

Dell EMC Unity™ Family

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Configuring High Availability

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Dell EMC
Hopkinton, Massachusetts 01748-9103
1-508-435-1000 In North America 1-866-464-7381
www.DellEMC.com

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Additional resources

As part of an improvement effort, revisions of the software and hardware are periodically released. Therefore, some functions described in this document might not be supported by all versions of the software or hardware currently in use. The product release notes provide the most up-to-date information on product features. Contact your technical support professional if a product does not function properly or does not function as described in this document.

Where to get help

Support, product, and licensing information can be obtained as follows:

Product information

For product and feature documentation or release notes, go to Unity Technical Documentation at: www.emc.com/en-us/documentation/unity-family.htm.

Troubleshooting

For information about products, software updates, licensing, and service, go to Online Support (registration required) at: <https://Support.EMC.com>. After logging in, locate the appropriate **Support by Product** page.

Technical support

For technical support and service requests, go to Online Support at: <https://Support.EMC.com>. After logging in, locate **Create a service request**. To open a service request, you must have a valid support agreement. Contact your Sales Representative for details about obtaining a valid support agreement or to answer any questions about your account.

Special notice conventions used in this document



Indicates a hazardous situation which, if not avoided, will result in death or serious injury.



Indicates a hazardous situation which, if not avoided, could result in death or serious injury.



Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.



Addresses practices not related to personal injury.

Note

Presents information that is important, but not hazard-related.

Additional resources

CHAPTER 1

Configure High Availability using Unisphere

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Link aggregation (physical deployments only)

The storage system provides network high availability or redundancy by using link aggregation. With link aggregation, there can be two to four Ethernet port combinations in one logical link. Each storage processor (SP) must have the same type and number of Ethernet ports. The loss of a network connection does not initiate failover to the peer SP, avoiding an outage. The switch automatically moves traffic to the remaining ports in the link aggregation if the path to one port fails. When the connection is restored, the switch adds the failed port back to the link aggregation group and resumes use of the port. You can aggregate ports that are on the same IO module, different IO modules, or you can aggregate IO module and onboard Ethernet ports together (such as the onboard 10GbE BaseT port with the 10GbE Optical CNA ports). Link aggregation also allows the system to load-balance host traffic, providing better performance.

Ports must have the same MTU size in order to be aggregated. Linked ports must connect to the same logical switch, and the switch must be configured to use the IEEE 802.3ad standard Link Aggregation Control Protocol (LACP). Link Aggregation should also be configured at the host level to provide resiliency against port or cable failures. Depending on the vendor, this may also be referred to as trunking, bonding, or NIC teaming. Refer to your switch vendor's documentation for more information about using LACP.

Note

Link aggregation can only be used for NAS server, file replication, and file import interfaces; you cannot aggregate Ethernet ports that have iSCSI configured.

Link aggregation has the following advantages:

- **High availability of network paths to and from the storage system** — If one physical port of an aggregated port fails, the system does not lose connectivity.
- **Possible increased overall throughput** — This is because multiple physical ports are bonded into one logical port.
- **Load balancing across linked ports** — Network traffic is distributed between multiple physical ports.

Create a link aggregation

Aggregate two or more ports together for high availability.

Before you begin

Ports must have the same MTU size in order to be aggregated. Linked ports must connect to the same logical switch, and the switch must be configured to use the IEEE 802.3ad standard Link Aggregation Control Protocol (LACP).

Note

Link aggregation can only be used for NAS server, file replication, and file import interfaces; you cannot aggregate Ethernet ports that have iSCSI configured.

Procedure

1. Under **Settings**, select **Access > High Availability**
2. Under **Link aggregations**, select the **Add** icon.

3. Select the Ethernet ports you want to add to the link aggregation.

Change a link aggregation

Add or remove ports from a link aggregation.

Before you begin

You cannot edit a link aggregation that is already part of a fail safe network (FSN). You must first remove that link aggregation from the FSN in order to do so. You cannot remove the master/primary port from a link aggregation. You cannot add a port to the link aggregation that is already independently part of an FSN.

Ports must have the same MTU size in order to be aggregated. Linked ports must connect to the same logical switch, and the switch must be configured to use the IEEE 802.3ad standard Link Aggregation Control Protocol (LACP).

Procedure

1. Under **Settings**, select **Access > High Availability**.
2. Under **Link aggregations**, select an existing link aggregation and click the **Edit** icon.
 - a. Select a non-primary port and click the **Delete** icon to remove it from the link aggregation.

Note

Removing a port from a link aggregation with only two ports will destroy the link aggregation.

- b. Alternatively, click the **Add** icon and select a new port to add to the link aggregation.
 - c. Optionally, change the MTU size for the link aggregation (changes all ports at once).
3. Click **Apply** after each change before you make another modification.

Fail-safe networking

Learn about Fail-safe networking (FSN).

A Fail-Safe Network (FSN) is a high-availability feature that extends link failover into the network by providing switch-level redundancy. An FSN appears as a single link with a single MAC address and potentially multiple IP addresses. An FSN can be a port, a link aggregation, or any combination of the two. An FSN adds an extra layer of availability to link aggregations alone. Link aggregations provide availability in the event of a port failure. FSNs provide availability in the event of a switch failure. Each port or link aggregation is considered as a single connection. Only one connection in an FSN is active at a time. All the connections making up the FSN share a single hardware (MAC) address.

If the system detects a failure of the active connection, it will automatically switch to the standby connection in the FSN. That new connection assumes the network identity of the failed connection, until the primary connection is available again. You can designate which connection is the primary port/connection. To ensure connectivity in the event of a hardware failure, create FSN devices on multiple I/O modules or onboard ports. The FSN components are connected to different switches.

If the network switch for the active connection fails, the FSN fails over to a connection using a different switch, thus extending link failover out into the network.

When replicating from one Unity system to another, configure the FSN the same way on both systems as a best practice. You will need to manually configure the FSN on the destination before setting up replication. Otherwise, if you set up the FSN on the destination after replication is configured, you will need to use the **Override address** option to select the FSN as the interface for the destination NAS server.

Note

A NAS server IP interface should be build on the highest level logical device. If you want to repurpose a port or link aggregation currently used as a NAS server IP interface for an FSN, you will need to remove the IP interface from the NAS server, create the FSN, and reassign the IP interface to the FSN device.

Create a fail-safe network

Learn how to create a fail-safe network.

Before you begin

If you want to add a link aggregation to this FSN, be sure to create that link aggregation first.

FSN provides additional protection and redundancy over link aggregation by providing high availability in the event of a switch failure.

Procedure

1. Under **Settings**, select **Access > High Availability**
2. Under **Fail Safe Networking**, click the **Add** icon.
3. Select two or more ports to add to the Fail Safe Network. You can choose standalone ports or link aggregations, or any combination of the two.
4. Select the **Primary Port** for the FSN and click **Apply**.

Change an FSN

Learn how to add or remove links to an existing fail-safe network.

Before you begin

You cannot remove a primary port from an FSN.

Procedure

1. Under **Settings**, select **Access > High Availability**.
2. Under **Fail Safe Networking**, select the FSN for which you want to add or remove ports or link aggregations and click the **Edit** icon.
3. Select a non-primary port and click the **Delete** icon to remove it from the FSN. Alternatively, click the **Add** icon and select a new port or link aggregation to add to the FSN. Click **Apply** after each add or delete change before you make another modification.

Repurpose a NAS Ethernet port for FSN or link aggregation

Before you begin

Note

If you only have one interface currently set up for your NAS server, the host connection will experience downtime during this repurpose process.

If you have already dedicated an Ethernet port as an interface for a NAS server, but would like to repurpose it for fail-safe networking (FSN) or link aggregation (LA), you will need to deconstruct the network port, assign it to a LA or FSN, and then build the NAS server on top of the new FSN device.

Procedure

1. Remove the IP interface from the NAS server for the port you would like to use in the FSN.
2. Optionally, create the Link Aggregation to be included in the FSN.
3. Create an FSN using the desired ports and/or link aggregations.
4. Recreate the IP interface for the NAS server on top of the FSN device.

CHAPTER 2

Configure High Availability using CLI

- [Manage link aggregations](#)..... 14
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Manage link aggregations

Link aggregation lets you link physical ports (for example, port 0 and port 1) on a SP to a single logical port and therefore lets you use up to four Ethernet ports on the SP. If your system has two SPs, and you link two physical ports, the same ports on both SPs are linked for redundancy. For example, if you link port 0 and port 1, the system creates a link aggregation for these ports on SP A and a link aggregation on SP B.

Each link aggregation is identified by an ID.

Note

The cabling on SP A must be identical to the cabling on SP B, or you cannot configure link aggregation.

Link aggregation has the following advantages:

- Increases overall throughput since two physical ports are linked into one logical port.
 - Provides basic load balancing across linked ports since the network traffic is distributed across multiple physical ports.
 - Provides redundant ports so that if one port in a linked pair fails, the system does not lose connectivity.
-

Note

With link aggregation, both linked ports must be connected to the same switch and the switch must be configured to use link aggregation that uses the Link Aggregation Control Protocol (LACP). The documentation that came with your switch should provide more information on using LACP.

The following table describes the attributes for link aggregation.

Table 1 Link aggregation attributes

Attribute	Description
ID	ID of the link aggregation. The ID is a combination of the link ID and the SP that contains the linked ports.
Ports	IDs of the linked physical ports. The port names include the name of the SP that contains the ports.
SP	Name of the SP on which the ports are linked. Valid values are: <ul style="list-style-type: none"> • SPA • SPB
MTU size	Maximum transmission unit (MTU) packet size (in bytes) for the linked ports. Default is 1500 bytes per packet.
Linux device name	Linux network device name.

Table 1 Link aggregation attributes (continued)

Attribute	Description
FSN port ID	ID of the FSN port to which the link aggregation belongs, if it is part of an FSN.
Available MTU size	<p>List of available MTU sizes.</p> <hr/> <p>Note</p> <p>This displays as an interval defined by the minimum and maximum values, for example: 1280-9216.</p> <hr/>
Health state	<p>Health state of the link aggregation. The health state code appears in parentheses. Value is one of the following:</p> <ul style="list-style-type: none"> • Unknown (0) — Status is unknown. • OK (5) — Working correctly. • OK BUT (7) — Lost connection, but the link aggregation is not in use. • Degraded/Warning (10) — Working and performing all functions, but the performance may not be optimum. • Minor failure (15) — Working and performing all functions, but overall performance is degraded. This condition has a minor impact on the system and should be remedied at some point, but does not need to be fixed immediately. • Major failure (20) — Failing and some or all functions may be degraded or not working. This condition has a significant impact on the system and should be remedied immediately. • Critical failure (25) — Failed and recovery may not be possible. This condition has resulted in data loss and should be remedied immediately. • Non-recoverable error (30) — Completely failed and cannot be recovered.
Health details	Additional health information.

Create link aggregations

Create a link aggregation by linking two physical ports on an SP to create a logical port.

Format

```
/net/la create -ports <value> [-mtuSize <value>]
```

Action qualifier

Qualifier	Description
-ports	Type the IDs of the physical ports to link on the SP. Separate the IDs with a comma. For example, to link ports 0 and 1 on SPA, type: eth0_SPA,eth1_SPA.
-mtuSize	Type the MTU size (in bytes) for the linked ports. The MTU size can be set to a custom value between 1280 and 9216. Specific I/O modules may restrict allowed range for MTU size value. The MTU size values of 1500 bytes (default) and 9000 bytes (jumbo frame) are supported by all interfaces and I/O modules.

Example

The following command links port 0 and port 1 on SPA with the default MTU size. The system has two SPs, so port 0 and port 1 on SPB are also linked, which results in two link aggregation IDs:

```
uemcli -d 10.0.0.1 -u Local/joe -p MyPassword456! /net/la create -
ports "eth0_SPA,eth1_SPA"
```

```
Storage system address: 10.0.0.1
Storage system port: 443
HTTPS connection

ID = la0_SPA
ID = la0_SPB
Operation completed successfully.
```

View link aggregations

View details about link aggregations. You can filter on the link aggregation ID.

Format

```
/net/la [-id <value>] show
```

Object qualifier

Qualifier	Description
-id	Type the ID of the link aggregation.

Example

The following command shows the link aggregations on the system, in this case, for both SPA and SPB:

```
uemcli -d 10.0.0.1 -u Local/joe -p MyPassword456! /net/la show -detail
```

```
Storage system address: 10.0.0.1
Storage system port: 443
HTTPS connection

1:  ID              = spa_la_0_2
    SP              = spa
    Ports           = spa_iom_0_eth2, spa_iom_0_eth3
    FSN port ID     = None
    MTU size        = 3456
    Available MTU sizes = 1280-9216
```



```

Linux device name = bond12
Health state      = OK (5)
Health details   = "The component is operating normally.
No action is required."
Operational status =

2:  ID           = spb_la_0_2
    SP           = spb
    Ports        = spb_iom_0_eth2, spb_iom_0_eth3
    FSN port ID  = None
    MTU size     = 3456
    Available MTU sizes = 1280-9216
    Linux device name = bond12
    Health state  = OK (5)
    Health details = "The component is operating normally.
No action is required."
Operational status =

```

Change link aggregations

Change the settings of a link aggregation.

Format

```
/net/la -id <value> set [-ports <value>] [-mtuSize <value>]
```

Object qualifier

Qualifier	Description
-id	Type the ID of the link aggregation to change.

Action qualifier

Qualifier	Description
-ports	Type the IDs of the physical ports to link on the SP. Separate the IDs with a comma. For example, to link ports 0 and 1 on SPA, type: eth0_SPA,eth1_SPA
-mtuSize	Type the MTU size (in bytes) for the linked ports. The MTU size can be set to a custom value between 1280 and 9216. Specific I/O modules may restrict allowed range for MTU size value. The MTU size values of 1500 bytes (default) and 9000 bytes (jumbo frame) are supported by all interfaces and I/O modules.

Example

The following command changes the MTU size for link aggregation la0_SPA to 9000 bytes. The system has two SPs, so MTU size is updated for both link aggregation IDs:

```
uemcli -d 10.0.0.1 -u Local/joe -p MyPassword456! /net/la -id la0_SPA
set -mtuSize 9000
```

```

Storage system address: 10.0.0.1
Storage system port: 443
HTTPS connection

ID = la0_SPA

```

```
ID = la0_SPB
Operation completed successfully.
```

Delete link aggregations

Delete a link aggregation.

Format

```
/net/la [-id <value>] delete
```

Object qualifier

Qualifier	Description
-id	Type the ID of the link aggregation to delete.

Example

The following command deletes link aggregation la0_SPA. The system has two SPs, so link aggregation la0_SPB is also deleted:

```
uemcli -d 10.0.0.1 -u Local/joe -p MyPassword456! /net/la -id la0_SPA
delete
```

```
Storage system address: 10.0.0.1
Storage system port: 443
HTTPS connection
```

```
ID = la0_SPA
ID = la0_SPB
Operation completed successfully.
```

Manage Fail-safe networking (physical deployments only)

Learn about Fail-safe networking (FSN) and which attributes are used to manage FSN in the CLI.

A Fail-Safe Network (FSN) is a high-availability feature that extends link failover into the network by providing switch-level redundancy. An FSN appears as a single link with a single MAC address and potentially multiple IP addresses. An FSN can be a port, a link aggregation, or any combination of the two. An FSN adds an extra layer of availability to link aggregations alone. Link aggregations provide availability in the event of a port failure. FSNs provide availability in the event of a switch failure. Each port or link aggregation is considered as a single connection. Only one connection in an FSN is active at a time. All the connections making up the FSN share a single hardware (MAC) address.

If the system detects a failure of the active connection, it will automatically switch to the standby connection in the FSN. That new connection assumes the network identity of the failed connection, until the primary connection is available again. You can designate which connection is the primary port/connection. To ensure connectivity in the event of a hardware failure, create FSN devices on multiple I/O modules or onboard ports. The FSN components are connected to different switches. If the network switch for the active connection fails, the FSN fails over to a connection using a different switch, thus extending link failover out into the network.

When replicating from one Unity system to another, configure the FSN the same way on both systems as a best practice. You will need to manually configure the FSN on the destination before setting up replication. Otherwise, if you set up the FSN on the

destination after replication is configured, you will need to use the override option to select the FSN as the interface for the destination NAS server.

Note

A NAS server IP interface should be build on the highest level logical device. If you want to repurpose a port or link aggregation currently used as a NAS server IP interface for an FSN, you will need to remove the IP interface from the NAS server, create the FSN, and reassign the IP interface to the FSN device.

Table 2 FSN attributes

Attribute	Description
ID	ID of the Fail-Safe Networking port.
SP	Storage processor the FSN is on.
MTU size	Maximum Transmission Unit (MTU) size.
Available MTU sizes	List of available MTU sizes. Note This displays as an interval defined by the minimum and maximum values, for example: 1280-9216.
Linux device name	Name of the Linux network device.
Primary port	ID of the primary port used in the FSN. The primary port cannot be removed.
Secondary ports	Comma-separated list of the other secondary ports in the FSN. This includes both link aggregations and ethernet ports.
Active port	ID of the active port for the FSN.
Health state	The health state of the FSN. Valid values are: <ul style="list-style-type: none"> OK (5) — The FSN is operating normally, or the active port of the FSN has changed. Degraded/Warning (10) — Performance of the FSN has degraded. Minor failure (15) — An FSN port link is down. Major failure (20) — An FSN port is missing ports, or an FSN port is not symmetrical.
Health details	Detailed health information for the FSN.

Create an FSN

Use the CLI to create a fail-safe network.

Create a fail-safe network using two or more ports or link aggregations.

Format

```
/net/fsn create -primaryPort <value> -secondaryPorts <value> [-mtuSize <value>]
```

Action qualifier

Qualifier	Description
-primaryPort	Type the ID of the primary port for the FSN. This can be either an ethernet port or link aggregation.
-secondaryPorts	Type the comma-separated list of additional port or link aggregation IDs to be included in the FSN.
-mtuSize	Optionally, type the Maximum Transmission Unit size for the FSN. The MTU must be in the range allowed for all of the ports included in the FSN. The MTU size can be set to a custom value between 1280 and 9216. Specific I/O modules may restrict allowed range for MTU size value. The MTU size values of 1500 bytes (default) and 9000 bytes (jumbo frame) are supported by all interfaces and I/O modules.

Example

The following example creates an FSN where the primary port is a single ethernet port, and the secondary ports include a link aggregation and additional single ethernet port.

```
uemcli -d 10.0.0.1 -u Local/joe -p MyPassword456! /net/fsn create -primaryPort spa_eth0 -secondaryPorts "spa_la_2,spa_eth3"
```

```
Storage system address: 10.0.0.1
Storage system port: 443
HTTPS connection

ID = spa_fsn_0
ID = spb_fsn_0

Operation completed successfully.
```

View FSN settings

Review the list and details of each FSN on the system.

Format

```
/net/fsn [-id <value>] show
```

Object qualifier

Qualifier	Description
-id	Type the ID for the FSN port for which you would like to view details. Do not specify to see details for all FSNs on the system.

Example

The following example shows the details of all the FSNs on the system.

```
uemcli -d 10.0.0.1 -u Local/joe -p MyPassword456! /net/fsn show -
detail
```

```
Storage system address: 10.0.0.1
Storage system port: 443
HTTPS connection

1:  ID                = spa_fsn_0_1
   SP                = spa
   Primary port      = spa_iom_0_eth1
   Secondary ports   = spa_la_2_
   Active port       = spa_iom_0_eth1
   MTU size          = 1500
   Available MTU sizes = 1500,9000
   Health state      = OK (5)
   Health details    = "FSN port is operating normally."

2:  ID                = spb_fsn_0_1
   SP                = spb
   Primary port      = spb_iom_0_eth1
   Secondary ports   = spb_la_2_
   Active port       = spb_iom_0_eth1
   MTU size          = 1500
   Available MTU sizes = 1500,9000
   Health state      = OK (5)
   Health details    = "FSN port is operating normally."
```

Change an FSN

Make changes to an existing FSN.

Change a fail-safe network by modifying the included secondary ports or MTU sizes.

Format

```
/net/fsn -id <value> set [-secondaryPorts <value>] [-mtuSize
<value>]
```

Object qualifier

Qualifier	Description
-id	Type the ID of the FSN port.

Action qualifier

Qualifier	Description
-secondaryPorts	Type the list of full IDs of the physical ports and/or link aggregation ports for the FSN. Remove any from the list you wanted deleted from the FSN, and add any you want included.
-mtuSize	Type the new Maximum Transmission Unit (MTU) size for the FSN. The MTU must be in the range allowed for all of the ports included in the FSN. The MTU size can be set to a custom value between 1280 and 9216. Specific I/O modules may restrict allowed range for MTU size value. The MTU size values of 1500 bytes (default) and 9000 bytes (jumbo frame) are supported by all interfaces and I/O modules.

Example 1

The following example changes the MTU size of the FSN "spa_fsn_0".

```
uemcli -d 10.0.0.1 -u Local/joe -p MyPassword456! /net/fsn -d
spa_fsn_0 set -mtuSize 9000
```

```
Storage system address: 10.0.0.1
Storage system port: 443
HTTPS connection

ID = spa_fsn_0
ID = spb_fsn_0

Operation completed successfully.
```

Example 2

The following example shows an attempt to add Ethernet port "spa_iom_0_eth2" to FSN "spa_fsn_0", however this ethernet port is already in use for another link aggregation and could not be added independently to the FSN.

```
uemcli -d 10.0.0.1 -u Local/joe -p MyPassword456! /net/fsn -d
spa_fsn_0 set -secondaryPorts spa_iom_0_eth2
```

```
Storage system address: 10.0.0.1
Storage system port: 443
HTTPS connection

Operation failed. Error code: 0x6000851
One of the specified ports cannot be used to configure an FSN
because to it is already included in an FSN or link aggregation.
(Error Code:0x6000851)
```

Delete an FSN

Delete an FSN from the system.

Delete a fail-safe network.

Format

```
/net/fsn -id <value> delete
```

Object qualifier

Qualifier	Description
-id	Type the ID of the FSN port.

Example

The following example deletes FSN "spa_fsn_0"

```
uemcli -d 10.0.0.1 -u Local/joe -p MyPassword456! /net/fsn -id
spa_fsn_0 delete
```

```
Storage system address: 10.0.0.1
Storage system port: 443
HTTPS connection

ID = spa_fsn_0
ID = spb_fsn_0

Operation completed successfully.
```