



# Storage virtualization

## ONTAP 9

NetApp

February 28, 2023

# Table of Contents

- Storage virtualization . . . . . 1
  - Storage virtualization overview . . . . . 1
  - SVM use cases . . . . . 2
  - Cluster and SVM administration . . . . . 3
  - Namespaces and junction points . . . . . 3

# Storage virtualization

## Storage virtualization overview

You use *storage virtual machines (SVMs)* to serve data to clients and hosts. Like a virtual machine running on a hypervisor, an SVM is a logical entity that abstracts physical resources. Data accessed through the SVM is not bound to a location in storage. Network access to the SVM is not bound to a physical port.



SVMs were formerly called “vservers.” You will still see that term in the ONTAP command line interface (CLI).

An SVM serves data to clients and hosts from one or more volumes, through one or more network *logical interfaces (LIFs)*. Volumes can be assigned to any data aggregate in the cluster. LIFs can be hosted by any physical or logical port. Both volumes and LIFs can be moved without disrupting data service, whether you are performing hardware upgrades, adding nodes, balancing performance, or optimizing capacity across aggregates.

The same SVM can have a LIF for NAS traffic and a LIF for SAN traffic. Clients and hosts need only the address of the LIF (IP address for NFS, SMB, or iSCSI; WWPN for FC) to access the SVM. LIFs keep their addresses as they move. Ports can host multiple LIFs. Each SVM has its own security, administration, and namespace.

In addition to data SVMs, ONTAP deploys special SVMs for administration:

- An *admin SVM* is created when the cluster is set up.
- A *node SVM* is created when a node joins a new or existing cluster.
- A *system SVM* is automatically created for cluster-level communications in an IPspace.

You cannot use these SVMs to serve data. There are also special LIFs for traffic within and between clusters, and for cluster and node management.



*Data accessed through an SVM is not bound to a physical storage location. You can move a volume without disrupting data service.*

### ***Why ONTAP is like middleware***

The logical objects ONTAP uses for storage management tasks serve the familiar goals of a well-designed middleware package: shielding the administrator from low-level implementation details and insulating the configuration from changes in physical characteristics like nodes and ports. The basic idea is that the administrator should be able to move volumes and LIFs easily, reconfiguring a few fields rather than the entire storage infrastructure.

## **SVM use cases**

Service providers use SVMs in secure multitenancy arrangements to isolate each tenant's data, to provide each tenant with its own authentication and administration, and to simplify chargeback. You can assign multiple LIFs to the same SVM to satisfy different customer needs, and you can use QoS to protect against tenant workloads “bullying” the workloads of other tenants.

Administrators use SVMs for similar purposes in the enterprise. You might want to segregate data from different departments, or keep storage volumes accessed by hosts in one SVM and user share volumes in another. Some administrators put iSCSI/FC LUNs and NFS datastores in one SVM and SMB shares in another.



*Service providers use SVMs in multitenant environments to isolate tenant data and simplify chargeback.*

# Cluster and SVM administration

A *cluster administrator* accesses the admin SVM for the cluster. The admin SVM and a cluster administrator with the reserved name `admin` are automatically created when the cluster is set up.

A cluster administrator with the default `admin` role can administer the entire cluster and its resources. The cluster administrator can create additional cluster administrators with different roles as needed.

An *SVM administrator* accesses a data SVM. The cluster administrator creates data SVMs and SVM administrators as needed.

SVM administrators are assigned the `vsadmin` role by default. The cluster administrator can assign different roles to SVM administrators as needed.

## Role-Based Access Control (RBAC)

The *role* assigned to an administrator determines the commands to which the administrator has access. You assign the role when you create the account for the administrator. You can assign a different role or define custom roles as needed.

# Namespaces and junction points

A NAS *namespace* is a logical grouping of volumes joined together at *junction points* to create a single file system hierarchy. A client with sufficient permissions can access files in the namespace without specifying the location of the files in storage. Junctioned volumes can reside anywhere in the cluster.

Rather than mounting every volume containing a file of interest, NAS clients mount an NFS *export* or access an SMB *share*. The export or share represents the entire namespace or an intermediate location within the namespace. The client accesses only the volumes mounted below its access point.

You can add volumes to the namespace as needed. You can create junction points directly below a parent volume junction or on a directory within a volume. A path to a volume junction for a volume named “vol3” might be `/vol1/vol2/vol3`, or `/vol1/dir2/vol3`, or even `/dir1/dir2/vol3`. The path is called the *junction path*.

Every SVM has a unique namespace. The SVM root volume is the entry point to the namespace hierarchy.



To ensure that data remains available in the event of a node outage or failover, you should create a *load-sharing mirror* copy for the SVM root volume.



*A namespace is a logical grouping of volumes joined together at junction points to create a single file system hierarchy.*

#### Example

The following example creates a volume named “home4” located on SVM vs1 that has a junction path /eng/home:

```
cluster1::> volume create -vserver vs1 -volume home4 -aggregate aggr1
-size 1g -junction-path /eng/home
[Job 1642] Job succeeded: Successful
```

## Copyright information

Copyright © 2023 NetApp, Inc. All Rights Reserved. Printed in the U.S. No part of this document covered by copyright may be reproduced in any form or by any means—graphic, electronic, or mechanical, including photocopying, recording, taping, or storage in an electronic retrieval system—without prior written permission of the copyright owner.

Software derived from copyrighted NetApp material is subject to the following license and disclaimer:

THIS SOFTWARE IS PROVIDED BY NETAPP “AS IS” AND WITHOUT ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WHICH ARE HEREBY DISCLAIMED. IN NO EVENT SHALL NETAPP BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

NetApp reserves the right to change any products described herein at any time, and without notice. NetApp assumes no responsibility or liability arising from the use of products described herein, except as expressly agreed to in writing by NetApp. The use or purchase of this product does not convey a license under any patent rights, trademark rights, or any other intellectual property rights of NetApp.

The product described in this manual may be protected by one or more U.S. patents, foreign patents, or pending applications.

LIMITED RIGHTS LEGEND: Use, duplication, or disclosure by the government is subject to restrictions as set forth in subparagraph (b)(3) of the Rights in Technical Data -Noncommercial Items at DFARS 252.227-7013 (FEB 2014) and FAR 52.227-19 (DEC 2007).

Data contained herein pertains to a commercial product and/or commercial service (as defined in FAR 2.101) and is proprietary to NetApp, Inc. All NetApp technical data and computer software provided under this Agreement is commercial in nature and developed solely at private expense. The U.S. Government has a non-exclusive, non-transferrable, nonsublicensable, worldwide, limited irrevocable license to use the Data only in connection with and in support of the U.S. Government contract under which the Data was delivered. Except as provided herein, the Data may not be used, disclosed, reproduced, modified, performed, or displayed without the prior written approval of NetApp, Inc. United States Government license rights for the Department of Defense are limited to those rights identified in DFARS clause 252.227-7015(b) (FEB 2014).

## Trademark information

NETAPP, the NETAPP logo, and the marks listed at <http://www.netapp.com/TM> are trademarks of NetApp, Inc. Other company and product names may be trademarks of their respective owners.