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Tech Brief

Increasing the License Size of a Sky Appliance

This procedure is for Actifio representatives who must move a customer to a larger capacity Actifio Sky license. This procedure is available in Actifio 7.1 and is performed mostly from the Actifio Appliance CLI.

This task requires taking ADHD offline for an extended period of time. To estimate how long this procedure will take, determine how long a typical Garbage Collection operation takes on the appliance, then multiply that time by:

Appliance VDP Version	How Long to Expect ADHD to be Offline
10.0.0+	0.5 x gc
7.1 to 10.0.0	1.0 x gc
< 7.1	2.5 x gc

This tech brief includes:

Licensing

Actifio Sky appliance license keys are generated internally at Actifio and are based on the Actifio appliance's UUID. The UUID is displayed during the Actifio Sky installation process. The Actifio Sky appliance's UUID must be passed on to the Actifio representative responsible for generating licenses. Adjust the memory and CPUs and cores to meet one of the Actifio Sky appliance licenses.

Once a license size has been increased, it can not be decreased.

> **Note:** *The 5TB license is for evaluations. If you purchase an Actifio Sky appliance you can keep the current 5TB appliance, have your Actifio representative increase the capacity of the appliance, or install a new, separate, larger Actifio Sky appliance.*

Before You Begin

Before you begin you must:

- Obtain the UUID of the Actifio Sky appliance
- Obtain a copy of the new, larger Actifio Sky license (requires UUID)
- Turn off ADHD and shut down the appliance
- Identify new Actifio Sky VM requirements and reconfigure the Actifio VM

Obtain UUID

You can obtain the Actifio Sky appliance's UUID from either:

- The CLI command line: `udsinfo getsysteminfo`
- The AGM: **Manage > Appliances > License Management**. The UUID is at the top of the page.

Obtain the New License

Send a copy of the Actifio Sky appliance's UUID to the Actifio representative responsible for generating licenses. Be sure to include both the size of the license required and whether or not encryption is needed.

When you receive a copy of the key, from the Actifio CLI, copy and paste the license key after the following udstask command:

```
udstask mklicense -licensekey <paste license key here>
```

Turn off ADHD and Shutdown the Actifio Sky Appliance

Before proceeding you must, from the Actifio CLI turn off ADHD:

```
udppm command "localdedups off"
udppm command "remotededups off"
udppm command "dedupasync off"
udppm command "expiration off"
```

From the **AGM Jobs Monitor**, ensure all jobs are complete. Then from the **AGM Manage Appliances page,** shut down the Actifio Sky appliance.

Identify Requirements and Reconfigure the Actifio Sky VM

The following sections provide the best practices for configuring an Actifio Sky VM on VMware:

Requirements for Sky Appliances That WILL Use Dedup Policies

The following table allows you to compare the requirements and capabilities of Sky model that will protect data in both the Snapshot and Dedup Pools.

Requirement	Model					
	1TB	5TB	10TB	30TB	50TB	128TB
CPUs required. [a]	1	2	4	8[b]	12[c]	12[c]
CPUs required for encryption at rest. [a]	2	4	6	10[c]	15[c]	15[c]
Minimum Reserved Memory	6GiB	10GiB	16GiB	48GiB	72GiB	150GiB
Minimum Disk Space for Primary Pool. [c]	200GB					
Minimum Disk Space for Snapshot Pool. [d]	10GB					
Minimum Disk Space for Dedup Pool. [d]	100GB					
SSD Minimums [d]	Optional: 10GiB	Optional: 50GiB	Optional: 100GiB	Required: 300GiB	Required: 500GiB	Required: 1.28TiB
Maximum VDisks	1000			3000	5000	5000

a. Minimum 2 GHz per CPU. The CPU **must be reserved** and the balloon driver must be turned off. Any paging or swapping will cause significant performance impact and in some cases result in the appliance deadlocking.

b. Requires vSphere Host and vCenter 5.1 or later.

c. See Actifio Sky Appliance Storage Requirements on page 5. Must be Thick Provision Eager Zeroed.

d. See Adding SSDs to an Actifio Sky Appliance on page 10 for details on adding SSDs.

Requirements for Sky Appliances That WILL NOT Use Dedup Policies

This table allows you to compare the requirements and capabilities of Sky model for VDP appliances that will protect data in Snapshot Pools only.

Requirement	Model		
	60TB	120TB	200TB
CPUs required.[a]	4	6	8
CPUs required for encryption at rest. [a]	6	8	10
Minimum Reserved Memory	16GiB	32GiB	48GiB
Minimum Disk Space for Primary Pool [b]	200GiB		
Minimum Disk Space for Snapshot Pool	10GiB		
Required Disk Space for Dedup Pool if appliance WILL NOT use dedup policies.	100GiB		
Maximum VDisks	10,000		

a. Minimum 2 GHz per CPU. The CPUs **must be reserved** and the balloon driver must be turned off. Any paging or swapping will cause significant performance impact and in some cases result in the appliance deadlocking.

b. See Actifio Sky Appliance Storage Requirements on page 5. Must be Thick Provision Eager Zeroed.

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Actifio Sky Appliance Storage Requirements

The Sky Appliance uses three storage pools: Primary Pool, Snapshot Pool, and the Dedup Pool. The appliance uses the Dedup Pool even if it does not support Dedup policies. Each pool **MUST:**

- Reside on a separate RAID-6 array that supports at least 100 IOPS per disk.

- Use 7200 RPM disks, 10,000 RPM disks are preferred.

- Have a performance profile of 35 random reads per second per TB with 64KB read size or 10 random writes per second per TB with 64 KB write size.

Note: Run the IOPerf tool prior to Sky Appliance installation to ensure adequate performance. ActifioNOW contains documentation on how to run IOP.

- Use **Thick Provision Eager Zero** disks. Using thin provisioned disks can result in data loss.

To size a Sky Appliance, consider the amount of data to be captured, its type, change rate, growth, and how long it will be retained. These variables and others are considered in the VDP solution sizing tool.

The sizing tool recommends how to allocate space for at least three **Thick Provisioned Eager Zero** disks:

- **Primary Pool:** One 200 GB disk used by the Actifio Sky Appliance.

- **Snapshot Pool:** Accommodates the full copies (snapshots) to be retained, plus enough space for future growth. A minimum of 10 GB is required. You can add additional disks in vSphere to accommodate growth. The Snapshot Pool requires its own SCSI controller set to VMware Paravirtual.

- **Dedup Pool:** Accommodates the deduplicated data to be retained, plus enough space for future growth. A minimum of 1TB is required. You can add additional disks in vSphere to accommodate growth. The Dedup Pool requires its own SCSI controller set to VMware Paravirtual.

  For Sky Appliance models that are not configured for deduplication, you must still add a Dedup Pool disk of 100GB. Such configurations however do not require a separate SCSI controller.

Note: Do not resize disks for Snapshot and Dedup Pools. If additional storage is needed, add disks.

When creating disks, ensure that the **Mode** is set to **Independent** and **Persistent**.

Configuring Actifio Sky in a VMware Environment

These sections detail the best practices for configuring the Actifio Sky VM.

ESX and vCenter 5.0 for 30TiB and 50TiB Licenses

To accommodate more than 7 processors/cores, VMware requires ESX and vCenter 5.0 or later. Actifio Sky appliances with 30TB and 50TB licenses must be installed ESX servers and vCenters running 5.0 or later.

> **Note:** VMware's ESX and vCenter 5.0 requirement is not limited to the Actifio Sky appliance. All VMs with more than 7 processors/cores must run on ESX and vCenter 5.0 or later or else data capture and access operations may fail.

Actifio Sky Appliances on Licensed/Unlicensed ESX Servers

If an Actifio Sky appliance is installed on an unlicensed (free) ESXi server, the Policy Templates for that Actifio Sky appliance **CANNOT** capture other VMs and applications installed on that ESXi server.

If an Actifio Sky appliance is installed on an unlicensed (free) ESXi server, the Policy Templates for that Actifio Sky appliance CAN capture and access VMs and applications on licensed ESX servers and applications on physical servers.

If an Actifio Sky appliance is installed on a licensed ESX server, the Policy Templates for that Actifio Sky appliance CAN capture VMs and applications on the ESX server on which the Actifio Sky appliance is installed. Policy Templates for that Actifio Sky appliance can also capture VMs and applications on other licensed ESX servers and applications on physical servers.

Turn ESX Power Management Off

ESX power management can interfere with the operation of an Actifio Sky appliance. Ensure that power management is turned off.

Turn the Ballooning Driver Off

You must turn off ballooning for the Actifio Sky appliance's VM.

To turn off ballooning you must set the maximum balloon size to zero:

1. Log into the ESX server as a user with administrative rights.
2. Shut down the Actifio Sky appliance.
3. Right-click the Actifio Sky appliance listed on the Inventory panel and click **Edit Settings**.
4. Click the **Options** tab, then under Advanced, click **General.**
5. Click **Configuration Parameters**.
6. Click **Add row** and add the parameter **sched.mem.maxmemctl** in the text box.
7. Click on the row next to it and add **0** in the text box.
8. Click **OK** to save changes.

NTP

Do not use VMware Tools periodic time synchronization for the Actifio Sky appliances' VM. You must use NTP instead.

Networking

Actifio Sky appliances require the following network settings:

Static IPs: You must provide static IPs for all NICs on Actifio Sky appliances.

VMXNET2 and VMXNET3: Actifio Sky appliances that use 30 TB licenses and greater must use the VMXNET2 or VMXNET3 Ethernet adapters. These adapters enable 10GB performance.

Adding NICs: By default, the Actifio Sky appliance comes with a single NIC. To add additional NICs, see the Actifio Sky System Management Tech Brief. This tech brief is available through your Actifio representative.

iSCSI: The Actifio Sky appliance uses iSCSI to mount data. Ensure that iSCSI is turned on for the Actifio Sky appliance's ESX server and the servers that host the data the Actifio Sky appliance will capture and manage.

When capturing an entire VM, iSCSI does not need to be configured on the ESX server that hosts the VM to be captured. Once the VM has been captured, to present the VM to another ESX server, including the ESX server from which it was captured, the ESX server must have iSCSI configured.

When capturing applications on a VM, iSCSI must be configured on the VM's ESX server.

The Actifio Snapshot pool and the Actifio Dedup pool must each have their own SCSI controller set to **VMware Paravirtual**.

Apply the Updated License

Once you have reconfigured the Actifio Sky VM, bring Actifio Sky VM back online and verify the new system resources are properly set and no jobs are running. To apply the new license to the Actifio Sky VM:

1. Log in to the Actifio Sky appliance as root user.

2. Ensure the license you added is present:
    ```
    udsinfo lslicense
    ```
    The date time stamp should match the date and time you added the license. Both the old and the new licenses will be displayed:

3. Bring ADHD back online with:
    ```
    udstask restartadhd -clean
    ```

4. Apply the new license size:
    ```
    udstask configdedup -size <value in TB>
    ```
    Where <value in TB> is the size of the license you added to this Actifio Sky appliance. Allowable size entries are: 5, 10, 30, or 50. The new size specified MUST be larger than the old license size.

    This command will:

    o   Verify that adequate system resources are available.

    o   Take ADHD offline.

    o   Prep the new disk space for use by dedup.

    o   Modify the dedup store configuration for the new size.

    o   Backup the current dedup index and bloom filter.

    o   Create a new dedup index and bloom filter. These are repopulated using an offline GC operation.

5. Wait for configdedup operation to complete.
    You can monitor progress by watching /dumps/dedup_resize.log

    ADHD will come back up automatically once the configdedup command completes.

6. Once completed, to verify that the job worked:
    ```
    zfs get volsize
    ```
    ```
    less /dumps/dedup_resize
    ```


7. After you have verified that configdedup is complete, you must turn ADHA back on:
    ```
    udppm command "localdedups on"
    ```
    ```
    udppm command "remotededups on"
    ```
    ```
    udppm command "dedupasync on"
    ```
    ```
    udppm command "expiration on"
    ```
    ```
    udppm command "quiesce off"
    ``` # This is required as the script turns quiesce on.

8. Finally, remove the old license: `udstask rmlicense <id of old license>`. If you do not remove the old license, the Actifio dashboard will show the licensed capacity as the sum of both the old and new licenses.

Troubleshooting

In situations where:

- GC crashed while grow running due to missing/invalid hash found during ZTR
- Power outage during the resize
- The VM or OOM killed
- Any other panic/crash

Note: *The grow script will keep ADHD offline in the event of any failure.*

Gather all information about the situation and contact the Actifio ADHD team.

If time is an issue and you need to get the Actifio Sky appliance online as soon as possible:

- As a root user on the Actifio Sky appliance you can run the following "revert" CLI command:

  `/act/bin/dedup_resize --revert`
  When it completes, verify in dedup_resize.log that the revert was successful.

Remove ADHD block and bring the Actifio Sky appliance back online.

When you know the issue is resolved, Perform the Add License procedure again.

Table 1: Possible Errors

Error	What to do
Wrong License	In this instance, the command was trying to match the new dedup pool size with the customer license. To verify this, open Actifio Desktop and check the licenses applied.
Not meeting minimum requirements	When Grow is run and this error appears, the system does not meet the minimum requirements. To remedy, repeat the process and ensure to correct license size is entered
No License	If the licensed capacity is zero, this usually means there is no license applied. Run udsinfo lslicense to see if any licenses are applied. Repeat the add licenses process.

Adding SSDs to an Actifio Sky Appliance

After you have upgraded your Actifio Sky appliance, the amount of SSD available to the Actifio Sky appliance must match that of its new license.

Actifio Sky appliances that have licenses of 30 TB and greater must use an SSD. Each Actifio Sky license type has its own SSD requirement:

- 50TB – 512GiB SSD Required
- 30TB – 308GiB SSD Required
- 10TB – 103GiB SSD Optional
- 5TB – 53GiB SSD Optional
- 1TB – 11GiB SSD Optional

If an SSD is already assigned to an Actifio Sky appliance from a release prior to Actifio 7.0, it cannot be used. If you have an SSD from a release prior to Actifio 7.0 it does not need to be removed. However, if you feel that the SSD must be removed, contact your Actifio representative for assistance.

Note: *If the dedup pool is built entirely from an SSD, then there is no need to add an SSD.*

Use the hypervisor vendor's best practices to physically add an SSD to a hypervisor. Once the SSD has been added, see:

- VMware Versions for SSD Support on page 10
- Adding an SSD From the Actifio CLI on page 11

Note: *The procedures specified in this document apply to Actifio Sky's Dedup Pool and are separate from the way SSDs are used with Actifio CDS.*

VMware Versions for SSD Support

Sky Appliances are delivered with VMware Virtual Machine Compatibility Level 7. This allows Actifio Sky to work with older versions of ESX.

For an Actifio Sky appliance to identify SSDs automatically, both of the following need to be true:

The ESX hosting environment needs to be version 5.5.0 or greater.

The VM Compatibility has to be updated to version 10.

If one or both of these conditions is not true, then you will not be able to add an SSD to the Actifio Sky appliance via the Actifio Sky Desktop. Instead, you will have to use the Actifio CLI to add the SSD to the Actifio Sky appliance. See Adding an SSD From the Actifio CLI on page 11 for details.

Adding an SSD From the Actifio CLI

After adding an SSD to your virtual server, add the SSD to your Actifio Sky appliance's Dedup Pool:

1. Identify the SSD:

```
# udsinfo lsssd
id wwid                                      slot status
 - pci-0000:00:10.0-scsi-0:0:4:0             None None
```

2. Add the SSD to the Actifio Sky appliance's Dedup Pool:

```
# udstask addssd pci-0000:00:10.0-scsi-0:0:4:0
```

If the SSD still does not appear in the Actifio Sky appliance's Manage Dedup Pool dialog box, manually add the SSD to the Dedup Pool.

1. Identify the Dedup Pool to which the SSD will be added:

```
# udsinfo lsdiskpool
id warnpct modifydate                name           safepct mdiskgrp
71      80 2015-07-30 17:19:25.459   act_pri_pool000     90 act_pri_pool000
72      88 2015-07-30 17:19:25.462   act_ded_pool000    100 act_ded_pool000/act_ded_vdk0000
73      80 2015-07-30 17:19:25.463   act_per_pool000     90 act_per_pool00
```

2. Assign the SSD to the Actifio Sky appliance's dedup pool:

```
# udstask addssd -diskpool act_ded_pool000 pci-0000:03:00.0-scsi-0:0:4:0
```

3. Verify the changes under slot status:

```
# udsinfo lsssd
id wwid                                      slot status
 - pci-0000:00:10.0-scsi-0:0:40              None act_ded_pool000
```