiator IP stays the same while target portal IP is changing every time for a different data IP).
9. After completion you'll see four sessions:



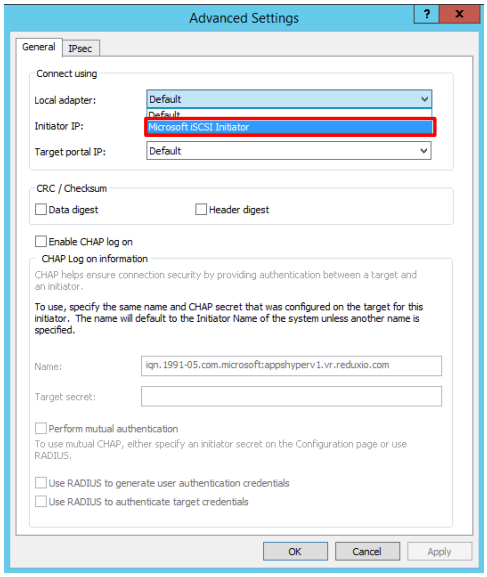
10. Click **Add session.**



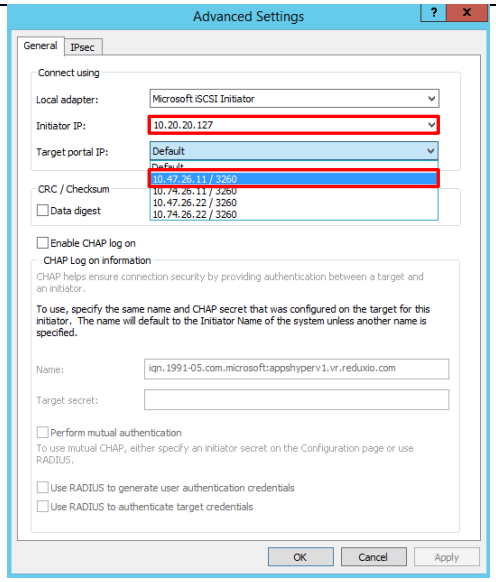
11. Check **Enable multi-path** and click **Advanced.**



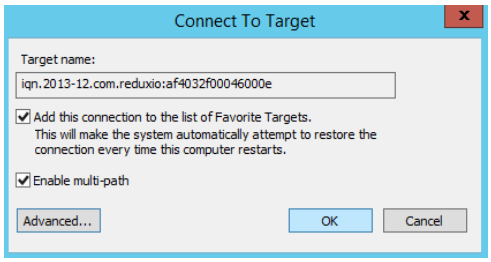
12. In **Local Adapter** choose **Microsoft iSCSI Initiator.**



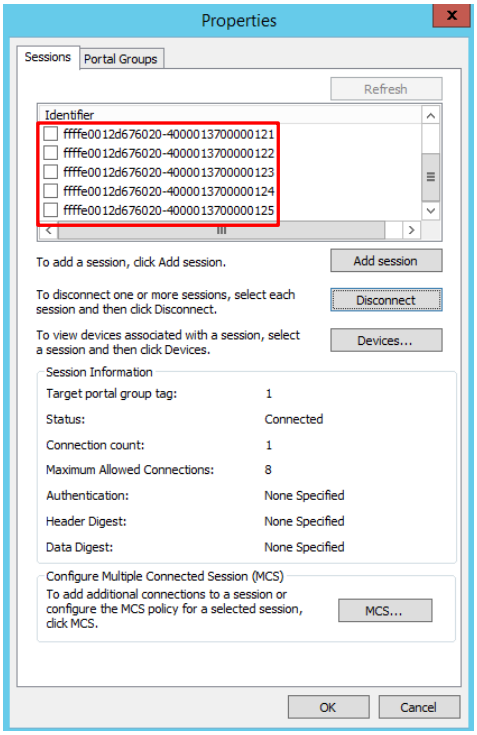
13. In **Initiator IP** choose **your second ISCSI NIC.**
14. In **Target portal IP** Choose **the first IP** and click **OK.**



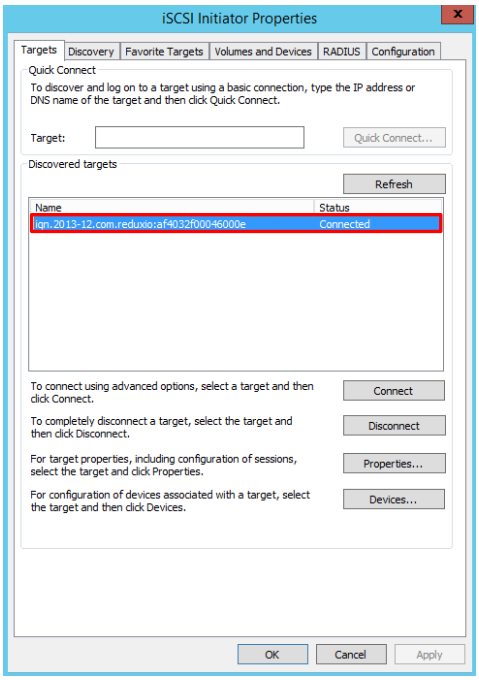
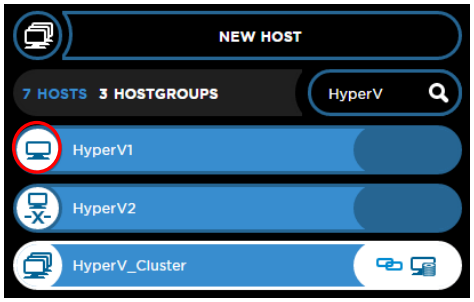
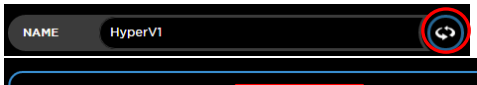
15. In **Target portal IP** Choose **the first IP** and click **OK**.



16. Repeat steps 18-23 for the other three target's data IP for the second ISCSI NIC. (Initiator IP stays the same while target portal IP is changing every time for a different data IP).
17. After completion you'll see eight sessions.



18. Click **OK**.

4. Validating Multipathing Connection	1. Notice that the status has Changed to "**Connected**".  2. Connect to Reduxio Storage Manager. 3. Select **HOSTS & VOLUMES** icon in the icon bar.  4. Search the server defined with the multipathing configuration and enter its properties. 5. Notice that the server we defined appears as connected.  6. Click **SESSIONS**.  

	7. Notice that all eight sessions are available from this screen.