

Scale-Out Functionality User Guide (rev. v3 FW v3.02.00 and after)

Important Notes:

1. The Client mode is the default mode.
2. The Scale-Out function can be setup as “Client-Server combo mode” or “Pure Server mode” of associate system.
3. Once the system has enabled the “Pure Server mode” of the Scale-Out function, all other services will be stopped.
4. It is recommended to use only identical HDD models in one NAS
5. If Auto Management is enabled, please ensure that the standby brick volume’s size is equal or greater than the size of the damaged volume
6. It is recommended to use at least two Scale-Out systems to avoid a single point of failure.
7. Resetting a Scale-Out server will erase all data.
8. “Brick” means storage volume in the context of this manual, e.g. a formatted HDD or a RAID 1, etc.
9. Even though, theoretically a scale out compound can be realized over the internet with the use of VPNs, we recommend the usage in a local network environment with at least one Gigabit of bandwidth.

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General Explanation of Scale Out

The Scale-Out function allows volume capacity to be expanded dynamically through connecting numerous independent Thecus NAS systems in the same network subnet. The most remarkable advantage concerning the Thecus Scale-Out function is that the expansion impact is minimal. Added capacity will be seamlessly integrated into the network storage, the data will be automatically redistributed to the new storage capacity and even single disks in existing NAS can be added to the scale out compound easily.

Also, since the data is distributed across devices, RAID system's redundancy becomes obsolete in many applications as the Scale-Out system offers redundancy (with the number of copies being selectable) across devices with the added advantage that data would be still accessible, even if a whole NAS unit becomes unavailable.

Scale-Out relies on a client-server architecture and it is recommended to use at least two Thecus NAS systems. One acts as a client and the other one as server. However, scale-out function can still work for single Thecus NAS device but requires at least 3 volumes.

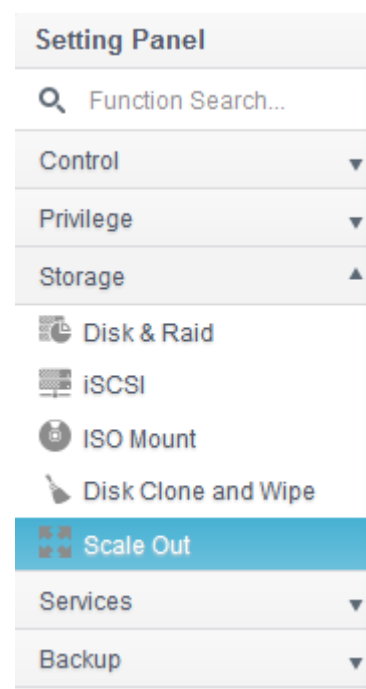
To understand better how Scale-Out works and learn how to easily set it up, let's systematically go through the steps below.

The Scale-Out function can be found under the "Storage" category in the "Setting" Panel.

First Steps and Scale-Out Mode

In this example, the Thecus N2810 and 2xN5810PRO will be used for the setting steps and actual usage. The N2810 will serve as the Scale-Out "client-server combo mode" and the other 2 units will act as Scale-Out servers.

To become the Scale-Out server, the user must have created a volume, which can be a RAID over several disks or a single disk classified as a JBOD (these creation functions are listed together in the RAID menu of the OS). The RAID volume can be created by following the standard creation procedure (please refer to the user manual) or by enabling "Auto Management", located in the advanced settings. For this sample unit we had a volume created before. Below you can find a screenshot of the RAID creation menu showing the volume status, which is a JBOD over two disks in our example case.



RAID							
Disk Spin Down Disk Security							
Create							
RAID Name	Status	Level	Disk	Capacity	File Syst...	FCK Time	FCK Status
sc01	Healthy	JBOD	1	0.00% 0.08GB / 1830.30GB	ext4		
sc02	Healthy	JBOD	2	0.00% 0.02GB / 1860.50GB	btrfs		

The system IP address is needed to let the Scale-Out client connect, so we have listed the system's IP address. The example system IP for this unit is 172.16.65.153.

Network Setting	Linking Aggregation	Quality of Service	DDNS
WAN/LAN Setting			
<input checked="" type="radio"/> WAN/LAN1	IPv4: 172.16.65.153	MAC: 00:14:fd:19:0a:a9	Edit
<input type="radio"/> LAN2	IPv4:	MAC: 00:14:fd:19:0a:aa	Edit

Now, we can continue to set the Scale-Out functional role for this candidate. The Scale-Out functions can be found under the "Storage" category. Click on Scale-Out and the settings screen will appear as below. The default status of associated system of Scale-Out function is "Uninitialized". To enable the Scale-Out function, it needs to define the Scale-Out function mode either "Client-Server combo mode" or "Pure Server mode".

To have "Client-Server combo mode" enabled, simply click on "Start Scale-Out" button and leave "Pure Server mode" check box blank or checked on box to let system become "Pure Server mode". The major different in between "Client-Server combo mode" and "Pure Server mode" is "Client-Server mode" can act client and server roles at same time, it normally used in the single NAS environment and will expand capacity later. For "Pure Server mode" it is obviously only act as server role.

NOTE

The Scale-Out "Client-Server mode" will have MASTER RAID volume of associate system remains in CLIENT mode. All other volumes will become to scale-out bricks.

The Scale-Out "Pure Server mode" will have all RAID volume of associate system become to scale-out bricks.

Scale-Out function default status: **Uninitialized**

Scale Out

Scale Out

Status	Uninitialized
Pure Server Mode ⓘ	<input type="checkbox"/> Enable
Cluster Password ⓘ	*****
Sync E-mail Notification ⓘ	Sync E-mail Notification Setting
<input type="button" value="Start Scale Out"/> <input type="button" value="Reset Scale Out"/>	

Client-Server combo mode enabled. (Pure Server mode unchecked)

Scale Out | Storage Pool | Volumes | Auto Management

Scale Out

Status	Activate
Pure Server Mode ⓘ	<input type="checkbox"/> Enable
Cluster Password ⓘ	*****
Sync E-mail Notification ⓘ	Sync E-mail Notification Setting
<input type="button" value="Stop Scale Out"/> <input type="button" value="Reset Scale Out"/>	

Pure-Server mode enabled.

Scale Out | Storage Pool | Volumes | Auto Management

Scale Out

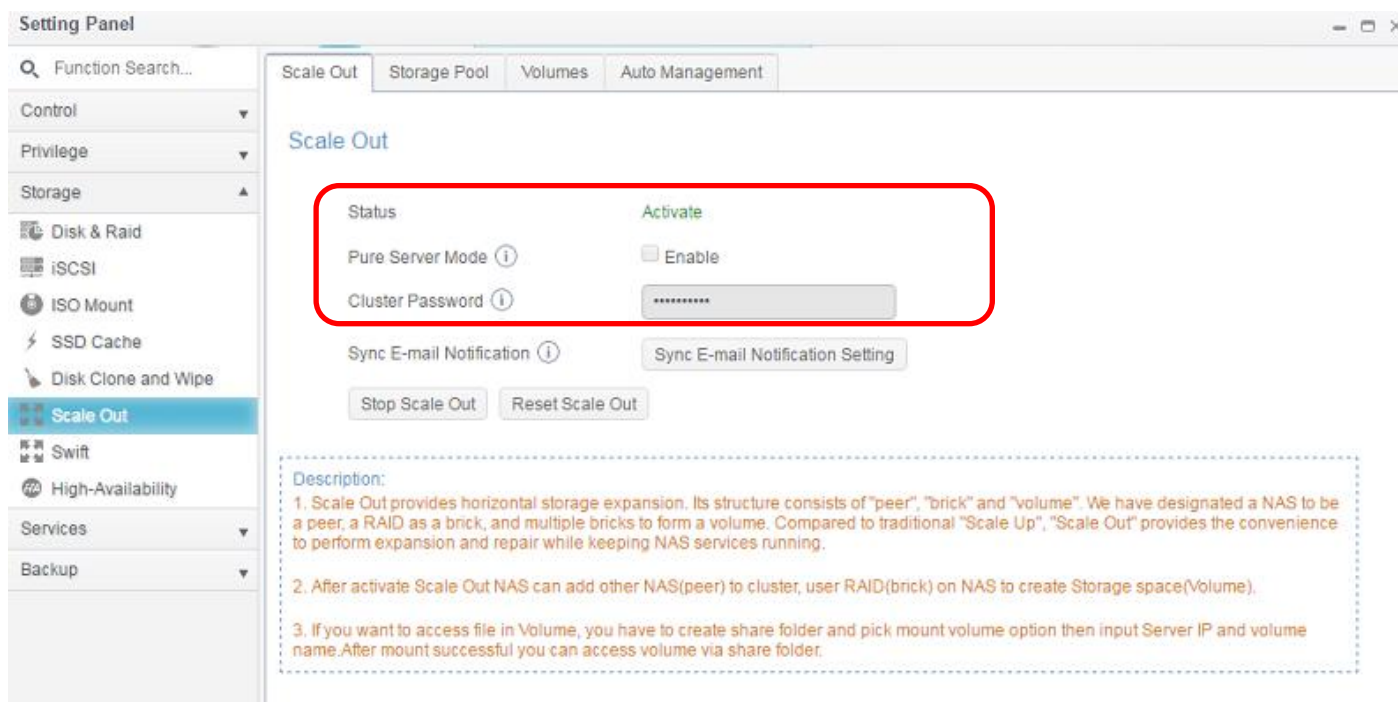
Status	Activate
Pure Server Mode ⓘ	<input checked="" type="checkbox"/> Enable
Cluster Password ⓘ	*****
Sync E-mail Notification ⓘ	Sync E-mail Notification Setting
<input type="button" value="Stop Scale Out"/> <input type="button" value="Reset Scale Out"/>	

Enabling Scale-Out

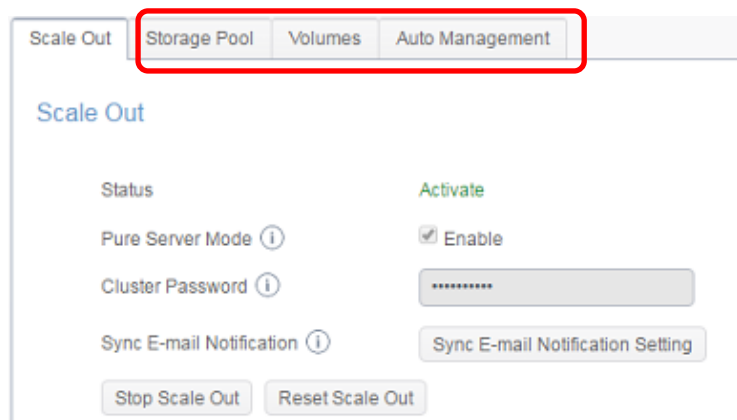
The default status of Scale-Out is uninitialized. To activate the Scale-Out function, choose the Scale-Out mode as described in the previous section and then please input a password in “Cluster Password”. Follow by clicking on the “Start Scale-Out” button. This cluster password is going to be

used for the scale-out server members to know each other and distinguish it from other Scale-Out groups.

If the Scale-Out “Pure-Server Mode” has been created, the system will log out automatically. Please login again and since the Scale-Out “Pure Server mode” has been enabled, you will notice that many functions have been disabled, such as iSCSI, samba, afp ftp, etc. If the “Client-Server mode” has selected, it can be carried on for other operations.



Once the Scale-Out function has been activated, more tabs will become available for further settings.



Storage Pool

“Storage Pool” is the tab that lists the available “Peers” for Scale-Out server members. The “Peers” can be seen as a single system. In the “Peer” information section, we can see that there is one

“Brick” available; the “Brick” can be seen as a “Volume” count of the associated system; this sample unit has 2 volumes created initially and Scale-Out has “Client-Server combo mode” selected. So the master RAID volume will keep as client mode to be used, and the other volume will become accessible to be used as a brick in Scale-Out. Look at the screenshot below for details

Setting Panel					
Scale Out Storage Pool Volumes Auto Management					
Add Peer Remove Peer Refresh					
NAS Name	IP Address	Brick Count	Pure Server Mode	Status	
N5810pm1st	172.16.65.103	1		Online	

To add more “Bricks” from other systems, click on “Add Peer”, and the system will browse the local network and list all available “Peers” to choose from. See below for a sample list:

Please Select NAS
Select NAS which you want to add into scale out cluster.

	NAS Name	IP Address	NAS Type	Version
<input type="checkbox"/>	N7770-10G	172.16.65.52	N7770-10G	3.02.00.tornado.0428.develop
<input type="checkbox"/>	N5810PRO-Alan	172.16.65.51	N5810PRO	3.02.00.tornado.0428.develop
<input checked="" type="checkbox"/>	N5810pm1st	172.16.65.103	N5810	3.02.00.tornado.0428.develop
<input type="checkbox"/>	N5810pm2nd	172.16.65.107	N5810	3.02.00.tornado.0428.develop
<input type="checkbox"/>	N2810sc	172.16.65.153	N2810	3.02.00.tornado.0428.develo...
<input type="checkbox"/>	N2350	172.16.65.102	N2350	3.02.00.tornado.0428.a385

Discover NAS
Next
Cancel

Let’s choose N5810pm1st, then click “Next”, the system will then require the admin’s password to gain permission to be added.

Add Peer

Please input admin password to add peer

X	IP Address	Admin Password	Pure Server Mode
	N5810pm1st 172.16.65.103	<input type="password"/>	<input checked="" type="checkbox"/>

Previous

Add

Cancel

Input the admin’s password of the associated system and then click the “Add” button.

Add Peer

Please input admin password to add peer

X

IP Address

Admin Password

Add Peer Success

Pure Server Mode

☒

N5810pm1st
172.16.65.103

••••••••

Add Peer Success

☒

Add Peer

Add Peer Success

Finish

The system will start to communicate with the selected candidate and display a pop-up message once the operation has been completed. Since the system will need to enable the Scale Out role at the candidate’s side, it may take a little while; therefore please be patient while the task is being completed.

Now the storage pool will have a new Peer that will join two additional bricks (from N5810pm1st with “Pure Server mode enabled) to the storage pool. Please see below.

Scale Out Storage Pool Volumes Auto Management					
Add Peer		Remove Peer		Refresh	
NAS Name	IP Address	Brick Count	Pure Server Mode	Status	
▶ N5810pm1st	172.16.65.103	2	✓	Online	
▶ N2810sc	172.16.65.153	1		Online	

Scale Out

Storage Pool

Volumes

Auto Management

Add Peer

Remove Peer

Refresh

NAS Name

IP Address

Brick Count

Pure Server Mode


Status

N5810pm1st

172.16.65.103

2

Online



No

RAID Name

Status

Disk

Capacity

1

1st01

Healthy

2

1.8 TB

2

1st02

Healthy

3


1.8 TB

N2810sc

172.16.65.153

1

Online



No

RAID Name

Status

Disk

Capacity

1

sc02

Healthy

2

1.8 TB

Let's check where these bricks have come from. Login to the just added NAS (<http://172.16.65.103>) (only in this example, your IP will differ) and check the RAID volumes and you will find that the volumes have joined the list of our Scale-Out bricks.

Setting Panel								
Function Search...		RAID Disk Spin Down						
Control		Create						
Privilege								
Storage								
Disk & Raid								
SSD Cache								
Disk Clone and Wipe								
RAID Name	Status	Level	Disk	Capacity	File Syst...	FSCk Time	FSCk Status	
✓ 1st01	Healthy	JBOD	2	0.00% 0.04GB / 1859.59GB	xfs			
1st02	Healthy	JBOD	3	0.00% 0.07GB / 1830.30GB	ext4			

For the same Scale-Out server group, members will sync their settings periodically. As you can see, the first Scale-Out sample unit **N2810@172.16.65.153** and the joined peer **N5810pm1st@172.16.65.103** have the same "Storage Pool" lists.

Setting Panel

Function Search...

Control

Privilege

Storage

Disk & Raid

ISCSI

Scale Out

Storage Pool

Volumes

Auto Management

Add Peer

Remove Peer

Refresh

NAS Name	IP Address	Brick Count	Pure Server Mode	Status
N5810pm1st	172.16.65.103	2	✓	Online
N2810sc	172.16.65.153	1		Online

Setting Panel

Function Search...

Control

Privilege

Storage

Disk & Raid

SSD Cache

Scale Out

Storage Pool

Volumes

Auto Management

Add Peer

Remove Peer

Refresh

NAS Name	IP Address	Brick Count	Pure Server Mode	Status
N2810sc	172.16.65.153	1		Online
N5810pm1st	172.16.65.103	2	✓	Online

NOTE

The System will fail to add a Peer if:

1. The selected Peer is already being used in other scale out server group.
2. The input admin password is incorrect.
3. The selected system does not support scale out function.

To remove a "Peer" from the Scale-Out server group, select the associated "Peer" then click the "Remove Peer" button, then confirm.

Scale Out

Storage Pool

Volumes

Auto Management

Add Peer

Remove Peer

Refresh

NAS Name	IP Address	Brick Count	Pure Server Mode	Status
N5810pm1st	172.16.65.103	2	✓	Online



No	RAID Name	Status	Disk	Capacity
1	1st01	Healthy	2	1.8 TB
2	1st02	Healthy	3	1.8 TB

NAS Name	IP Address	Brick Count	Pure Server Mode	Status
N2810sc	172.16.65.153	1		Online

NOTE

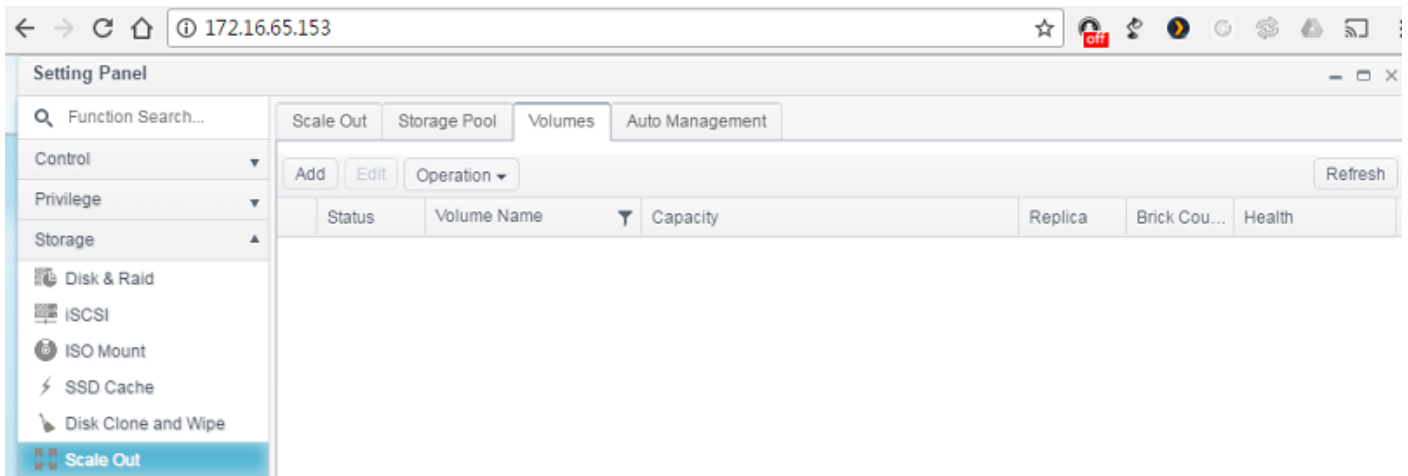
The Peer cannot be removed if it is at the localhost level.

Volumes

After the “Peer” and “Brick” setup has been completed, now we can create a “Scale-Out Volume” for Scale-Out client to connect with.

Add Scale-Out Volume:

The Scale-Out volume can be created in ANY Scale-Out server as long as it is in the same group. Let’s take our Scale-Out server with the IP <http://172.16.65.153> (example) to create a first Scale-Out volume.



Click on “Add” and the “General Settings” screen will appear as below:

Volume Setting

Please fill the setting value of volume

Volume Name

Please input volume name here

Replica

2

2

Brick Distribution Mode

Based on security

2

Advanced ▶

Group	Brick		Group Capacity
Group1	1st01	1.8 TB	1.8 TB
	sc02	1.8 TB	

Available capacity: 1.8 TB

Apply

Cancel

Steps:

1. Input Volume Name: It is going to use this name to create the shared folder.

Let's take "1stSCvolume" input as an example.

Volume Setting

Please fill the setting value of volume

Volume Name

1stSCvolume

2. Replica: This is the setting for how many data copies that are going to be created per volume group. The default value is 2. So from this example, system will automatically allocate available bricks to meet the setting, so the count is 2 (N2810 x1 and N5810pm1st x1) and form Group1. If using the default value 3, then this volume will have 2 groups and each group having 3 data copies.

Volume Setting

Please fill the setting value of volume

Volume Name

1stSCvolume

Replica

2

2

Brick Distribution Mode

Based on security

2

Advanced ▶

Group	Brick		Group Capacity
Group1	1st01	1.8 TB	1.8 TB
	sc02	1.8 TB	

If set replica value 3, then this volume will have 3 data copies as system allocated bricks as shown below (N2810 x1 and N5810pm1st x2).

Volume Setting

Please fill the setting value of volume

Volume Name

Replica

Brick Distribution Mode

Group	Brick	Group Capacity
Group1	1st01	1.8 TB
	1st02	1.8 TB
	sc02	1.8 TB

If set replica value 4, then the volume is unable to be created and no group will be listed.

Volume Setting

Please fill the setting value of volume

Volume Name

Replica

Brick Distribution Mode

Group	Brick	Group Capacity
-------	-------	----------------

Please note, the total available bricks is 3 (N2810 x1 “Client-Server combo mode” and N5810pm1st x2 “Pure Server mode”). So to have replica value greater or equal 4 then added additional bricks are required.

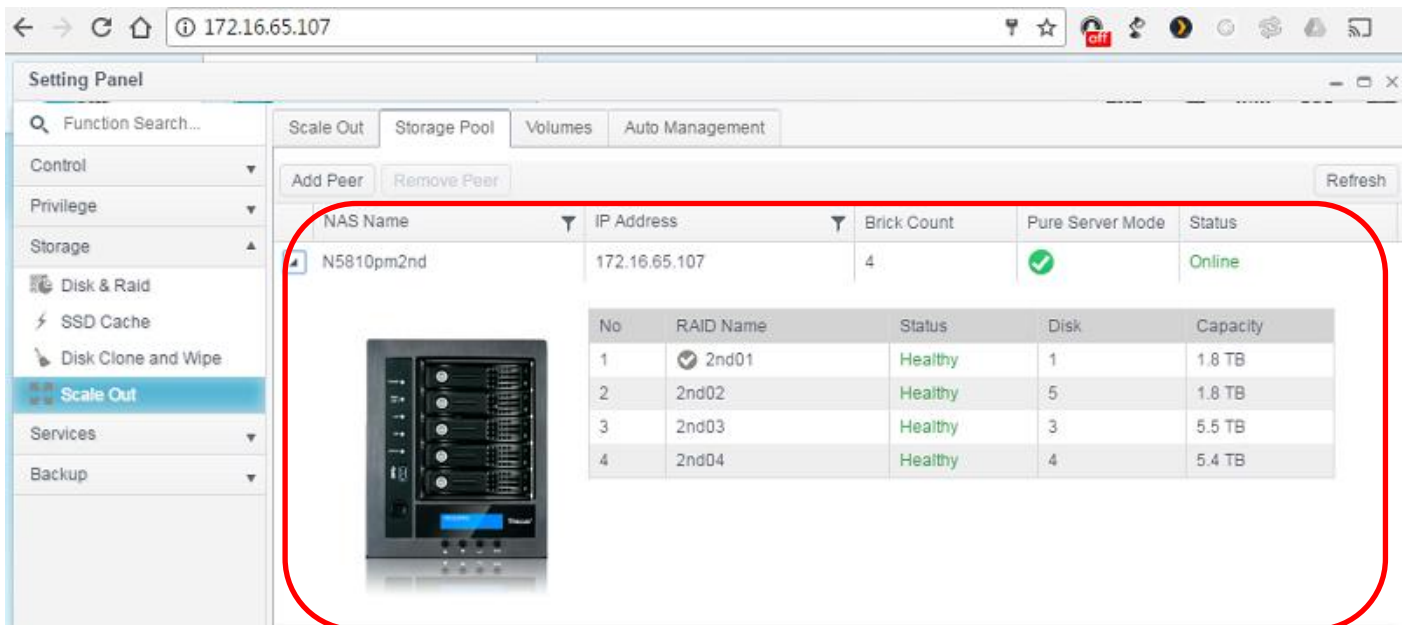
NOTE

The example above features 3 available bricks but you could choose 2 or 3 replica values.

1. The available brick must be greater or equal than the replica or the volume won't be created.
2. If setup two replicas and the available bricks are 4. The volume will have two groups. Data I/O will be read/written to this volume of two groups at the same time with two data copies.

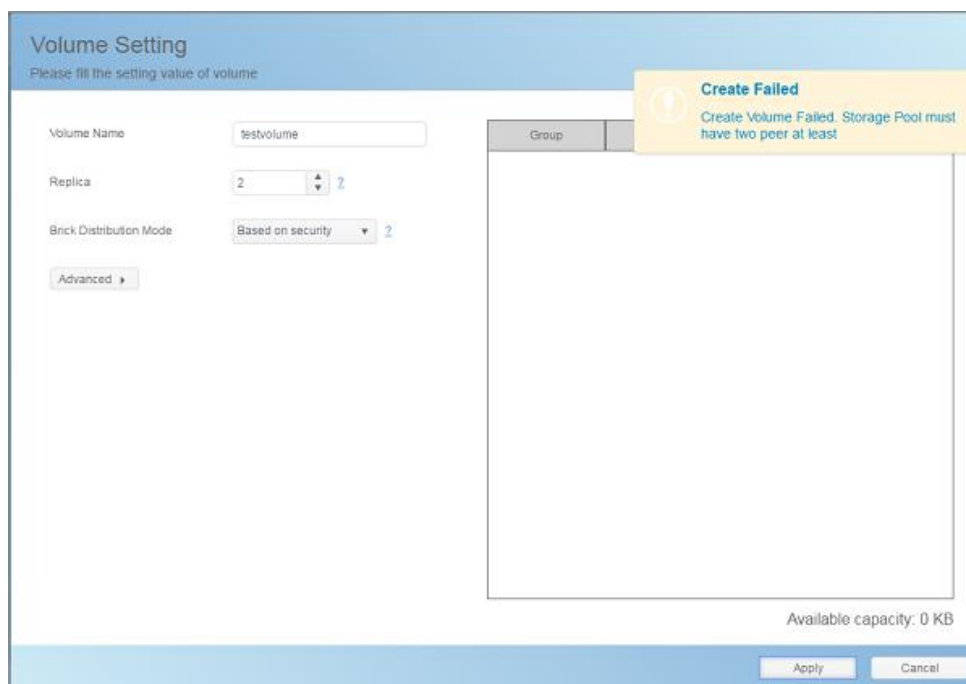
3. Brick distribution mode: There are 2 modes can chose, “Based on Security” and “Based on Capacity”.

Let's take independent Scale-Out Server N5810pm2nd with 4 bricks to execute to show the behavior while applied in two different modes. This Scale-Out server has IP: 172.16.65.107 and 4 bricks available.



Based on Security mode: By choosing this mode, the system will require the available bricks to be from separate units. On the other hand, to choose this mode, it has to have 2 systems to meet the requirement or system will prompt an error message.

Below there is a screenshot to illustrate it did not have available brick to create Scale-Out volume in “Secure mode” and error message prompted.



Based on Capacity mode: By Choosing this mode, the system will allocate the maximum capacity from the available bricks to create Scale-Out volume. In this scenario it is unnecessary for the available bricks to be from separate systems but it could risky if system failure occurred.

An example of a system that is based on “Capacity mode” is shown below.

To create Scale-Out volume in 7.3TB with 2 groups.

Volume Setting
Please fill the setting value of volume

Volume Name:

Replica:

Brick Distribution Mode:

Group	Brick	Group Capacity
Group1	2nd03	5.5 TB
	2nd04	5.5 TB
Group2	2nd01	1.8 TB
	2nd02	1.8 TB

Available capacity: 7.3 TB

NOTE

Once the Scale-Out volume mode has set, it can't change or it needs to reset Scale-Out and re-initialize. .

Click on Advanced, there are three more setting can be setup. In normal circumstance, it has no need to change and leave as default value.

4. Cache size: Size of the read cache, default value is 32MB.

Cache Size MB (4MB~32GB)

5. Write Behind Cache Size: Size of the write-behind buffer Default value is 1MB.

Cache Size MB (4MB~32GB)

Write Behind Cache Size MB (512KB~1GB)

6. IO (Input/Output) Thread Count: Number of threads in IO threads translates which are concurrently performed at a given time, default value is 16.

Advanced ▶

Cache Size MB (4MB~32GB)

Write Behind Cache Size MB (512KB~1GB)

IO Thread Count (1~64) ?

Click on "Apply" button to confirm the settings, then you will have your first Scale-Out volume created, please look at the screenshot below.

Scale OutStorage PoolVolumesAuto Management

AddEditOperationRefresh

Status	Volume Name	Capacity	Replica	Brick Cou...	Health
On	1stSCvolume	0.00% 39.42 MB / 1.82 TB	2	2	Normal

Group	Hostname	RAID Name	Capacity	Status
1	172.16.65.103	1st01	1.8 TB	Online
1	172.16.65.153	sc02	1.8 TB	Online
	172.16.65.103	1st02	1.8 TB	Unused

This volume has 1 group and each group contains two data copies.

NOTE

The system will allocate bricks to volume groups automatically. This cannot be assigned manually.

The Scale-Out volume capacity is optimized through thin-provisioning. Users can create as many Scale-Out volumes as needed.

Let's create the 2nd Scale-Out volume with the name "2ndSCvolume" at replica level 3. Same steps as above have been taken as can be seen below.

First Scale-Out volume "1stSCvolume" in one group, two data copies.

Scale Out | Storage Pool | Volumes | Auto Management

Add | Edit | Operation ▾ | Refresh

Status	Volume Name	Capacity	Replica	Brick Cou...	Health
On	1stSCvolume	0.00% 39.49 MB / 1.82 TB	2	2	Normal

Group	Hostname	RAID Name	Capacity	Status
1	172.16.65.103	1st01	1.8 TB	Online
1	172.16.65.153	sc02	1.8 TB	Online
	172.16.65.103	1st02	1.8 TB	Unused

Second Scale-Out volume “2ndSCvolume” in one group, three data copies.

Scale Out

Storage Pool

Volumes

Auto Management

Add

Edit

Operation

Refresh

Status	Volume Name	Capacity	Replica	Brick Cou...	Health
▶ On	1stSCvolume	0.00% 39.49 MB / 1.82 TB	2	2	Normal
▣ On	2ndSCvolume	0.00% 76.28 MB / 1.82 TB	3	3	Normal

Group	Hostname	RAID Name	Capacity	Status
1	172.16.65.103	1st01	1.8 TB	Online
1	172.16.65.103	1st02	1.8 TB	Online
1	172.16.65.153	sc02	1.8 TB	Online

Volume Operation

Volume Start and Stop:

The created Scale-Out volume can be stopped or started again by selecting it from the available list then clicking on the “Operation” button from sub menu bar. To stop a Scale-Out volume can be achieved by simply clicking on the “Stop” button. Once confirmed, the Scale-Out volume status will change its status to “Off” and will be inaccessible from the Scale-Out client. Vice versa, the Scale-Out volume can be started again by clicking on the “Start” button and the status will change to “On”.

The screenshot shows the 'Volumes' tab in the Scale-Out management interface. The 'Operation' dropdown menu is open, showing options: Start, Stop, Expand Capacity, Expand All Volumes Capacity, Repair, and Repair All Volumes. A red arrow points from the 'Stop' option to the '1stSCvolume' entry in the volume list. The volume list shows the following data:

Group	Hostname	RAID Name	Capacity
1	172.16.65.103	1st01	1.8 TB
1	172.16.65.153	sc02	1.8 TB
	172.16.65.103	1st02	1.8 TB

Volume Expansion:

The great thing about Scale-Out is the capability of dynamic expansion. From sub menu tab click on “Operation” and it will show options dedicated to global capacity expansion and repairing.

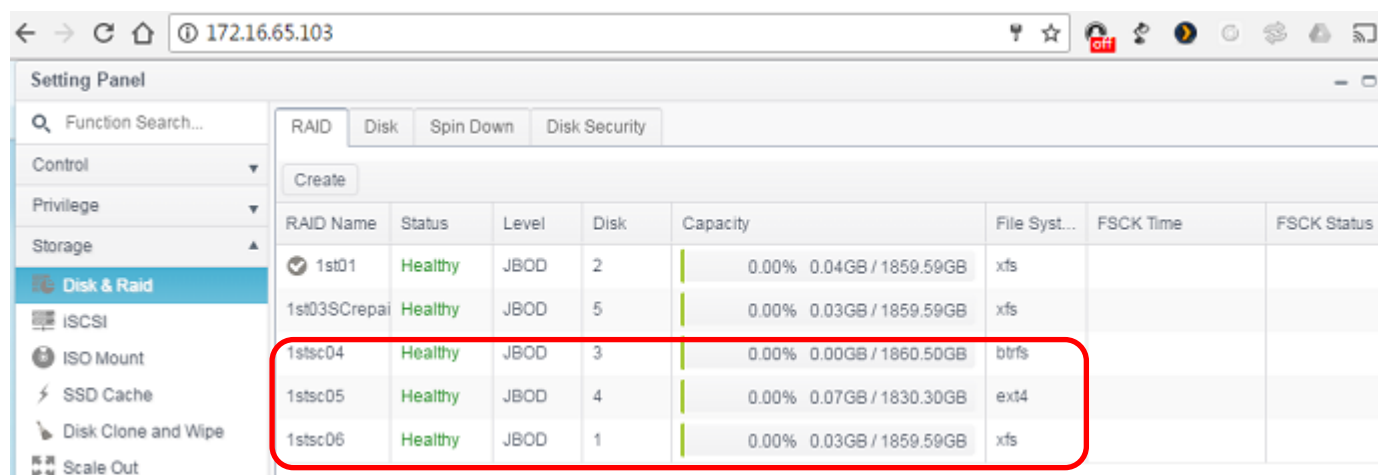
The screenshot shows the 'Volumes' tab in the Scale-Out management interface. The 'Operation' dropdown menu is open, showing options: Start, Stop, Expand Capacity, Expand All Volumes Capacity, Repair, and Repair All Volumes. The volume list shows the following data:

Status	Capacity	Replica	Brick Cou...	Health
On	0.00% 39.49 MB / 1.82 TB	2	2	Normal
On	0.00% 76.28 MB / 1.82 TB	3	3	Normal

If the expansion is performed for a particular volume, select the associated volume and click on “Expand Capacity”, then the system will auto check available bricks and proceed with the volume expansion. If it is required, expand capacity for all volumes by choosing “Expand All Volume Capacity”.

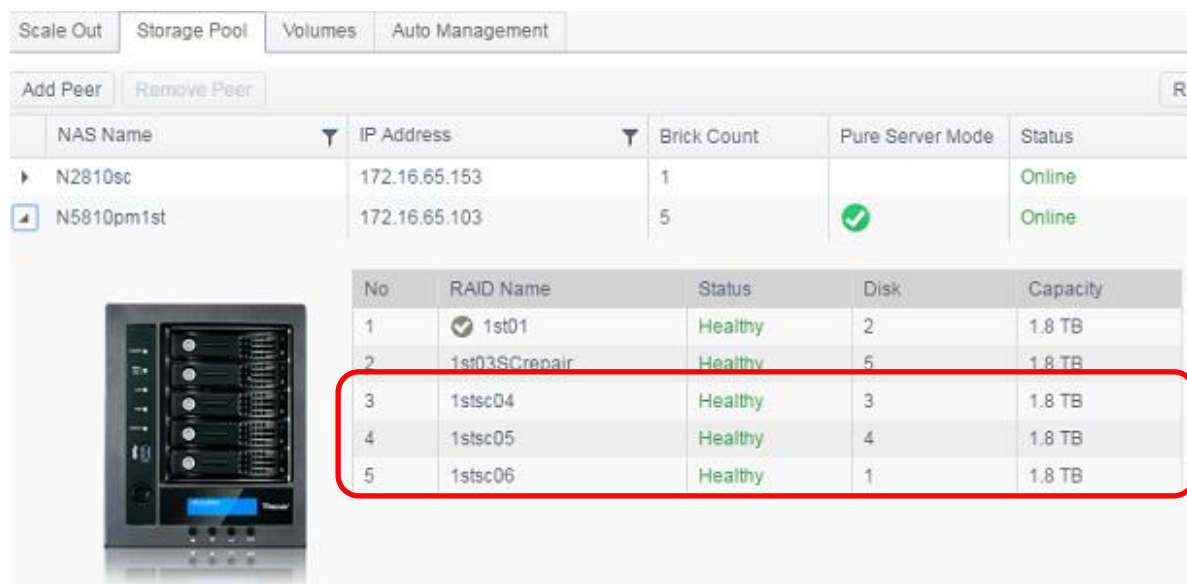
Let’s create additional 3 RAID volumes from Scale-Out server N5810pm1st (172.16.65.103) and execute capacity expansion.

Additional 3 RAID volume has been created as shown in the red circle below:



RAID Name	Status	Level	Disk	Capacity	File Syst...	FSCK Time	FSCK Status
1st01	Healthy	JBOD	2	0.00% 0.04GB / 1859.59GB	xtfs		
1st03SCrepair	Healthy	JBOD	5	0.00% 0.03GB / 1859.59GB	xtfs		
1stsc04	Healthy	JBOD	3	0.00% 0.00GB / 1860.50GB	btrfs		
1stsc05	Healthy	JBOD	4	0.00% 0.07GB / 1830.30GB	ext4		
1stsc06	Healthy	JBOD	1	0.00% 0.03GB / 1859.59GB	xtfs		

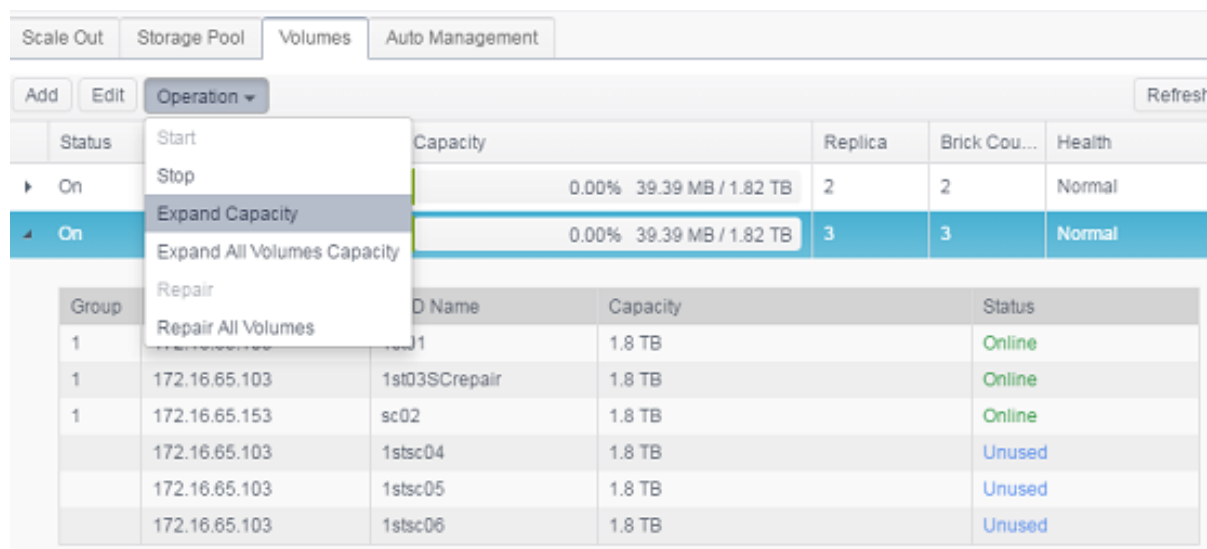
Bricks for Scale-Out server N5810pm1st has become 5 numbers from the original 2.



NAS Name	IP Address	Brick Count	Pure Server Mode	Status
N2810sc	172.16.65.153	1		Online
N5810pm1st	172.16.65.103	5	✓	Online

No	RAID Name	Status	Disk	Capacity
1	1st01	Healthy	2	1.8 TB
2	1st03SCrepair	Healthy	5	1.8 TB
3	1stsc04	Healthy	3	1.8 TB
4	1stsc05	Healthy	4	1.8 TB
5	1stsc06	Healthy	1	1.8 TB

Select 2ndSCvolume and choose “Expand Capacity” from Operation dropdown list.



Status	Capacity	Replica	Brick Cou...	Health
On	0.00% 39.39 MB / 1.82 TB	2	2	Normal
On	0.00% 39.39 MB / 1.82 TB	3	3	Normal

Group	D Name	Capacity	Status
1	1st01	1.8 TB	Online
1	172.16.65.103 1st03SCrepair	1.8 TB	Online
1	172.16.65.153 sc02	1.8 TB	Online
	172.16.65.103 1stsc04	1.8 TB	Unused
	172.16.65.103 1stsc05	1.8 TB	Unused
	172.16.65.103 1stsc06	1.8 TB	Unused

System will check available bricks and the Scale-Out mode. In this case, system has found 3 unused bricks and “Based Capacity mode” for this Scale-Out volume. It is now giving capacity expansion of an additional 1.8TB as shown below in green part.

Expand Capacity ×

Brick Distribution Mode : Based on capacity

Group	Brick	Group Capacity
Group1	1st01 1.8 TB	1.8 TB
	1st03SCrepair 1.8 TB	
	sc02 1.8 TB	
Group2	1stsc06 1.8 TB	1.8 TB
	1stsc04 1.8 TB	
	1stsc05 1.8 TB	

Available capacity: 1.8 TB -> 3.6 TB

Apply

Cancel

After clicking on “Apply”, the capacity will be expanded from 1.8T -> 3.6T.

Add Edit Operation

Refresh

	Status	Volume Name	Capacity	Replica	Brick Cou...	Health
▶	On	1stSCvolume	0.00% 39.38 MB / 1.82 TB	2	2	Normal
▶	On	2ndSCvolume	0.00% 115.66 MB / 3.63 TB	3	6	Normal

Group	Hostname	RAID Name	Capacity	Status
1	172.16.64.158	1st01	1.8 TB	Online
1	172.16.64.158	1st03SCrepair	1.8 TB	Online
1	172.16.65.153	sc02	1.8 TB	Online
2	172.16.64.158	1stsc06	1.8 TB	Online
2	172.16.64.158	1stsc04	1.8 TB	Online
2	172.16.64.158	1stsc05	1.8 TB	Online

HINT

This expansion case is only applied to 2ndSCvolume because all available unused bricks are coming from one unit. And 1stSCvolume has volume mode “Based on Security mode” which required brick from different system.

Volume Repair:

Other than using available bricks to expand volume capacity, it can be used to repair damage in the bricks. Following the same scenario as above, the user can select a particular one or all volumes to repair.

In the example below, one bricks is damaged on Peer 172.16.65.103 and the system has detected the issue, the volume status will show that the Scale-Out volume is "Abnormal" and also lists the damaged brick.

Setting Panel

Scale Out | Storage Pool | **Volumes** | Auto Management

Add | Edit | Operation | Refresh

Status	Volume Name	Capacity	Replica	Brick Cou...	Health
On	1stSCvolume	0.00% 39.5 MB / 1.82 TB	2	2	Normal
On	2ndSCvolume	0.00% 39.5 MB / 1.82 TB	3	3	Abnormal

Group 1: Part bricks of group is offline or damaged, increased risk of data loss. Please start scale out on disconnect peer let bricks online, then repair volume to replace damaged brick with unused bricks.

Group	Hostname	RAID Name	Capacity	Status
1	172.16.65.103	1st01	1.8 TB	Online
1	172.16.65.153	sc02	1.8 TB	Online

Group	Hostname	RAID Name	Capacity	Status
1	172.16.65.103	1st01	1.8 TB	Damaged
1	172.16.65.153	sc02	1.8 TB	Online

Let's repair the brick by replacing it with a new one. To do this, we have created a new volume named "1st03SCrepair" from Scale-Out server N5810pm1st.

RAID

Disk

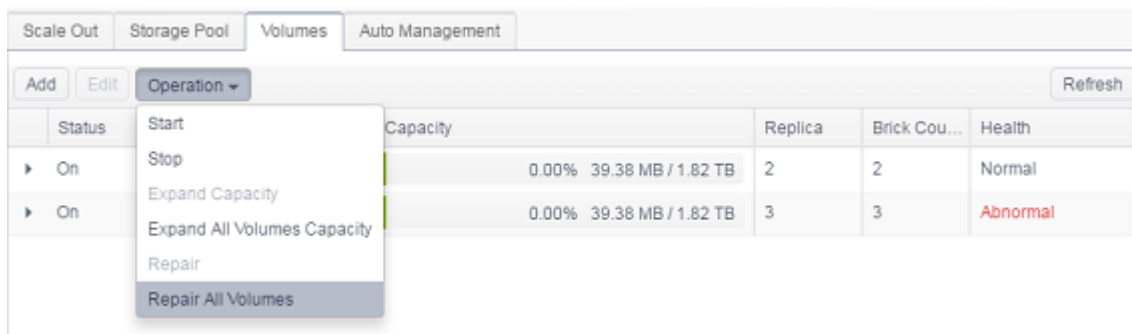
Spin Down

Disk Security

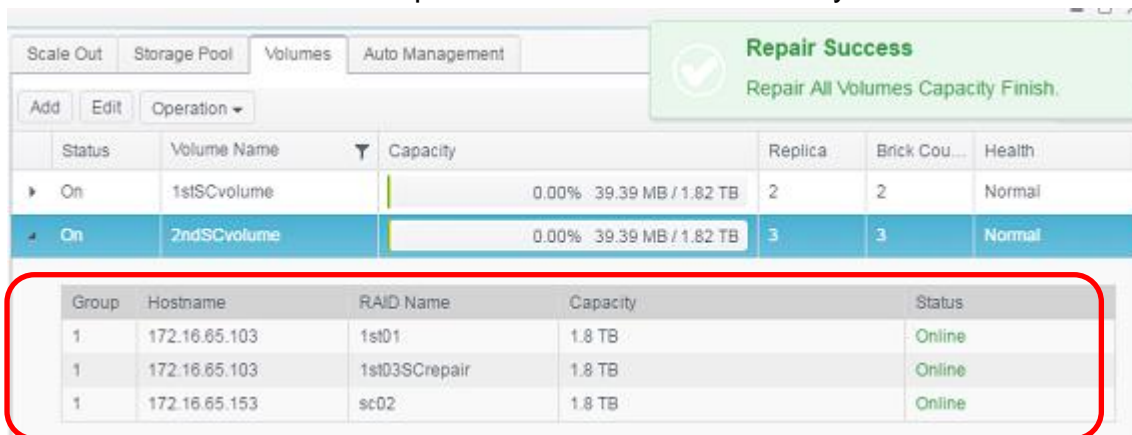
Create

RAID Name	Status	Level	Disk	Capacity	File Syst...
1st01	Healthy	JBOD	2	0.00% 0.04GB / 1859.59GB	xts
1st03SCrepair	Healthy	JBOD	5	0.00% 0.03GB / 1859.59GB	xts

The next step is to go to the Scale-Out volume setting page and choose "Repair All Volumes Capacity".



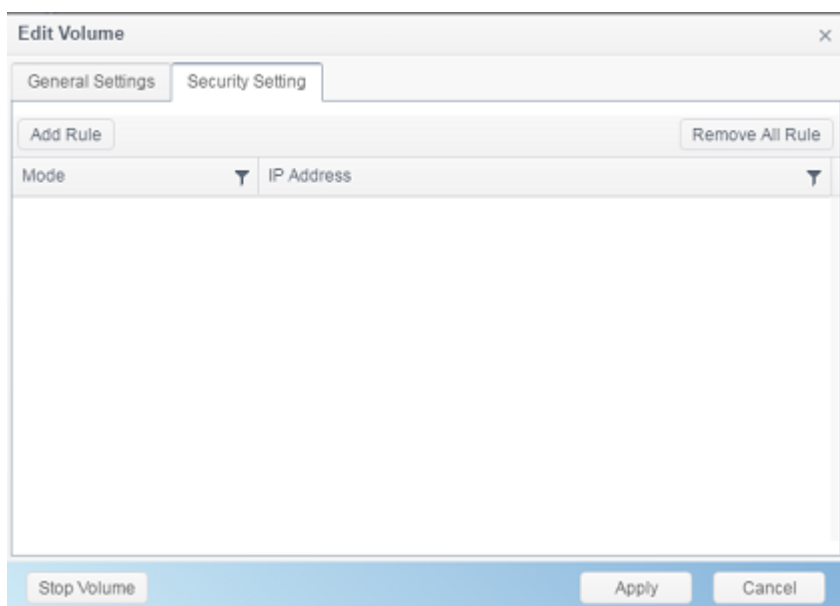
Now the volume has been repaired and is back to a healthy status.



Scale-Out Volume Editing:

The created Scale-Out volume can be edited by selecting it from the available list then clicking on the “Edit” button. The Scale-Out volume can be changed through some advanced setting pertaining to cache size, Write Behind Cache Size and IO Thread.

Rules to accept or reject connections can also be specified for the Scale-Out volume. Click on “Security Setting” and the screen below will appear.



Click on “Add Rule” to add a new connection definition or “Remove All Rules” to clear the list.

Auto Management

Scale-Out can be empowered to work smartly by enabling “Auto Management”. There are 3 different settings that can be enabled.

Scale Out Settings

Storage Pool

Volumes

Auto Management

Auto Management Settings

☐ Auto create RAID with unused disks (Type: JBOD, Filesystem: btrfs.If disks have data, won't do anything)

☐ When system detect disk be plugged, system will automatically build RAID with this disk (Type: JBOD, Filesystem: btrfs.If disks have data, won't do anything)

☐ When you create/delete RAID or RAID damaged, system will try to repair volume with unused brick (only repair damaged brick in volume, won't repair offline brick)

Apply

1. If scenario one is enabled, the system is cold booted with a disk installed (clean), then the RAID volume will be created automatically by default and this RAID volume will become an unused brick.
2. If the 2nd scenario is enabled, a disk is plugged in (hot plug-in, disk clean), then the system will create a RAID volume automatically and this RAID volume will become unused brick.
3. If any brick from volume group is damaged, the system will use unused bricks to repair it.

Stop Scale-Out

In any case, if the Scale-Out server needs to stop, click on the “Stop Scale-Out” button. The status for the Scale-Out server will change to “Offline”.

Example for stopping Scale-Out server on system IP 172.16.65.153:

Scale Out

Scale Out

Status

Deactivated

Pure Server Mode ⓘ

☒ Enable

Cluster Password ⓘ

Sync E-mail Notification ⓘ

Sync E-mail Notification Setting

Start Scale Out

Reset Scale Out

✓

Stop Success

Stop Scale Out Success

If you now check on any member of the associated Scale-Out server group ex. 172.16.65.103 the status of the system IP 172.16.65.153 will be shown as “Offline”.



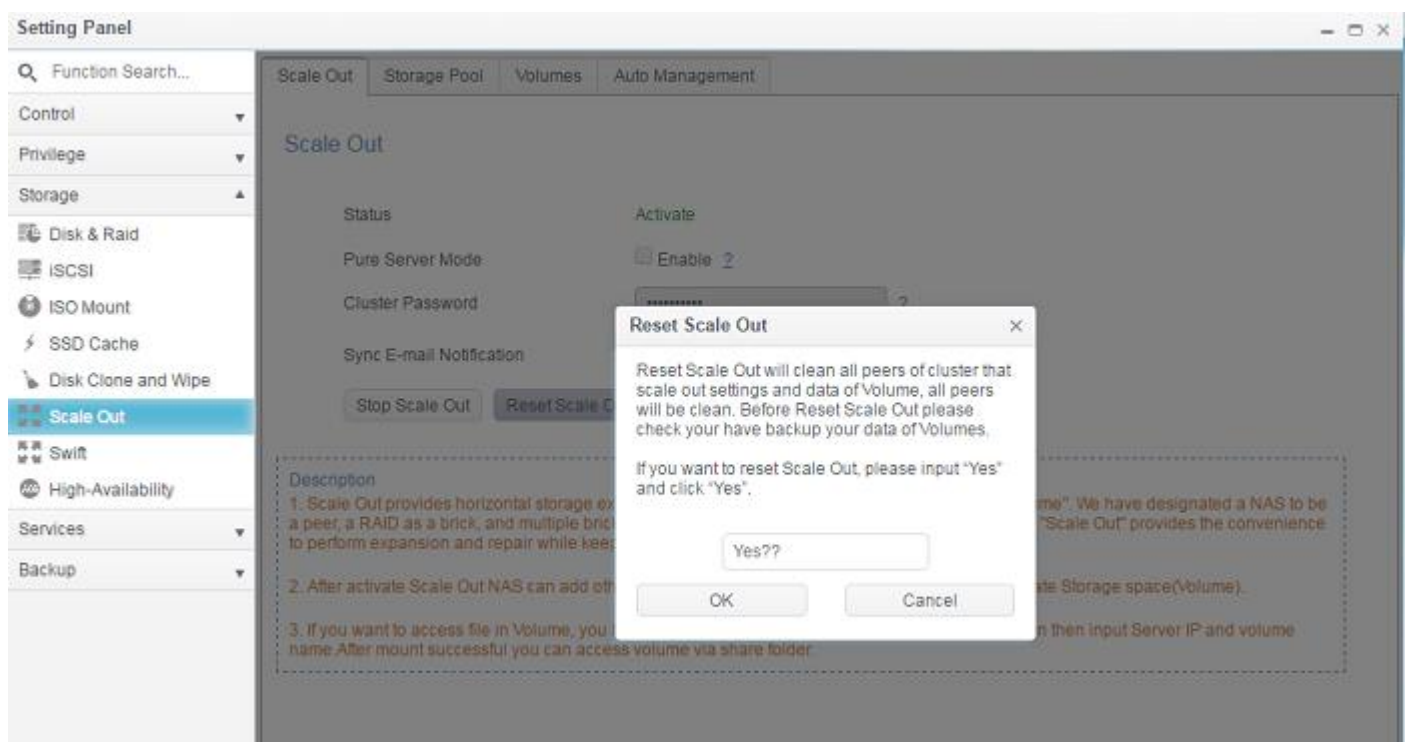
NAS Name	IP Address	Brick Count	Pure Server Mode	Status
	172.16.65.153	0		Offline
N5810pm1st	172.16.65.103	2	<input checked="" type="checkbox"/>	Online

Stopping the Scale-Out server won't affect any data existing in the Scale-Out server volumes. By Restart the Scale-Out server to put this Scale-Out member back to online status.

Reset Scale-Out

If the Scale-Out server needs to be removed from the Scale-Out group, click on “Reset Scale-Out” to apply.

WARNING: Once it has been confirmed, all data inside the Scale-Out volumes will be destroyed completely and there is no way to get it back.

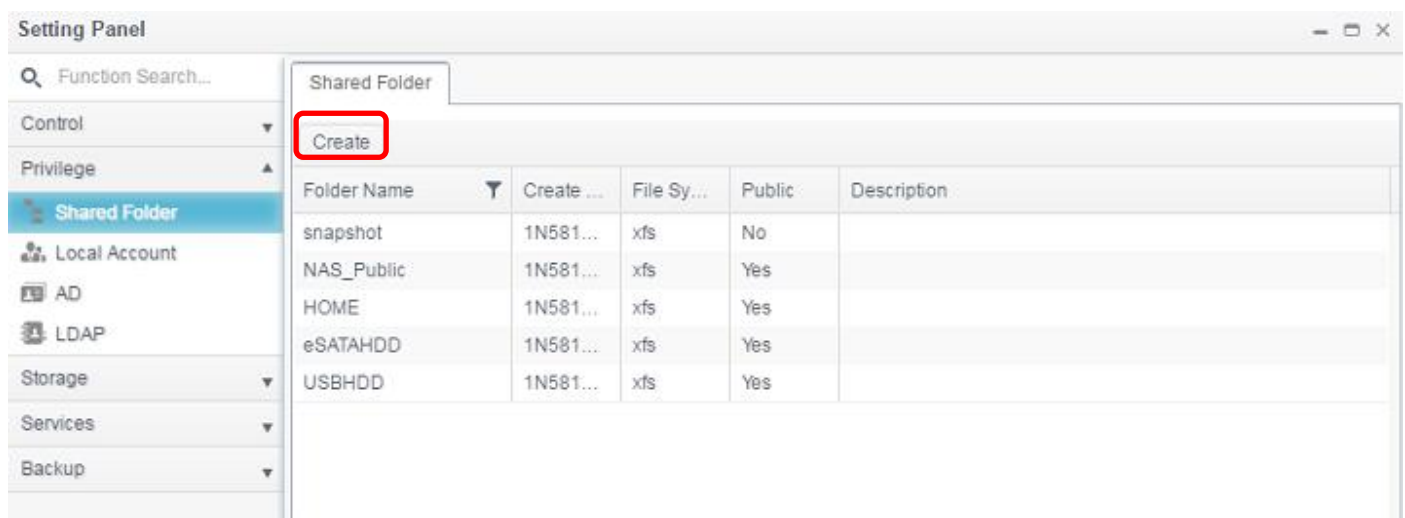


Create Scale-Out Shared Folder

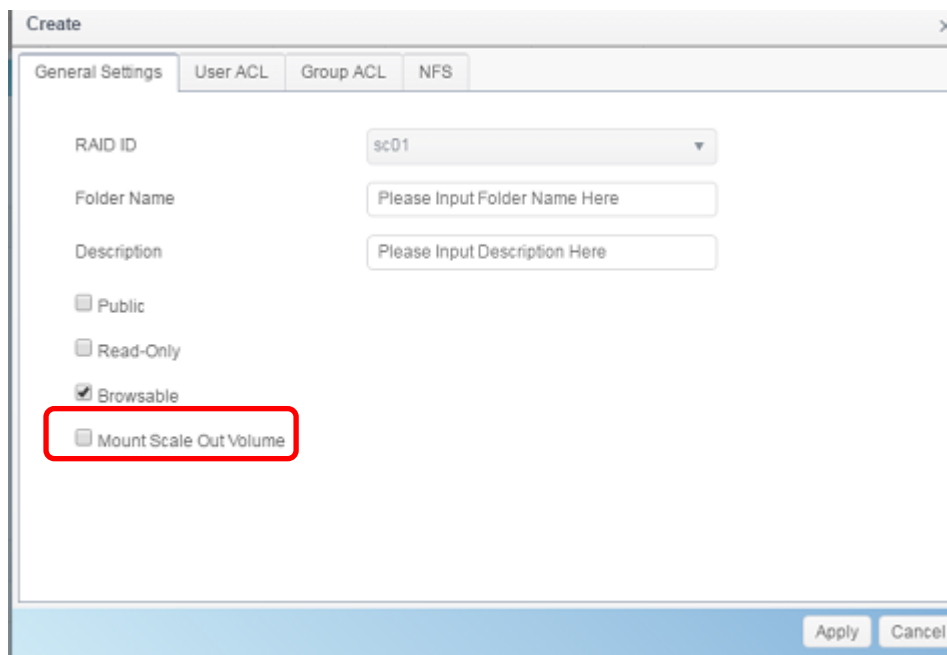
After the Scale-Out server group setup has been completed, the Scale-Out volume will be ready to use. Next, we will go through how a Scale-Out client can connect to a Scale-Out volume.

Let’s take an N2810 with the IP <http://172.16.65.153> in Scale-Out client mode. The system has been created with Scale-Out “Client-Server combo mode”, so it can be used as client role to access Scale-Out volume.

To connect with the Scale-Out volume, please go to “Share Folder” under “Privilege” in the Setting Panel.

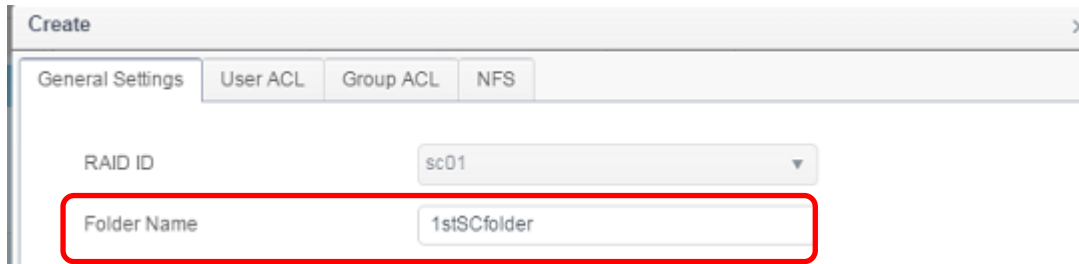


Click on “Create” and the screen will appear as below.



Steps:

1. Folder name: To be seen on file protocol level access, let's choose "1stSCfolder" as a folder name.



Create

General Settings User ACL Group ACL NFS

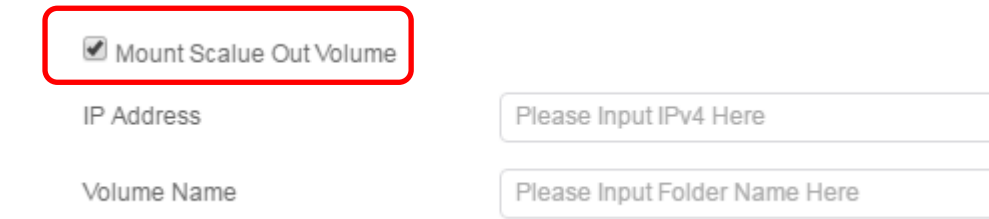
RAID ID sc01

Folder Name 1stSCfolder

2. Description: Fill in if needed.

3. Public/Read-Only/Browsable: enable/disable as needed.

4. Mount Scale-Out Volume: **Enable** this one and input the Scale-Out Volume IP address and Volume Name.

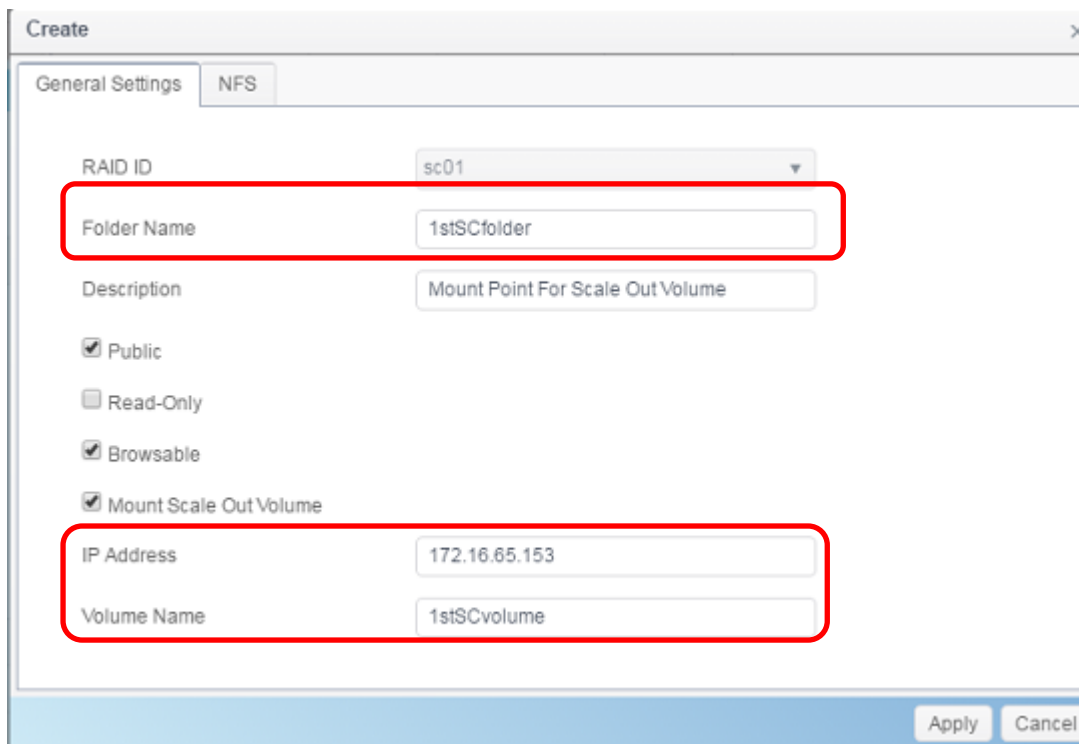


☒ Mount Scale Out Volume

IP Address Please Input IPv4 Here

Volume Name Please Input Folder Name Here

The IP address can be that of any Scale-Out server member, we have 172.16.65.153 and 172.16.65.103. The volume names are those we have created earlier; they are "1stSCvolume" and "2ndSCvolume". Let's fill in 172.16.65.153 and "1stSCvolume" then click Apply



Create

General Settings NFS

RAID ID sc01

Folder Name 1stSCfolder

Description Mount Point For Scale Out Volume

☒ Public

☐ Read-Only

☒ Browsable

☒ Mount Scale Out Volume

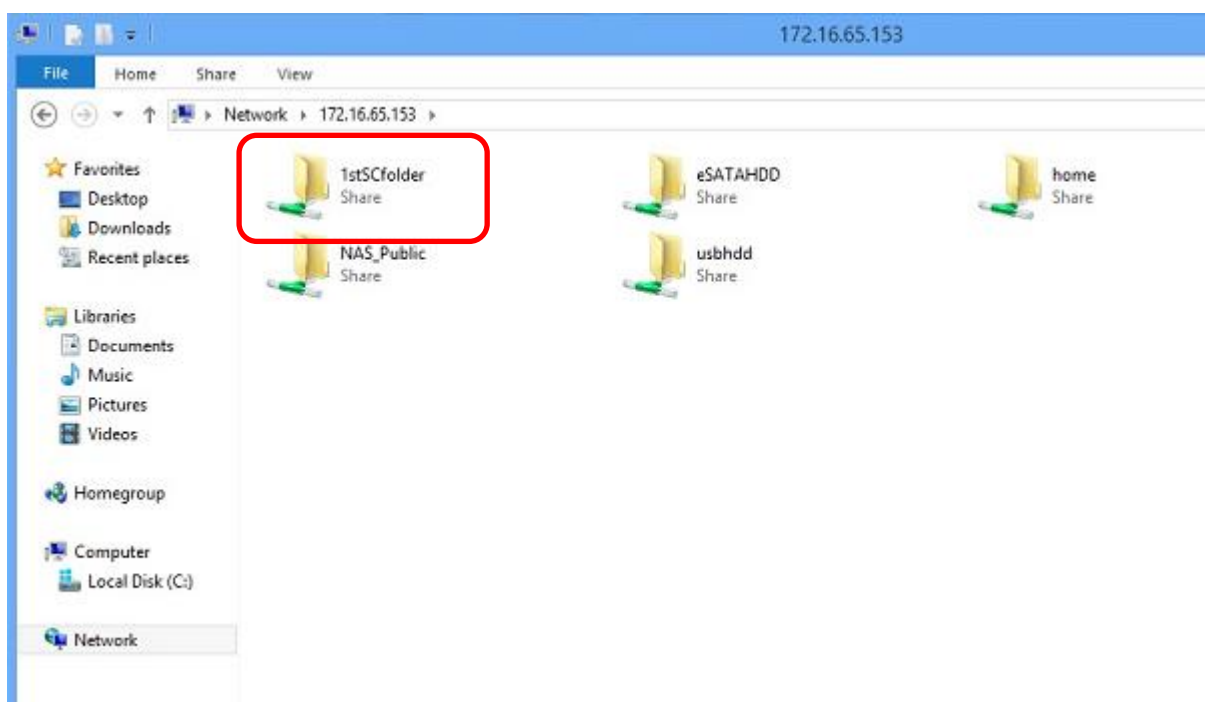
IP Address 172.16.65.153

Volume Name 1stSCvolume

Apply Cancel

Shared Folder					
Create					
Folder Name	Create on...	File System	Public	Description	
snapshot	sc01	ext4	No		
NAS_Public	sc01	ext4	Yes		
HOME	sc01	ext4	Yes		
eSATAHDD	sc01	ext4	Yes		
USBHDD	sc01	ext4	Yes		
1stSCfolder	sc01	Scale Out	Yes	Mount Point For Scale Out Volume	

Now in the shared folder list, "1stSCfolder" has been added. It can be used just like a standard shared folder. Let's connect via Windows and we will see that "1stSCfolder" is there; please refer to the screenshot below. Surely you could use the same steps to create more Scale-Out folders, even using the same storage resources.



Support

If you have questions, encounter technical difficulties or need assistance with your NAS or setting up Scale-Out, please contact Thecus technical support under: http://www.thecus.com/sp_tech.php