Using IPv6 with Dell Storage PS Series Arrays

Dell Engineering
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A Dell Best Practices Guide
Revisions

<table>
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<th>Date</th>
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<tr>
<td>January 2016</td>
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Executive summary

The purpose of this guide is to provide experienced storage administrators with a single source for information regarding the usage of Dell™ Storage PS Series arrays and host side software in an IPv6 environment.

Audience

This documentation is designed for administrators experienced with and responsible for managing PS Series arrays.

1 IPv6 support in PS Series array firmware

IPv6 is fully supported with Dell PS Series arrays for use with the iSCSI protocol.

This section provides important information for using IPv6 with PS Series arrays.

1.1 Current limitations

These limitations apply to the use of IPv6 with the PS Series array:

- On arrays with versions of firmware prior to version 9.0 the dedicated management network can only be configured with IPv4, not IPv6.
- If joining a new member to an existing IPv6-only group, specify the IPv6 option with the CLI setup command (for example setup ipv6).
- The iSNS client used with PS Series groups does not support IPv6.
- Replication is supported between partners as long as they use a common Internet Protocol:
  - If one partner uses only IPv4 or only IPv6 and the other uses a combination of IPv4 and IPv6, replication is supported. This setup means that one partner has only one IP protocol configured, and the other has both the IPv4 protocol and IPv6 protocol configured. The partners will replicate using the protocol common to both.
  - If one partner uses only IPv4 and the other uses only IPv6, replication is not supported.

- IPv6 IP addresses are not currently supported for volume access controls.
  - Creating a basic access point or an access policy with an IPv6 address is not currently supported.
  - Instead, create basic access points and access policies using the initiator name or a CHAP account.

- The Group Manager GUI cannot be used to configure IPv6 networking, The CLI must be used.

This OS limitation applies to the use of IPv6 with iSCSI:

- IPv6 Windows 2008 initiators will not connect using jumbo frames.

In IPv6 environments using Intel X520/X540 CNAs and jumbo frames, Windows 2008 initiators will not connect. This is due to the IPv6 extension header being greater than 256 bytes. Dell recommends disabling the checksum offload on the Intel X520/X540 CNAs because of the 256-byte limit.
1.2 Configuring a new group for IPv6

Configuring a new PS Series array that will use IPv6 must be performed from the CLI using a serial connection, and not with the Remote Setup Wizard tools.

In the following sections references are made to several PS Series firmware CLI commands. Additional information on these commands, and others, can be found in the Dell EqualLogic Group Manager CLI Reference Guide.

1.2.1 Connecting to the array using the serial port

Set up a serial connection to the array, as appropriate for the control module model. Make the connection to the serial port on the active control module (the ACT LED will be green). The serial connection must have the following characteristics:

- 9600 baud
- 1 STOP bit
- No parity
- 8 data bits
- No hardware flow control

Any serial port terminal program can be used for the connection.

1.2.2 Configuring the array

1. When connected to the array, press [Enter] and log in to the default group administration account with the username grpadmin and password grpadmin.

2. Enter CLI commands at the command prompt.

   By default a member that is not configured automatically runs the setup script. This default version of the setup script only accepts IPv4 addresses.

3. Enter n at the setup prompt to cancel the default IPv4 setup, and then enter the command setup ipv6 to configure for IPv6 address.

An IPv6 setup includes the following differences:

- You do not have to enter an IP address for the network interface (eth0). Your router broadcasts available addresses (shown during the setup) and the network interface uses one of those addresses.
- No subnet mask is required or applicable for IPv6.
- When creating a new group or specifying the group that a member will join, enter the group IP address in IPv6 format (for example, fc00::abc1:def2:cba3:fed4) instead of IPv4 format (for example, 192.0.2.33).
1.2.3 Example configuration

> setup ipv6

Group Manager Setup Utility
The setup utility establishes the initial network and storage configuration for a storage array and then configures the array as a member of a new or existing group of arrays.

For help, enter a question mark (?) at a prompt.

Do you want to proceed (yes | no) [no]: yes

Initializing. This may take several minutes to complete.
Enter the network configuration for the array.

Member name []: member1
Network interface [eth0]:
Acquiring dynamic addresses on interface eth0...
IPv6: name[eth0] addr[fe80:2::50d4:f757:9006:f0f0]
IPv6: name[eth0] addr[fc00::50d4:f757:9006:f0f0]
IP address for network interface []: [Enter]

Initializing interface eth0. This may take a minute.....

Enter the IP address and name of the group that the array will join.

Group name []: v6group
Group IP address []: fc00::2402:abc1:def2:cb3:fed4
Searching to see if the group exists. This may take a few minutes.

Attempting to connect to the group with IPsec...
Attempting to connect to the group without IPsec...

The group does not exist or currently cannot be reached. Make sure you have entered the correct group IP address and group name.

Do you want to create a new group (yes | no) [yes]: yes

Group Configuration

Group Name: v6group
Group IP address: fc00::2402:abc1:def2:cb3:fed4

Do you want to use the group settings shown above (yes | no) [yes]: yes
Password for managing group membership:**********
Retype password for verification:**********
Password for the default group administration account:**********
Retype password for verification:**********
Saving the configuration...
Waiting for configuration to become active.....

Group v6group has been created with one member.
Use the Group Manager GUI or CLI to set the RAID policy for the member. You can then create a volume which a host can connect to using an iSCSI initiator.

To access the Group Manager GUI, specify http://group_ip_address in a Web browser window. To access the CLI, use telnet or SSH to connect to the group IP address from a remote terminal, or attach a console terminal directly to a serial port on a group member's active control module. See the Dell EqualLogic Group Manager Administrator's Manual for more information.

v6group>

1.3 Adding a member to an existing IPv6 group
When adding a member to an existing group, the new member must use the same protocol as the existing group. A new member is added to an existing group using the same setup tools used for configuring a new group. If the member is joining an IPv6 only group, then specify the IPv6 option with the command setup ipv6 from the CLI, and provide the group name and IPv6 group IP address of the existing group when prompted. The remainder of the process is identical to the process for IPv4, except assigning the IPv6 IP address to the individual controller network ports, which is usually handled by the network infrastructure.

1.4 Configuring IPv6 on an existing IPv4 group
An existing PS Series group configured for IPv4, can be configured to also use IPv6. If SAN management has been configured to use the dedicated management ports, and the firmware is prior to version 9.0, it must currently continue to use IPv4.

PS Series arrays natively run both IPv4 and IPv6 stacks, with the IPv6 implementation being designed to use the IPv6 Stateless Address Autoconfiguration with 64bit prefixes. Therefore, the only changes required on the array, assuming a properly configured network, is the setting of a stateful IPv6 group and group management IP addresses.

If the preference is to use stateful IPv6 addresses on all controller network ports, see section 1.4.1 “Setting stateful IPv6 addresses on controller network ports” should be completed prior to setting the IPv6 group address as described in section 1.4.2. Adding IPv6 support to an existing IPv4 group involves two steps. First, enabling IPv6 on all controller network ports used for iSCSI and then setting an IPv6 group IP address. Optionally the IPv4 address used for the group IP address and controller network ports can be removed.
1.4.1 Setting stateful IPv6 addresses on controller network ports
If stateful IPv6 addresses are preferred for the controller network ports, then these IPv6 addresses should be assigned to all controller network ports in the group prior to setting the group IPv6 addresses.

To configure stateful IPv6 addresses in a controller network port, use the following command:

```
member select member_name eth select port_number ipv6address ip_address
```

**Note:** When using stateful IPv6 addresses, all network controller ports on all group members must be configured with stateful IPv6 address prior to setting an IPv6 group address.

1.4.2 Setting the IPv6 group address
The group IP address is used for iSCSI initiator access to volumes and group management. A group can have both an IPv4 and an IPv6 group address.

To specify an IPv6 group IP use the following command:

```
grpparams group-ipv6address ip_address
```

1.4.3 Setting the IPv6 management group address
In some environments array management is placed in a separate management network. The result is an array that has both a group IP address, for iSCSI access, and a group management IP address, for day to day array management.

To specify an IPv6 management group IP, use the following command:

```
grpparams management-network ipv6address ip_address
```

To view the currently configured management group IP, use the following command:

```
grpparams management-network show
```

**Note:** An IPv6 management group IP can only be configured on arrays running firmware version 9 or later.

1.4.4 Removing IPv4 addresses
PS Series arrays natively run both IPv4 and IPv6 stacks, and there is no requirement to remove IPv4 settings once an IPv6 group address has been assigned. If the preference is that a group is only accessible using an IPv6 group address, then the IPv4 address can be removed.

However, if the group IPv4 address is removed while connections are open, users or initiators that become disconnected will not be able to reconnect to the original IPv4 address. If initiators are configured statically with the group IPv4 address, you will need to update the iSCSI initiators with the new group IPv6 address information. However, if initiators are configured to find targets dynamically, they can rediscover
the targets if the computer running the initiator and the group use a common Internet Protocol to perform discovery and log in to a target.

To delete the IPv4 group IP address use the following command:

```
grpparams group-ipaddress none
```

To delete the IPv4 management group IP address use the following command:

```
grpparams management-network ipaddress none
```

To remove the IPv4 address from an individual controller network port use the following command:

```
member select member_name eth select port_number ipaddress none
```

**Note:** You cannot delete an IPv4 group IP address unless the group has an IPv6 group IP address configured.

### 1.5 IPv6 only commands

**Ping6:** An IPv6 version of the ping CLI command for verifying connectivity from an array to other hosts on the IPv6 network.

### 1.6 Replication

Replication is supported between partners as long as they use a common Internet Protocol.

- If both partners are using only IPv4 addressing or only IPv6 addressing, replication is supported. This setup means that each partner has only one group IP address configured and their addresses use the same protocol.
- If one partner uses only IPv4 or only IPv6 and the other uses a combination of IPv4 and IPv6, replication is supported. The partners will replicate using the protocol common to both.
- If one partner uses only IPv4 and the other uses only IPv6, replication is not supported.
2 IPv6 support in Host Integration Toolkits

At the time of publishing this document, the following support for IPv6 with Host Integration Tools for Microsoft, Linux and VMware was available. More recent versions of these Host Integration Tools may include IPv6 support.

2.1 Toolkits supported with IPv6

The remainder of this section is a list of software and support statuses at the time of publishing this document.

2.1.1 Host Integration Tools for Microsoft v4.8.0

- Auto-Snapshot Manager
  - Yes
- MPIO
  - Yes
- PowerShell
  - Some cmdlets support only IPv4 addresses while others support either IPv4 or IPv6. The cmdlets handle IPv4 and IPv6 correctly as long as the values entered are enclosed in quotes.
  - When listing host names, specify the host IP address, host name, fully qualified domain name, or IPv6 address. If you are specifying an IPv6 address, enter the address as follows:
    > Change all the "::" characters to "-" characters.
    > If there is a "%" character, change it to "s".
    > Add ".ipv6-literal.net" to the end.
    > For example, an address of fe80::2c02:db79%8 must be entered as fe80-2c02-db79s8.ipv6-literal.net.
  - Remote Setup Wizard
    - Not supported at this time, direct connect and use the CLI.

2.1.2 Host Integration Tools for Linux v1.4.0

- Auto-Snapshot Manager
  - Yes
- MPIO
  - Yes, but not supported with Broadcom iSCSI off load adaptors
• RSW
  - Only IPv4 addresses are supported.

2.1.3 VMware Integration
• Virtual Storage Manager for VMware v4.5.2
  - No
• Storage Replication Adapter for VMware Site Recovery Manager v2.2.1
  - No
• Multipathing Extension Module for VMware vSphere 1.3
  - No
• Adapter for VMware vCenter Operation Manager 1.1
  - No

2.1.4 Other PS Series tools
• Dell Storage Update Manager v1.4
  - Dell Storage Update Manager cannot communicate with IPv6-only groups.
• SAN Headquarters v3.1
  - Group name resolution requires an active DNS server for IPv4 and, if your groups are configured for IPv6, an active DNS server for IPv6.
  - The SAN HQ infrastructure requires name resolution provided by the IPv6 SAN server. Host name file resolution is not supported.
  - To ensure full SupportAssist functionality, you must have IPv4 enabled on the SAN HQ server.
  - When adding a group to the monitoring list, you cannot use a local IPv6 address as the group network address. Instead, use a globally-scoped address that is set statically or dynamically.
• Manual Transfer Utility
  - The Manual Transfer Utility (MTU) includes support for IPv6 through the MTU CLI.
3 OS support
The following major operating systems added support for iSCSI over IPv6 in the following releases:

- Microsoft® Windows® 2008 and later
- Red Hat® Enterprise Linux® 5 and later
- VMware vSphere® ESXi™ 6, with experimental support in ESXi 4.x and 5.x. See KB1021769

Refer to the OS vendor for the most recent statement of support for IPv6, recommended releases, and patches or hotfixes.
A  Technical support and resources

Dell.com/support is focused on meeting customer needs with proven services and support.

For additional support information on specific array models, see the following table.

<table>
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<tr>
<th>Dell Storage</th>
<th>Online support</th>
<th>Email</th>
<th>Phone support (US only)</th>
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<tr>
<td>SC Series and Compellent</td>
<td><a href="https://customer.compellent.com">https://customer.compellent.com</a></td>
<td><a href="mailto:support@compellent.com">support@compellent.com</a></td>
<td>866-EZ-STORE (866-397-8673)</td>
</tr>
<tr>
<td>SCv Series</td>
<td><a href="http://www.dell.com/support">http://www.dell.com/support</a></td>
<td>Specific to service tag</td>
<td>800-945-3355</td>
</tr>
<tr>
<td>XC Series</td>
<td><a href="http://www.dell.com/support">http://www.dell.com/support</a></td>
<td>Specific to service tag</td>
<td>800-945-3355</td>
</tr>
<tr>
<td>PS Series (EqualLogic)</td>
<td><a href="http://eqlsupport.dell.com">http://eqlsupport.dell.com</a></td>
<td><a href="mailto:eqlx-customer-service@dell.com">eqlx-customer-service@dell.com</a></td>
<td>800-945-3355</td>
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Dell TechCenter is an online technical community where IT professionals have access to numerous resources for Dell software, hardware and services.

Storage Solutions Technical Documents on Dell TechCenter provide expertise that helps to ensure customer success on Dell Storage platforms.