NetApp

Manage LUNs for FC and iSCSi

ONTAP 9

NetApp
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Increase the size of a LUN

The size to which you can increase your LUN varies depending upon your version of ONTAP.

ONTAP version	Maximum LUN size
ONTAP 9.8 and later	• 128 TB for All SAN Arrays (ASAs) • 16 TB for non-ASAs
ONTAP 9.5, 9.6, 9.7	16TB
ONTAP 9.4 or earlier	10 times the original LUN size, but not greater than 16TB For example, if you create a 100 GB LUN, you can only grow it to 1,000 GB.

You do not need to take the LUN offline to increase the size. However, after you have increased the size, you must rescan the LUN on the host for the host to recognize the change in size.

See the Command Reference page for the `lun resize` command for more information about resizing a LUN.

ⓘ   Solaris LUNs cannot be resized.

Steps

1. Increase the size of the LUN:

   ```
   lun resize -vserver vserver_name -volume volume_name -lun lun_name -size
   lun_size
   ```

2. Verify the increased LUN size:

   ```
   lun show -vserver vserver_name
   ```

   > ⓘ ONTAP operations round down the actual maximum size of the LUN so it is slightly less than the expected value. Also, actual LUN size might vary slightly based on the OS type of the LUN. To obtain the exact resized value, run the following commands in advanced mode:
   >
   > ```
   > set -unit B
   > ```
   >
   > ```
   > lun show -fields max-resize-size -volume volume_name -lun lun_name
   > ```

3. Rescan the LUN on the host.

4. Follow your host documentation to make the newly created LUN size visible to the host file system.

Decrease the size of a LUN

Before you decrease the size of a LUN, the host needs to migrate the blocks containing the LUN data into the boundary of the smaller LUN size. You should use a tool such as SnapDrive for Windows to ensure that the LUN is properly decreased without truncating blocks containing LUN data. Manually decreasing the size of your LUN is not recommended.

About this task

After you decrease the size of your LUN, ONTAP automatically notifies the initiator that the LUN size has decreased. However, additional steps might be required on your host for the host to recognize the new LUN size. Check your host documentation for specific information about decreasing the size of the host file structure.

Move a LUN

You can move a LUN across volumes within a storage virtual machine (SVM), but you cannot move a LUN across SVMs. LUNs moved across volumes within an SVM are moved immediately and without loss of connectivity.

What you'll need

If your LUN is using Selective LUN Map (SLM), the SLM reporting nodes must have been modified to include the destination node and its HA partner.

About this task

Storage efficiency features, such as deduplication, compression, and compaction are not preserved during a LUN move. They must be reapplied after the LUN move is completed.

Data protection through Snapshot copies occurs at the volume level. Therefore, when you move a LUN, it falls under the data protection scheme of the destination volume. If you do not have Snapshot copies established for the destination volume, Snapshot copies of the LUN are not created. Also, all of the Snapshot copies of the LUN stay in the original volume until those Snapshot copies are deleted.

You cannot move a LUN to the following volumes:

- A SnapMirror destination volume
- The SVM root volume

You cannot move the following types of LUNs:

- A LUN that has been created from a file
- A LUN that is in NVFail state
- A LUN that is in a load-sharing relationship
- A protocol-endpoint class LUN

> (i) For Solaris os_type LUNs that are 1 TB or larger, the host might experience a timeout during the LUN move. For this LUN type, you should unmount the LUN before initiating the move.

System Manager procedure

Beginning with ONTAP 9.10.1, you can use System Manager to create a new volume when you move a single LUN. In ONTAP 9.8 and 9.9.1, the volume to which you are moving your LUN must exist before you begin the LUN move.

Steps

1. In System Manager, click **Storage>LUNs**.
2. Right click the LUN you want to move, then click ⋮ and select **Move LUN**.

   In ONTAP 9.10.1, select to move the LUN to **An existing volume** or to a **New volume**.

   If you select to create a new volume, provide the volume specifications.

3. Click **Move**.

CLI procedure

Steps

1. Move the LUN:

   ```
   lun move start.
   ```

   During a very brief period, the LUN is visible on both the origin and destination volume. This is expected and is resolved upon completion of the move.

2. Track the status of the move and verify successful completion:

   ```
   lun move show.
   ```

Related information
- Selective LUN Map
- Modifying the SLM reporting-nodes list

Delete LUNs

You can delete a LUN from a storage virtual machine (SVM) if you no longer need the LUN.

What you'll need
The LUN must be unmapped from its igroup before you can delete it.

Steps

1. Verify that the application or host is not using the LUN.
2. Unmap the LUN from the igroup:

   ```
   lun mapping delete

   lun mapping delete -vserver vs5 -volume vo5 -lun lun5 -igroup igr5
   ```

3. Delete the LUN:

```
lun delete

lun delete -vserver vs5 -volume vol5 -lun lun5
```

4. Verify that you deleted the LUN:

```
lun show

lun show -vserver vs5
```

```
Vserver    Path              State     Mapped  Type     Size
---------  ----------------  --------  ------- --------  ------
vs5        /vol/vol16/lun8   online    mapped  windows  10.00GB
```

Considerations for copying LUNs

There are considerations you should be aware of when copying a LUN.

Cluster administrators can copy a LUN across storage virtual machines (SVMs) within the cluster by using the `lun copy` command. Cluster administrators must establish the storage virtual machine (SVM) peering relationship using the `vserver peer create` command before an inter-SVM LUN copy operation is performed. There must be enough space in the source volume for a SIS clone.

LUNs in Snapshot copies can be used as source LUNs for the `lun copy` command. When you copy a LUN using the `lun copy` command, the LUN copy is immediately available for read and write access. The source LUN is unchanged by creation of a LUN copy. Both the source LUN and the LUN copy exist as unique LUNs with different LUN serial numbers. Changes made to the source LUN are not reflected in the LUN copy, and changes made to the LUN copy are not reflected in the source LUN. The LUN mapping of the source LUN is not copied to the new LUN; the LUN copy must be mapped.

Data protection through Snapshot copies occurs at the volume level. Therefore, if you copy a LUN to a volume different from the volume of the source LUN, the destination LUN falls under the data protection scheme of the destination volume. If you do not have Snapshot copies established for the destination volume, Snapshot copies are not created of the LUN copy.

Copying LUNs is a nondisruptive operation.

You cannot copy the following types of LUNs:

- A LUN that has been created from a file
- A LUN that is in NVFAIL state
- A LUN that is in a load-sharing relationship
- A protocol-endpoint class LUN

Ways to limit LUN access with port sets and igroups

In addition to using Selective LUN Map (SLM), you can limit access to your LUNs through igroups and port sets.

Port sets can be used with SLM to further restrict access of certain targets to certain initiators. When using SLM with port sets, LUNs will be accessible on the set of LIFs in the port set on the node that owns the LUN and on that node's HA partner.

In the following example, initiator1 does not have a port set. Without a port set, initiator1 can access LUN1 through both LIF1 and LIF2.

You can limit access to LUN1 by using a port set. In the following example, initiator1 can access LUN1 only through LIF1. However, initiator1 cannot access LUN1 through LIF2 because LIF2 is not in port set1.

Related information

- Selective LUN Map
- Create port sets and binding igroups to port sets

Examine configured and used space of a LUN

Knowing the configured space and actual space used for your LUNs can help you determine the amount of space that can be reclaimed when doing space reclamation, the amount of reserved space that contains data, and the total configured size versus the actual size used for a LUN.

Step

1. View the configured space versus the actual space used for a LUN:

   ```
   lun show
   ```

   The following example show the configured space versus the actual space used by the LUNs in the vs3 storage virtual machine (SVM):

   ```
   lun show -vserver vs3 -fields path, size, size-used, space-reserve
   ```

```
vserver path                      size      space-reserve size-used
-------  ----------------         -------   ------------- ---------
vs3      /vol/vol0/lun1           50.01GB disabled        25.00GB
vs3      /vol/vol0/lun1_backup    50.01GB disabled        32.15GB
vs3      /vol/vol0/lun2           75.00GB disabled        0B
vs3      /vol/volspace/lun0       5.00GB  enabled         4.50GB
4 entries were displayed.
```

Control and monitor I/O performance to LUNs by using Storage QoS

You can control input/output (I/O) performance to LUNs by assigning LUNs to Storage QoS policy groups. You might control I/O performance to ensure that workloads achieve specific performance objectives or to throttle a workload that negatively impacts other workloads.

About this task

Policy groups enforce a maximum throughput limit (for example, 100 MB/s). You can create a policy group without specifying a maximum throughput, which enables you to monitor performance before you control the workload.

You can also assign storage virtual machines (SVMs) with FlexVol volumes and LUNs to policy groups.

Note the following requirements about assigning a LUN to a policy group:

- The LUN must be contained by the SVM to which the policy group belongs.

  You specify the SVM when you create the policy group.

- If you assign a LUN to a policy group, then you cannot assign the LUN's containing volume or SVM to a policy group.

For more information about how to use Storage QoS, see the System administration reference.

Steps

1. Use the `qos policy-group create` command to create a policy group.
2. Use the `lun create` command or the `lun modify` command with the `-qos-policy-group` parameter to assign a LUN to a policy group.
3. Use the `qos statistics` commands to view performance data.
4. If necessary, use the `qos policy-group modify` command to adjust the policy group's maximum throughput limit.

Tools available to effectively monitor your LUNs

Tools are available to help you effectively monitor your LUNs and avoid running out of space.

- Active IQ Unified Manager is a free tool that enables you to manage all storage across all clusters in your environment.
- System Manager is a graphical user interface built into ONTAP that enables you to manually manage storage needs at the cluster level.
- OnCommand Insight presents a single view of your storage infrastructure and enables you to set up automatic monitoring, alerts, and reporting when your LUNs, volumes, and aggregates are running out of storage space.

Considerations for transitioning SAN configurations

In a SAN environment, a disruption in service is required during the transition of a 7-Mode volume to ONTAP. You need to shut down your hosts to complete the transition. After transition, you must update your host configurations before you can begin serving data in ONTAP

You need to schedule a maintenance window during which you can shut down your hosts and complete the transition.

Capabilities and restrictions of transitioned LUNs

LUNs that have been transitioned from Data ONTAP operating in 7-Mode to ONTAP have certain capabilities and restrictions that affect the way the LUNs can be managed.

You can do the following with transitioned LUNs:

- View the LUN using the `lun show` command
- View the inventory of LUNs transitioned from the 7-Mode volume using the `transition 7-mode show` command
- Restore a volume from a 7-Mode Snapshot copy

  Restoring the volume transitions all of the LUNs captured in the Snapshot copy

- Restore a single LUN from a 7-Mode Snapshot copy using the `snapshot restore-file` command
- Create a clone of a LUN in a 7-Mode Snapshot copy
- Restore a range of blocks from a LUN captured in a 7-Mode Snapshot copy
- Create a FlexClone of the volume using a 7-Mode Snapshot copy

You cannot do the following with transitioned LUNs:

- Access Snapshot copy-backed LUN clones captured in the volume

Related information

[Copy-based transition](#)

I/O misalignments on properly aligned LUNs overview

ONTAP might report I/O misalignments on properly aligned LUNs. In general, these misalignment warnings can be disregarded as long as you are confident that your LUN is

properly provisioned and your partitioning table is correct.

LUNs and hard disks both provide storage as blocks. Because the block size for disks on the host is 512 bytes, LUNs present blocks of that size to the host while actually using larger, 4-KB blocks to store data. The 512-byte data block used by the host is referred to as a logical block. The 4-KB data block used by the LUN to store data is referred to as a physical block. This means that there are eight 512-byte logical blocks in each 4-KB physical block.

The host operating system can begin a read or write I/O operation at any logical block. I/O operations are only considered aligned when they begin at the first logical block in the physical block. If an I/O operation begins at a logical block that is not also the start of a physical block, the I/O is considered misaligned. ONTAP automatically detects the misalignment and reports it on the LUN. However, the presence of misaligned I/O does not necessarily mean that the LUN is also misaligned. It is possible for misaligned I/O to be reported on properly aligned LUNs.

If further investigation is required, technical support can run diagnostic commands that show detailed I/O alignment data to confirm the presence or absence of true LUN misalignment.

For more information about tools for correcting alignment problems, see the following documentation:

- Windows Unified Host Utilities 7.1
- Virtual Storage Console for VMware vSphere Installation and Administration Guide

Achieve I/O alignment using LUN OS types

To achieve I/O alignment with your OS partitioning scheme, you should use the recommended ONTAP LUN `ostype` value that most closely matches your operating system.

The partition scheme employed by the host operating system is a major contributing factor to I/O

misalignments. Some ONTAP LUN `ostype` values use a special offset known as a "prefix" to enable the default partitioning scheme used by the host operating system to be aligned.

> (i) In some circumstances, a custom partitioning table might be required to achieve I/O alignment. However, for `ostype` values with a "prefix" value greater than `0`, a custom partition might create misaligned I/O.

The LUN `ostype` values in the following table should be used based on your operating system.

LUN `ostype`	Prefix (bytes)	Prefix (sectors)	Operating system
`windows`	32,256	63	Windows 2000, 2003 (MBR format)
`windows_gpt`	17,408	34	Windows 2003 (GPT format)
`windows_2008`	0	0	Windows 2008 and later
`linux`	0	0	All Linux distributions
`xen`	0	0	Citrix XenServer
`vmware`	0	0	VMware ESX
`solaris`	1MB	2,048	Solaris
`solaris_efi`	17,408	34	Solaris
`hpux`	0	0	HP-UX
`aix`	0	0	AIX

Special I/O alignment considerations for Linux

Linux distributions offer a wide variety of ways to use a LUN including as raw devices for databases, various volume managers, and file systems. It is not necessary to create partitions on a LUN when used as a raw device or as physical volume in a logical volume.

For RHEL 5 and earlier and SLES 10 and earlier, if the LUN will be used without a volume manager, you should partition the LUN to have one partition that begins at an aligned offset, which is a sector that is an even multiple of eight logical blocks.

Special I/O alignment considerations for Solaris LUNs

You need to consider various factors when determining whether you should use the `solaris` ostype or the `solaris_efi` ostype.

See the Solaris Host Utilities Installation and Administration Guide for detailed information.

ESX boot LUNs report as misaligned

LUNs used as ESX boot LUNs are typically reported by ONTAP as misaligned. ESX creates multiple partitions on the boot LUN, making it very difficult to align. Misaligned ESX boot LUNs are not typically a performance problem because the total amount of misaligned I/O is small. Assuming that the LUN was correctly provisioned with the VMware `ostype`, no action is needed.

Related information

Guest VM file system partition/disk alignment for VMware vSphere, other virtual environments, and NetApp storage systems

Ways to address issues when LUNs go offline

When no space is available for writes, LUNs go offline to preserve data integrity. LUNs can run out of space and go offline for various reasons, and there are several ways you can address the issue.

If the…	You can…
Aggregate is full	- Add more disks. - Use the `volume modify` command to shrink a volume that has available space. - If you have space-guarantee volumes that have available space, change the volume space guarantee to `none` with the `volume modify` command.
Volume is full but there is space available in the containing aggregate	- For space guarantee volumes, use the `volume modify` command to increase the size of your volume. - For thinly provisioned volumes, use the `volume modify` command to increase the maximum size of your volume. If volume autogrow is not enabled, use `volume modify -autogrow-mode` to enable it. - Delete Snapshot copies manually with the `volume snapshot delete` command, or use the `volume snapshot autodelete modify` command to automatically delete Snapshot copies.

Related information

Disk and aggregate management

Logical storage management