



## **Release notes**

### **ONTAP 9**

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# Release notes

## ONTAP 9 release highlights

Each release of the ONTAP 9 data management software delivers new and enhanced features that improve the capabilities, manageability, performance, and security offerings in ONTAP.

In addition to these highlights, you can find comprehensive, per-version coverage of all the new and enhanced features introduced in recent ONTAP releases.

- Learn about [new and enhanced ONTAP MetroCluster features](#).
- Learn about [new and enhanced support for FAS, ASA, and AFF platforms and supported switches](#).
- Learn about updates to the [ONTAP REST API](#).

For details about known issues, limitations, and upgrade cautions in recent ONTAP 9 releases, refer to the [ONTAP 9 Release Notes](#). You must sign in with your NetApp account or create an account to access the Release Notes.

To upgrade to the latest release of ONTAP, see [Upgrade to the latest version of ONTAP](#) and [When should I upgrade ONTAP?](#)

### ONTAP 9.15.1 highlights

ONTAP 9.15.1 delivers new and enhanced features in the areas of security management, data protection, and NAS workload support. For a complete list of new features and enhancements, see [What's new in ONTAP 9.15.1](#).

- [Support for new AFF A-series systems, storage built for AI](#)

ONTAP 9.15.1 supports the new high-performance AFF A1K, AFF A90, and AFF A70 systems, designed for the next generation of business workloads such as AI/ML training and inference. This new class of systems provides up to twice the performance of existing AFF A-series offerings and delivers “always on” improved storage efficiency without performance trade-offs.

- [Dynamic authorization](#)

ONTAP 9.15.1 introduces an initial framework for dynamic authorization, a security feature that can determine whether a command issued by an administrator account should be denied, prompted for additional authentication, or allowed to proceed. Determinations are based on the user account's trust score, taking into account factors such as time of day, location, IP address, trusted device usage, and the user's authentication and authorization history.

- [Expanded scope of impact for Multi-admin verification](#)

ONTAP 9.15.1 RC1 adds over a hundred new commands to the MAV framework for additional protection from malicious insiders.

- [NFS over TLS](#)

Protect data “over the wire” at the protocol layer with simplified configuration compared to other technologies such as IPSec and NFS Kerberos. This feature is included as public preview at this time. For

more information about this capability, please contact your sales team for additional information.

- TLS 1.3 encryption support for cluster peering and more

ONTAP 9.15.1 introduces TLS 1.3 encryption support for S3 storage, FlexCache, SnapMirror and cluster peering encryption. Applications such as FabricPool, Microsoft Azure Page Blobs storage, and SnapMirror Cloud continue to use TLS 1.2 for the 9.15.1 release.

- Support for SMTP traffic over TLS

Securely transfer AutoSupport data over e-mail with TLS support.

- [SnapMirror active sync for symmetric active/active configurations](#)

This new capability provides synchronous bi-directional replication for business continuity and disaster recovery. Protect your data access for critical SAN workloads with simultaneous read and write access to data across multiple failure domains, enabling uninterrupted operations and minimizing downtime during disasters or system failures.

- [FlexCache writeback](#)

FlexCache writeback lets clients write locally to FlexCache volumes, reducing latency and improving performance compared to writing directly to the origin volume. The newly written data is asynchronously replicated back to the origin volume.

- [NFSv3 over RDMA](#)

NFSv3 over RDMA support can help you address high-performance requirements by providing low-latency, high-bandwidth access over TCP.

## ONTAP 9.14.1 highlights

ONTAP 9.14.1 delivers new and enhanced features in the areas of FabricPool, anti-ransomware protection, OAuth, and more. For a complete list of new features and enhancements, see [What's new in ONTAP 9.14.1](#).

- [WAFL reservation reduction](#)

ONTAP 9.14.1 introduces an immediate five percent increase in usable space on FAS and Cloud Volumes ONTAP systems by reducing the WAFL reserve on aggregates with 30 TB or more.

- [FabricPool enhancements](#)

FabricPool offers an increase in [read performance](#) and enables direct writing to the cloud, lowering the risk of running out of space and reducing storage costs by moving cold data to a less expensive storage tier.

- [Support for OAuth 2.0](#)

ONTAP supports the OAuth 2.0 framework, which can be configured using System Manager. With OAuth 2.0, you can provide secure access to ONTAP for automation frameworks without creating or exposing user IDs and passwords to plain text scripts and runbooks.

- [Autonomous Ransomware Protection \(ARP\) enhancements](#)

ARP grants you more control over event security, allowing you to adjust the conditions that create alerts and reducing the possibility for false positives.

- [SnapMirror disaster recovery rehearsal in System Manager](#)

System Manager provides a simple workflow to easily test disaster recovery at a remote location and to clean up after the test. This feature enables easier and more frequent testing and increased confidence in recovery time objectives.

- [S3 object lock support](#)

ONTAP S3 supports the object-lock API command, enabling you to protect data written to ONTAP with S3 from deletion using standard S3 API commands and to ensure that important data is protected for the appropriate amount of time.

- [Cluster](#) and [volume](#) tagging

Add metadata tags to volumes and clusters, which follow the data as it moves from on-premises to the cloud and reverse.

## ONTAP 9.13.1 highlights

ONTAP 9.13.1 delivers new and enhanced features in the areas of anti-ransomware protection, consistency groups, quality of service, tenant capacity management, and more. For a complete list of new features and enhancements, see [What's new in ONTAP 9.13.1](#).

- Autonomous Ransomware Protection (ARP) enhancements:

- [Automatic enablement](#)

With ONTAP 9.13.1, ARP automatically moves from training into production mode after it has sufficient learning data, eliminating the need for an administrator to enable it after the 30-day period.

- [Multi-admin verification support](#)

ARP disable commands are supported by multi-admin verification, ensuring that no single administrator can disable ARP to expose the data to potential ransomware attacks.

- [FlexGroup support](#)

ARP supports FlexGroups beginning with ONTAP 9.13.1. ARP can monitor and protect FlexGroups that span multiple volumes and nodes in the cluster, enabling even the largest datasets to be protected with ARP.

- [Performance and capacity monitoring for consistency groups in System Manager](#)

Performance and capacity monitoring provides detailed for each consistency group, enabling you to quickly identify and report potential issues at the application level rather than just at the data object level.

- [Tenant capacity management](#)

Multi-tenant customers and service providers can set a capacity limit on each SVM, allowing tenants to perform self-service provisioning without the risk of one tenant over-consuming capacity on the cluster.

- [Quality of Service ceilings and floors](#)

ONTAP 9.13.1 allows you to group objects such as volumes, LUNs, or files into groups and assign a QoS ceiling (maximum IOPs) or floor (minimum IOPs), improving application performance expectations.

## ONTAP 9.12.1 highlights

ONTAP 9.12.1 delivers new and enhanced features in the areas of security hardening, retention, performance, and more. For a complete list of new features and enhancements, see [What's new in ONTAP 9.12.1](#).

- [Tamper-proof Snapshots](#)

With SnapLock technology, Snapshot copies can be protected from deletion on either the source or destination.

Retain more recovery points by protecting snapshots on primary and secondary storage from deletion by ransomware attackers or rogue administrators.

- [Autonomous ransomware protection \(ARP\) enhancements](#)

Immediately enable intelligent autonomous ransomware protection on secondary storage, based on the screening model already completed for the primary storage.

After a failover, instantly identify potential ransomware attacks on secondary storage. A Snapshot is immediately taken of the data that is starting to be affected, and administrators are notified, helping to stop an attack and enhance recovery.

- [FPolicy](#)

One-click activation of ONTAP FPolicy to enable automatic blocking of known malicious files. The simplified activation helps to protect against typical ransomware attacks that use common, known file extensions.

- [Security hardening: Tamper-proof retention logging](#)

Tamperproof retention logging in ONTAP insuring compromised administrator accounts cannot hide malicious actions. Admin and user history cannot be altered or deleted without the system's knowledge.

Log and audit all admin actions regardless of origin guaranteeing all actions impacting data are captured. An alert is generated whenever system audit logs have been tampered with in any way notifying administrators of the change.

- [Security hardening: Expanded multifactor authentication](#)

Multifactor authentication (MFA) for CLI (SSH) supports Yubikey physical hardware token devices ensuring that an attacker cannot access the ONTAP system using stolen credentials or a compromised client system. Cisco DUO is supported for MFA with System Manager.

- [File-object duality \(multi-protocol access\)](#)

File-object duality enables native S3 protocol read and write access to the same data source that already has NAS protocol access. You can concurrently access your storage as files or as objects from the same data source, eliminating the need for duplicate copies of data for use with different protocols (S3 or NAS), such as for analytics that use object data.

- [FlexGroup rebalancing](#)

If FlexGroup constituents become unbalanced, FlexGroup can nondisruptively be rebalanced and managed from the CLI, REST API, and System Manager. For optimal performance, constituent members within a FlexGroup should have their used capacity evenly distributed.

- Storage capacity enhancements

WAFL Space Reservation has been significantly reduced, providing up to 400 TiB more usable capacity per aggregate.

## ONTAP 9.11.1 highlights

ONTAP 9.11.1 delivers new and enhanced features in the areas of security, retention, performance, and more. For a complete list of new features and enhancements, see [What's new in ONTAP 9.11.1](#).

- [Multi-admin verification](#)

Multi-admin verification (MAV) is an industry-first native approach to verification, requiring multiple approvals for sensitive administrative tasks such as deleting a Snapshot or volume. The approvals required in a MAV implementation prevent malicious attacks and accidental changes to data.

- [Enhancements to Autonomous Ransomware Protection](#)

Autonomous Ransomware Protection (ARP) uses machine learning to detect ransomware threats with increased granularity, enabling you to identify threats quickly and accelerate recovery in the event of a breach.

- [SnapLock Compliance for FlexGroup volumes](#)

Secure multi-petabyte datasets for workloads such as electronic design automation and media & entertainment by protecting the data with WORM file locking so it cannot be changed or deleted.

- [Asynchronous directory delete](#)

With ONTAP 9.11.1, file deletion occurs in the background of the ONTAP system, enabling you to easily delete large directories while eliminating performance and latency impacts on the host I/O.

- [S3 enhancements](#)

Simplify and expand the object data management capabilities of S3 with ONTAP with additional API endpoints and object versioning at the bucket level, enabling multiple versions of an object to be stored in the same bucket.

- System Manager enhancements

System Manager supports advanced capabilities to optimize storage resources and improve audit management. These updates include enhanced abilities to manage and configure storage aggregates, enhanced visibility into system analytics, hardware visualization for FAS systems.

## ONTAP 9.10.1 highlights

ONTAP 9.10.1 delivers new and enhanced features in the areas of security hardening, performance analytics, NVMe protocol support, and object storage backup options. For a complete list of new features and enhancements, see [What's new in ONTAP 9.10.1](#).

- [Autonomous Ransomware Protection](#)

Autonomous Ransomware Protection automatically creates a Snapshot copy of your volume and alerts administrators when abnormal activity is detected, enabling you to quickly detect ransomware attacks and

recover more quickly.

- **System Manager enhancements**

System Manager automatically download firmware updates for disks, shelves, service processors in addition to providing new integrations with NetApp Active IQ Digital Advisor, BlueXP, and certificate management. These enhancements simplify administration and maintain business continuity.

- **File System Analytics enhancements**

File System Analytics provides additional telemetry to identify top files, directories, and users in your file share, enabling you to identify workload performance issues to improve resource planning and implementation of QoS.

- **NVMe over TCP (NVMe/TCP) support for AFF systems**

Achieve high performance and reduce TCO for your enterprise SAN and modern workloads on AFF system when you use NVMe/TCP on your existing Ethernet network.

- **NVMe over Fibre Channel (NVMe/FC) support for NetApp FAS systems**

Use the NVMe/FC protocol on your hybrid arrays to enable uniform migration to NVMe.

- **Native hybrid cloud backup for object storage**

Protect your ONTAP S3 data with your choice of object storage targets. Use SnapMirror replication to back up to on-premises storage with StorageGRID, to the cloud with Amazon S3, or to another ONTAP S3 bucket on NetApp AFF and FAS systems.

- **Global file-locking with FlexCache**

Ensure file consistency at cache locations during updates to source files at the origin with global file-locking using FlexCache. This enhancement enables exclusive file-read locks in an origin-to-cache relationship for workloads that require enhanced locking.

## ONTAP 9.9.1 highlights

ONTAP 9.9.1 delivers new and enhanced features in the areas of storage efficiency, multifactor authentication, disaster recovery, and more. For a complete list of new features and enhancements, see [What's new in ONTAP 9.9.1](#).

- **Enhanced security for CLI remote access management**

Support for SHA512 and SSH A512 password hashing protects administrator account credentials from malicious actors who are trying to gain system access.

- **MetroCluster IP enhancements: support for 8-node clusters**

The new limit is twice as large as the previous one, providing support for MetroCluster configurations and enabling continuous data availability.

- **SnapMirror active sync**

Offers more replication options for backup and disaster recovery for large data containers for NAS workloads.



- [Increased SAN performance](#)

Delivers up to four-times higher SAN performance for single LUN applications such as VMware datastores so you can achieve high performance in your SAN environment.

- [New object storage option for hybrid cloud](#)

Enables use of StorageGRID as a destination for NetApp Cloud Backup Service to simplify and automate the backup of your on-premises ONTAP data.

#### Next steps

- [Upgrade to the latest version of ONTAP](#)
- [When should I upgrade ONTAP?](#)

## What's new in ONTAP 9.15.1

Learn about the new capabilities available in ONTAP 9.15.1.

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Learn about new and enhanced [ONTAP MetroCluster features](#).

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### Data protection

Update	Description
<a href="#">SnapMirror active sync supports symmetric active/active deployments</a>	SnapMirror active sync (formerly SnapMirror Business Continuity) now supports symmetric active/active deployments, enabling read and write I/O operations from both copies of a protected LUN with bidirectional synchronous replication.
Increased limit for volumes in a consistency group using SnapMirror asynchronous	Consistency groups using SnapMirror asynchronous protection now support up to 80 volumes in the consistency group.
<a href="#">Support for admin privilege level for REST API and CLI operations with consistency groups</a>	CLI and REST API operations for consistency groups are now supported at the administrative privilege level.

Update	Description
<a href="#">Persistent reservations for VMware virtual volumes with Windows Server Failover Clustering</a>	ONTAP currently supports VMware virtual volumes (vVols) as well as persistent reservations with traditional LUNs. Beginning with ONTAP 9.15.1, you can also create a persistent reservation with a vVol. Support for this feature is implemented in ONTAP Tools for VMware vSphere 9. It is only supported in a Windows Server Failover Cluster (WSFC) which is a group of clustered Windows virtual machines.

## Security

Update	Description
<a href="#">Simplified FPolicy persistent store creation and configuration</a>	<p>You can create the FPolicy persistent store and automate its volume creation and configuration at the same time using the <code>persistent-store create</code> command.</p> <p>The enhanced <code>persistent-store create</code> command also allows the use of the <code>autosize-mode</code> parameter, which allows the volume to grow or shrink in size in response to the amount of used space.</p>
<a href="#">Support for NFSv3 with RDMA</a>	NFS over RDMA configurations now support NFSv3.
<a href="#">FPolicy supports the NFS 4.1 protocol</a>	FPolicy supports the NFS 4.1 protocol.
<a href="#">Protobuf engine format support for FPolicy</a>	<p>Protobuf is Google's language-neutral mechanism for serializing structured data. It is smaller, faster, and simpler compared to XML, which helps improve FPolicy performance.</p> <p>You can use the protobuf external engine format. When set to protobuf, the notification messages are encoded in binary form using Google Protobuf. Before setting the external engine format to protobuf, ensure that the FPolicy server also supports protobuf deserialization.</p>
<a href="#">Dynamic Authorization for SSH connections</a>	ONTAP 9.15.1 provides the initial framework for Dynamic Authorization, which provides enhanced security for management of the ONTAP system by enabling you to assign a security trust score to administrator users and challenge them with additional authorization checks when their activity looks suspicious. You can utilize Dynamic Authorization as part of a data-centric Zero Trust security architecture.
<a href="#">Support for TLS 1.3 for S3 storage, FlexCache, and Cluster Peering encryption</a>	TLS 1.3 has been supported since ONTAP 9.11.1 for management access, but it is now supported in ONTAP 9.15.1 for S3 storage, FlexCache, and Cluster Peering encryption. Some applications, such as FabricPool, Microsoft Azure Page Blobs storage, and SnapMirror Cloud continue to be limited to the use of TLS 1.2 for the 9.15.1 release.

Update	Description
<a href="#">TLS support for NFS connections</a>	<p>NFS over TLS is available in ONTAP 9.15.1 as a public preview. As a preview offering, NFS over TLS is not supported for production workloads in ONTAP 9.15.1.</p> <p>NFS over TLS provides in-transit encryption of data from the storage device to the client. TLS is more recent and more convenient than Kerberos, enabling simpler configuration and administration.</p>
<a href="#">Eligible set of rule-protected commands extended for multi-admin verification</a>	Administrators can create multi-admin verification rules to protect cluster configuration, LUN deletion, system configuration, security configuration for IPsec and SAML, volume snapshot operations, vServer configuration, and other commands.
<a href="#">Delivery of AutoSupport messages using SMTP with TLS</a>	While the recommended transport of AutoSupport messages to NetApp is HTTPS, unencrypted SMTP has also been available. With ONTAP 9.15.1, customers now have the option of using TLS with SMTP. The SMTPS protocol establishes a secure transport channel by encrypting the email traffic as well as the optional email server credentials. Explicit TLS is used and so TLS is activated after the TCP connection is created. If copies of the messages are sent to local email addresses, the same configuration is used.

## Storage efficiency

Update	Description
<a href="#">Changes to reporting of volume space metrics</a>	Two new counters have been introduced which show only the metadata being used. In addition, several of the existing counters have been adjusted to remove the metadata and display only the user data. Together these changes provide a clearer view of the metrics separated into the two types of data. Customers can use these counters to implement more accurate chargeback models by discounting metadata from the total and only considering the actual user data.

## Storage resource management enhancements

Update	Description
<a href="#">FlexCache writeback support</a>	When writeback is enabled on the cache volume, write requests are sent to the local cache rather than to the origin volume, providing better performance for edge computing environments and caches with write-heavy workloads.
<a href="#">Performance enhancement for File System Analytics</a>	ONTAP enforces that 5-8% of a volume's capacity must be free when enabling File System Analytics, mitigating potential performance issues for volumes and File System Analytics.

Update	Description
FlexClone volumes encryption keys	A FlexClone volume is assigned a dedicated encryption key that is independent of the FlexVol volume's (host) encryption key.

## System Manager

Update	Description
<a href="#">System Manager support for configuring SnapLock vault relationships</a>	SnapLock vault relationships can be configured using System Manager when both the source and destination are running ONTAP 9.15.1 or later.
<a href="#">Performance enhancements for the System Manager dashboard</a>	The information on the System Manager dashboard Health, Capacity, Network, and Performance views includes more complete descriptions, including enhancements to the performance metrics that help you identify and troubleshoot latency or performance issues.

## Upgrade

Update	Description
<a href="#">Support for LIF migration to HA partner node during automated nondisruptive upgrade</a>	If LIF migration to the other batch group fails during an automated nondisruptive upgrade, the LIFs are migrated to the HA partner node in the same batch group.

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## Data protection

Update	Description
<a href="#">NVE supported on SVM root volumes</a>	SVM root volumes can be encrypted using unique keys with NetApp Volume Encryption.

Update	Description
<a href="#">Ability to set Snapshot copy locking on long-term retention Snapshot copies and to reinitialize the Compliance Clock</a>	On clusters with a SnapLock license, tamperproof Snapshot copy locking for Snapshot copies with long-term retention can be set for Snapshot copies created on non-SnapLock SnapMirror destination volumes and the Compliance Clock can be initialized when no SnapLock volumes are present.
<a href="#">SnapMirror active sync supports SCSI3 persistent reservations and Windows Failover Clustering</a>	SCSI3 persistent reservations and Window Failover Clustering for SnapMirror active sync supports multiple nodes accessing a device while at the same time blocking access to other nodes, ensuring clustering for different application environments stays consistent and stable.
<a href="#">Copy volume-granular Snapshots with consistency groups</a>	You can utilize consistency groups to replicate Asynchronous SnapMirror Snapshots and volume-granular Snapshots to the destination consistency groups for an extra layer of disaster recovery.
<a href="#">Asynchronous data protection support for consistency groups within SVM disaster recovery relationship</a>	SVMs configured for SVM disaster recovery can replicate consistency group information to the secondary site if the SVM contains a consistency group.
<a href="#">SnapMirror asynchronous support for 20 fanout targets</a>	The number of SnapMirror asynchronous fanout targets supported on A700 and higher systems increases from 16 to 20 when using ONTAP 9.14.1.
<a href="#">CLI support for consistency groups</a>	Manage consistency groups using the ONTAP CLI.

## File access protocols

Update	Description
<a href="#">NFSv4.1 session trunking</a>	Session trunking allows for multiple paths to an exported datastore. This simplifies management and improves performance as workloads scale up. It is especially appropriate in environments with VMware workloads.

## MetroCluster

Update	Description
<a href="#">S3 object storage support on mirrored and unmirrored aggregates</a>	Enable an S3 object storage server on an SVM in a mirrored or unmirrored aggregate in MetroCluster IP and FC configurations.
<a href="#">Support for provisioning an S3 bucket on mirrored and unmirrored aggregates in a MetroCluster cluster</a>	You can create a bucket on a mirrored or unmirrored aggregate in MetroCluster configurations.

To learn about platform and switch configuration enhancements for MetroCluster configurations, see the [ONTAP 9 Release Notes](#).

## S3 object storage

Update	Description
Automatic resizing has been enabled on S3 FlexGroup volumes to eliminate excessive capacity allocation when buckets are created on them	When buckets are created on or deleted from new or existing FlexGroup volumes, the volumes are resized to a minimum required size. The minimum required size is the total size of all the S3 buckets in a FlexGroup volume.
S3 object storage support on mirrored and unmirrored aggregates	You can enable an S3 object storage server on an SVM in a mirrored or unmirrored aggregate in MetroCluster IP and FC configurations.
Object locking based on users roles and lock retention period	Objects in S3 buckets can be locked from being overwritten or deleted. The ability to lock objects is based on specific users or time.
Configuring access for LDAP user groups to support external directory services and adding validity period for access and secret keys	ONTAP administrators can configure access for Lightweight Directory Access Protocol (LDAP) or Active Directory user groups to ONTAP S3 object storage, with the ability to enable authentication in LDAP fast bind mode. Users in local or domain groups or LDAP groups can generate their own access and secret keys for S3 clients. You can define a validity period for the access keys and secret keys of S3 users. ONTAP provides support for variables such as <code>\$aws:username</code> for bucket policies and group policies.

## SAN

Update	Description
NVMe/TCP automated host discovery	Host discovery of controllers using the NVMe/TCP protocol is automated by default.
NVMe/FC host side reporting and troubleshooting	By default, ONTAP supports the ability of NVMe/FC hosts to identify virtual machines by a unique identifier and for NVMe/FC hosts to monitor virtual machine resource utilization. This enhances host-side reporting and troubleshooting.
NVMe host prioritization	You can configure your NVMe subsystem to prioritize resource allocation for specific hosts. Host assigned a high priority are allocated larger I/O queue counts and larger queue depths.

## Security

Update	Description
Support for Cisco DUO multifactor authentication for SSH users	SSH users can authenticate using Cisco DUO as a second factor of authentication during sign-in.
Enhancements to OAuth 2.0 support	ONTAP 9.14.1 extends the core token-based authentication and OAuth 2.0 support initially provided with ONTAP 9.14.0. Authorization can be configured using Active Directory or LDAP with group-to-role mapping. Sender-constrained access tokens are also supported and secured based on Mutual TLS (mTLS). In addition to Auth0 and Keycloak, Microsoft Windows Active Directory Federation Service (ADFS) is supported as an Identity Provider (IdP).

Update	Description
<a href="#">OAuth 2.0 Authorization Framework</a>	The Open Authorization (OAuth 2.0) framework is added and provides token-based authentication for ONTAP REST API clients. This enables more secure management and administration of the ONTAP clusters using automation workflows powered by REST API scripts or Ansible. The standard OAuth 2.0 features are supported, including issuer, audience, local validation, remote introspection, remote user claim, and proxy support. Client authorization can be configured using self-contained OAuth 2.0 scopes or by mapping the local ONTAP users. Supported Identity Providers (IdP) include Auth0 and Keycloak using multiple concurrent servers.
<a href="#">Tunable alerts for Autonomous Ransomware Protection</a>	Configure Autonomous Ransomware Protection to receive notifications whenever a new file extension is detected or when an ARP Snapshot is taken, receiving earlier warning to possible ransomware events.
<a href="#">FPolicy supports persistent stores to reduce latency</a>	FPolicy allows you to set up a persistent store to capture file access events for asynchronous non-mandatory policies in the SVM. Persistent stores can help decouple client I/O processing from the FPolicy notification processing to reduce client latency. Synchronous and asynchronous mandatory configurations are not supported.
<a href="#">FPolicy supports FlexCache volumes on SMB</a>	FPolicy is supported for FlexCache volumes with NFS or SMB. Previously, FPolicy was not supported for FlexCache volumes with SMB.

## Storage efficiency

Update	Description
<a href="#">Scan tracking in File System Analytics</a>	Track the File System Analytics initialization scan with real time insights about progress and throttling.
<a href="#">Increase in usable aggregate space on FAS platforms</a>	For FAS platforms, the WAFL reserve for aggregates greater than 30TB in size is reduced from 10% to 5%, resulting in increased usable space in the aggregate.
<a href="#">Change in reporting of physical used space in TSSE volumes</a>	On volumes with temperature-sensitive storage efficiency (TSSE) enabled, the ONTAP CLI metric for reporting the amount of space used in the volume includes the space savings realized as a result of TSSE. This metric is reflected in the volume show -physical-used and the volume show-space -physical used commands. For FabricPool, the value of -physical-used is a combination of the capacity tier and the performance tier. For specific commands, see <code>volume show</code> and <code>volume show space</code> .

## Storage resource management enhancements

Update	Description
<a href="#">Proactive FlexGroup rebalancing</a>	FlexGroup volumes provide support for automatically moving growing files in a directory to a remote constituent to reduce I/O bottlenecks on the local constituent.
<a href="#">Snapshot copy tagging in FlexGroup volumes</a>	You can add, modify, and delete tags and labels (comments) in to help identify Snapshot copies and to help avoid accidentally deleting Snapshot copies in FlexGroup volumes.



Update	Description
Write directly to the cloud with FabricPool	FabricPool adds the ability to write data to a volume in FabricPool so it goes directly to the cloud without waiting for the tiering scan.
Aggressive read-ahead with FabricPool	FabricPool provides aggressive read-ahead of files such as movie streams on FabricPool volumes to ensure that no frames are dropped.

## SVM management enhancements

Update	Description
SVM data mobility support for migrating SVMs containing user and group quotas and qtrees	SVM data mobility adds support for migrating SVMs containing user and group quotas and qtrees.
Support for a maximum of 400 volumes per SVM, a maximum of 12 HA pairs, and pNFS with NFS 4.1 using SVM data mobility	The maximum number of supported volumes per SVM with SVM data mobility increases to 400 and the number of supported HA pairs increases to 12.

## System Manager

Update	Description
SnapMirror test failover support	You can use System Manager for performing SnapMirror test failover rehearsals without interrupting existing SnapMirror relationships.
Port management in a broadcast domain	You can use System Manager to edit or delete ports that have been assigned to a broadcast domain.
Enablement of Mediator-assisted Automatic Unplanned Switchover (MAUSO)	You can use System Manager to enable or disable Mediator-assisted Automatic Unplanned Switchover (MAUSO) when performing an IP MetroCluster switchover and switchback.
Cluster and volume tagging	You can use System Manager to use tags to categorize clusters and volumes in different ways, for example, by purpose, owner, or environment. This is useful when there are many objects of the same type. Users can quickly identify a specific object based on the tags that have been assigned to it.
Enhanced support for consistency group monitoring	System Manager displays historical data about consistency group usage.
NVMe in-band authentication	You can use System Manager to configure secure, unidirectional and bidirectional authentication between an NVMe host and controller over the NVMe/TCP and NVMe/FC protocols using the DH-HMAC-CHAP authentication protocol.
Support for S3 bucket lifecycle management extended to System Manager	You can use System Manager to define rules for deleting specific objects in a bucket, and through these rules, expire those bucket objects.



# What's new in ONTAP 9.13.1

Learn about the new capabilities available in ONTAP 9.13.1.

For details about known issues, limitations, and upgrade cautions in recent ONTAP 9 releases, refer to the [ONTAP 9 Release Notes](#). You must sign in with your NetApp account or create an account to access the Release Notes.

Learn about new and enhanced [ONTAP MetroCluster features](#).

Learn about new and enhanced support for [FAS, ASA, and AFF platforms and supported switches](#).

Learn about updates to the [ONTAP REST API](#).

To upgrade ONTAP, see [Prepare to upgrade ONTAP](#).

## Data protection

Update	Description
<a href="#">Multi-admin verification</a>	Cluster administrator can explicitly enable multi-admin verification on a cluster to require quorum approval before some SnapLock operations are executed.
<a href="#">Enhanced support for managing consistency groups including volume move and geometry</a>	You can move volumes between consistency groups, modify the geometry of hierarchical consistency groups, and gain capacity insights into consistency groups. System Manager supports creating a consistency group with new NAS volumes or NVME namespaces.
<a href="#">NDMP restore with SnapMirror Synchronous</a>	NDMP restore is supported with SnapMirror synchronous.
SnapMirror active sync enhancements	<ul style="list-style-type: none"><li>• <a href="#">Non-disruptively add volumes to a consistency group with an active SnapMirror active sync relationship</a>.</li><li>• <a href="#">Utilize NDMP restore with SnapMirror active sync</a>.</li></ul>
<a href="#">xref:./release-notes/Asynchronous SnapMirror support with a single consistency groups</a>	Consistency groups support Asynchronous SnapMirror configurations, allowing vaulting of SnapMirror backups for single consistency groups.

## File access protocols

Update	Description
<a href="#">NFSv4.x storepool support</a>	A few clients consume too many NFSv4.x storepool resources leading to other NFSv4.x clients getting blocked due to unavailability of NFSv4.x storepool resources. You can have the option to enable denying and blocking of clients who consume a lot of NFSv4.x storepool resource in their environments.

## MetroCluster

Update	Description
<a href="#">Transition from MetroCluster FC to MetroCluster IP using a shared switch for MetroCluster IP and Ethernet attached storage</a>	You can transition nondisruptively from a MetroCluster FC to a MetroCluster IP configuration (ONTAP 9.8 and later) using a shared switch.
<a href="#">Nondisruptive transitions from an eight-node MetroCluster FC configuration to a MetroCluster IP configuration</a>	You can nondisruptively transition workloads and data from an existing eight-node MetroCluster FC configuration to a new MetroCluster IP configuration.
<a href="#">Four-node MetroCluster IP configuration upgrades using switchover and switchback</a>	Upgrade controllers in a four-node MetroCluster IP configuration using switchover and switchback with <code>system controller replace</code> commands.
<a href="#">Mediator-assisted automatic unplanned switchover (MAUSO) is triggered for an environmental shutdown</a>	If one site shuts down gracefully due to an environmental shutdown, MAUSO is triggered.
<a href="#">Eight-node MetroCluster IP configurations support</a>	You can upgrade the controllers and storage in an eight-node MetroCluster IP configuration by expanding the configuration to become a temporary twelve-node configuration and then removing the old DR groups.
<a href="#">MetroCluster IP configuration conversion to a shared storage MetroCluster switch configuration</a>	You can convert a MetroCluster IP configuration to a shared storage MetroCluster switch configuration.

To learn about platform and switch configuration enhancements for MetroCluster configurations, see the [ONTAP 9 Release Notes](#).

## Networking

Update	Description
<a href="#">Expanded hardware support for RDMA cluster interconnect</a>	ONTAP supports AFF A900, ASA A900, and FAS9500 systems for cluster interconnect RDMA with an X91153A cluster NIC, helping to reduce latency, decrease failover times, and accelerate communication between nodes.
Increased data LIF limits	ONTAP provides greater flexibility by increasing data LIF scaling limits for both HA pairs and clusters.
IPv6 support during cluster setup on the A800 and FAS8700 platforms	On the A800 and FAS8700 platforms, you can use the ONTAP CLI to create and configure new clusters in IPv6-only networking environments.

## S3 object storage

Update	Description
<a href="#">S3 bucket lifecycle management</a>	S3 object expiration actions define when objects in a bucket expire. This capability enables you to manage object versions so you can meet retention requirements and manage overall S3 object storage effectively.

## SAN

Update	Description
<a href="#">Support for NVMe/FC on AIX hosts</a>	ONTAP supports the NVMe/FC protocol on AIX hosts. See the <a href="#">NetApp Interoperability Tool</a> for supported configurations.

## Security

Feature	Description
<a href="#">Autonomous Ransomware Protection</a>	<ul style="list-style-type: none"> <li>• <a href="#">Multi-admin verify functionality with Autonomous Ransomware Protection</a></li> <li>• <a href="#">Automatic transition from learning to active mode</a></li> <li>• <a href="#">FlexGroup support</a>, including analytics and reporting for FlexGroup volumes and operations including expanding a FlexGroup volume, FlexVol to FlexGroup conversions, FlexGroup rebalancing.</li> </ul>
<a href="#">SSH public key authentication with Active Directory</a>	You can use an SSH public key as your primary authentication method with an Active Directory (AD) user, or you can use an SSH public key as your secondary authentication method after an AD user.
X.509 certificates with SSH public keys	ONTAP enables you to associate an X.509 certificate with the SSH public key for an account, giving you the added security of certificate expiration and revocation checks upon SSH login.
<a href="#">FPolicy file access failure notification</a>	FPolicy supports notifications for access denied events. Notifications are generated for file operation failed due to lack of permission, which includes: failure due to NTFS permissions, failure due to Unix mode bits, and failure due to NFSv4 ACLs.
<a href="#">Multifactor authentication with TOTP (time-based one-time passwords)</a>	Set up local user accounts with multifactor authentication using a time-based one-time password (TOTP). The TOTP is always used as the second authentication method. You can use an SSH public key or user password as your primary authentication method.

## Storage efficiency

Update	Description
Change in reporting of primary data reduction ratio in System Manager	The primary data reduction ratio displayed in System Manager no longer includes Snapshot copy space savings in the calculation. It only depicts the ratio between used logical and used physical space. In prior releases of ONTAP, the primary data reduction ratio included significant space reduction benefits of Snapshot copies. As a result, when you upgrade to ONTAP 9.13.1, you will observe a significantly lower primary ratio being reported. You can still see data reduction ratios with Snapshot copies in the <b>Capacity</b> details view.
Temperature-sensitive storage efficiency	Temperature-sensitive storage efficiency adds sequential packing of contiguous physical blocks to improve storage efficiency. Volumes that have temperature-sensitive storage efficiency enabled will automatically have sequential packing enabled when systems are upgraded to ONTAP 9.13.1.
Logical space enforcement	Logical space enforcement is supported on SnapMirror destinations.
Storage VM capacity limits support	You can set capacity limits on a storage VM (SVM) and enable alerts when the SVM is approaching a percentage threshold.

## Storage resource management enhancements

Update	Description
Increase in maximum number of inodes	ONTAP will continue to automatically add inodes (at the rate of 1 inode per 32 KB of volume space) even if the volume grows larger than 680 GB. ONTAP will continue adding inodes until it reaches the maximum of 2,147,483,632.
Support for specifying a SnapLock type during FlexClone creation	You can specify one of three SnapLock types, either compliance, enterprise, or non-SnapLock, when creating a FlexClone of a read/write volume.
Enable File System Analytics by default	Set File System Analytics to be enabled by default on new volumes.
SVM disaster recovery fanout relationships with FlexGroup volumes	The fanout restriction of SVM DR with FlexGroup volumes is removed. SVM DR with FlexGroup includes support for SnapMirror fanout relationships to eight sites.
Single FlexGroup rebalancing operation	You can schedule a single FlexGroup rebalancing operation to begin at a date and time in the future that you specify.
FabricPool read performance	FabricPool provides improved sequential read performance for single and multi-stream workloads for cloud-resident data and tiering throughput. This improvement can send a higher rate of GETs and PUTs to the back end object store. If you have on-premises object stores, you should consider performance headroom on the object store service and determine whether you might need to throttle FabricPool PUTs.
Adaptive QoS policy templates	Adaptive QoS policy templates enable you to set throughput floors at the SVM level.

## SVM management enhancements

Update	Description
<a href="#">SVM data mobility</a>	Increases support for migrating SVMs containing up to 200 volumes.
Support for recreating SVM directories	The new CLI command <code>debug vserver refresh-vserver-dir -node node_name</code> recreates missing directories and files. For more information and command syntax, see <a href="#">the ONTAP Command Reference</a> .

## System Manager

Beginning with ONTAP 9.12.1, System Manager is integrated with BlueXP. Learn more about [System Manager integration with BlueXP](#).

Update	Description
Change in reporting of primary data reduction ratio	The primary data reduction ratio displayed in System Manager no longer includes Snapshot copy space savings in the calculation. It only depicts the ratio between used logical and used physical space. In prior releases of ONTAP, the primary data reduction ratio included significant space reduction benefits of Snapshot copies. As a result, when you upgrade to ONTAP 9.13.1, you will observe a significantly lower primary ratio being reported. You can still see data reduction ratios with Snapshot copies in the Capacity details view.
<a href="#">Tamperproof Snapshot copy locking</a>	You can use System Manager to lock a Snapshot copy on a non-SnapLock volume to provide protection from ransomware attacks.
<a href="#">Support for external key managers</a>	You can use System Manager to manage external key managers to store and manage authentication and encryption keys.
<a href="#">Troubleshooting hardware problems</a>	System Manager users can view visual depictions of additional hardware platforms in the "Hardware" page, including ASA platforms and AFF C-Series platforms. Support for AFF C-Series platforms is also included in the latest patch releases of ONTAP 9.12.1, ONTAP 9.11.1, and ONTAP 9.10.1. The visualizations identify problems or concerns with platforms, providing a quick method for users to troubleshoot hardware problems.

## What's new in ONTAP 9.12.1

Learn about the new capabilities available in ONTAP 9.12.1.

For details about known issues, limitations, and upgrade cautions in recent ONTAP 9 releases, refer to the [ONTAP 9 Release Notes](#). You must sign in with your NetApp account or create an account to access the Release Notes.

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Learn about new and enhanced support for [FAS, ASA, and AFF platforms and supported switches](#).

Learn about updates to the [ONTAP REST API](#).

To upgrade ONTAP, see [Prepare to upgrade ONTAP](#).

## Data protection

Update	Description
<a href="#">Support for larger FlexVol volumes with SnapMirror Synchronous</a>	The maximum FlexVol volume size supported in SnapMirror Synchronous configurations has increased from 100 TB to 300 TB. Both the source and destination clusters must be running <i>ONTAP 9.12.1P2 or later</i> .
<a href="#">Support for larger file and LUN sizes in SnapMirror Synchronous</a>	The maximum file and LUN size supported in SnapMirror Synchronous configurations has increased from 16 TB to 128 TB. Both the source and destination clusters must be running ONTAP 9.12.1 P2 or later.
<a href="#">Enhanced support for consistency groups</a>	<ul style="list-style-type: none"><li>• You can add and remove volumes from a consistency group, clone a consistency group (including from a Snapshot copy).</li><li>• Consistency groups support application tagging to streamline data protection and management processes.</li><li>• The ONTAP REST API supports configuring consistency groups with NFS/SMB volumes or NVMe namespaces.</li></ul>
<a href="#">SnapMirror Synchronous NDO</a>	SnapMirror Synchronous supports non-disruptive operations (NDO) of HA takeover and giveback, volume move, and other maintenance-related operations. This feature is available only on AFF/ASA platforms.
<a href="#">ONTAP Mediator 1.5 supports SnapMirror Business Continuity</a>	ONTAP Mediator 1.5 is available for monitoring SnapMirror active sync relationships.
<a href="#">SnapMirror active sync continuity enhancements</a>	SnapMirror active sync supports partial LUN restore from Snapshots. Additionally, Snapmirror active sync extends QoS to volumes not in the SnapMirror relationship.
<a href="#">Data warehouse rebuild indicator for SnapMirror asynchronous</a>	SnapMirror asynchronous provides an indicator showing how long a data warehouse rebuild takes after a disaster recovery rehearsal by displaying the percentage complete.
<a href="#">SnapLock option to set minimum retention time "unspecified" absolute retention time</a>	SnapLock includes an option to set a minimum retention time when the absolute retention time is set to "unspecified".
<a href="#">Tamperproof Snapshot copies</a>	You can lock a Snapshot copy on a non-SnapLock volume to provide protection from ransomware attacks. Locking Snapshot copies helps ensure that they are not deleted accidentally or maliciously.

## File access protocols

Update	Description
<a href="#">Disable weak encryption types for Kerberos communication</a>	A new SMB security option allows you to disable RC4 and DES in favor of Advanced Encryption Standard (AES) encryption types for Kerberos-based communication with the Active Directory (AD) KDC.

Update	Description
<a href="#">S3 client access to NAS data</a>	S3 clients can access the same NAS data as NFS and SMB clients without reformatting, making it easier to serve S3 applications that require object data.
<a href="#">NFS extended attributes</a>	NFS servers enabled for NFSv4.2 can store and retrieve NFS extended attributes (xattrs) from xattr-aware clients.
<a href="#">NFSv4.2 sparse files and space reservation support</a>	The NFSv4.2 client is able to reserve space for a sparse file. Space can also be deallocated and unreserved from a file.

## MetroCluster

Update	Description
<a href="#">ONTAP Mediator 1.5 is supported in a MetroCluster IP configuration</a>	ONTAP Mediator 1.5 is available for monitoring MetroCluster IP configurations.
<a href="#">IPsec support for front-end host protocol (such as NFS and iSCSI) is available in MetroCluster IP and MetroCluster fabric-attached configurations.</a>	IPsec support for front-end host protocol (such as NFS and iSCSI) is available in MetroCluster IP and MetroCluster fabric-attached configurations.
<a href="#">MetroCluster automatic forced switchover feature in a MetroCluster IP configuration</a>	You can enable the MetroCluster automatic forced switchover feature in a MetroCluster IP configuration. This feature is an extension of the Mediator-assisted unplanned switchover (MAUSO) feature.
<a href="#">S3 on an SVM on an unmirrored aggregate in a MetroCluster IP configuration</a>	You can enable the MetroCluster automatic forced switchover feature in a MetroCluster IP configuration. This feature is an extension of the Mediator-assisted unplanned switchover (MAUSO) feature.

To learn about platform and switch configuration enhancements for MetroCluster configurations, see the [ONTAP 9 Release Notes](#).

## Networking

Update	Description
<a href="#">LIF services</a>	You can use the <code>management-log-forwarding</code> service to control which LIFs are used to forward audit logs to a remote syslog server

## S3 object storage

Update	Description
<a href="#">Expanded support for S3 actions</a>	<p>The following Amazon S3 API actions are supported:</p> <ul style="list-style-type: none"> <li>• CopyObject</li> <li>• UploadPartCopy</li> <li>• BucketPolicy (GET, PUT, DELETE)</li> </ul>

## SAN

Update	Description
<a href="#">Increased maximum LUN size for AFF and FAS platforms</a>	Beginning with ONTAP 9.12.1P2, the maximum supported LUN size on AFF and FAS platforms increased from 16 TB to 128 TB.
<a href="#">Increased NVMe limits</a>	<p>The NVMe protocol supports the following:</p> <ul style="list-style-type: none"> <li>• 8K subsystems in a single storage VM and a single cluster</li> <li>• 12 node clusters NVMe/FC supports 256 controllers per port and NVMe/TCP supports 2K controllers per node.</li> </ul>
<a href="#">NVMe/TCP support for secure authentication</a>	Secure, unidirectional and bidirectional authentication between an NVMe host and controller is supported over NVMe/TCP using the DHHMAC-CHAP authentication protocol.
<a href="#">MetroCluster IP support for NVMe</a>	The NVMe/FC protocol is supported on 4-node MetroCluster IP configurations.

## Security

In October 2022, NetApp implemented changes to reject AutoSupport message transmissions that are not sent by either HTTPS with TLSv1.2 or secure SMTP. For more information, see [SU484: NetApp will reject AutoSupport messages transmitted with insufficient transport security](#).


Feature	Description
<a href="#">Autonomous Ransomware Protection interoperability enhancements</a>	<p>Autonomous Ransomware Protection is available for these configurations:</p> <ul style="list-style-type: none"> <li>• Volumes protected with SnapMirror</li> <li>• SVMs protected with SnapMirror</li> <li>• SVMs enabled for migration (SVM data mobility)</li> </ul>
<a href="#">Multifactor authentication (MFA) support for SSH with FIDO2 and PIV (both used by Yubikey)</a>	SSH MFA can use hardware-assisted public/private key exchange with username and password. Yubikey is a physical token device that is plugged into the SSH client to increase MFA security.
<a href="#">Tamper-proof logging</a>	All ONTAP internal logs are tamperproof by default, ensuring that compromised administrator accounts cannot hide malicious actions.
<a href="#">TLS transport for events</a>	EMS events can be sent to a remote syslog server using the TLS protocol, thereby enhancing protection over the wire for central external audit logging.



## Storage efficiency

Update	Description
<a href="#">Temperature-sensitive storage efficiency</a>	Temperature-sensitive storage efficiency is enabled by default on new AFF C250, AFF C400, AFF C800 platforms and volumes. TSSE is not enabled by default on existing volumes but can be enabled manually using the ONTAP CLI.
<a href="#">Increase in usable aggregate space</a>	For All Flash FAS (AFF) and the FAS500f platforms, the WAFL reserve for aggregates greater than 30TB is reduced from 10% to 5%, resulting in increased usable space in the aggregate.
<a href="#">File System Analytics: Top directories by size</a>	File System Analytics now identifies the directories in a volume that are consuming the most space.

## Storage resource management enhancements

Update	Description
<a href="#">FlexGroup rebalancing</a>	<p>You can enable automatic nondisruptive FlexGroup volume rebalancing to redistribute files between FlexGroup constituents.</p> <div> It's recommended that you do not use automatic FlexGroup rebalancing after a FlexVol to FlexGroup conversion. Instead, you can use the disruptive retroactive file move feature available in ONTAP 9.10.1 and later, by entering the <code>volume rebalance file-move</code> command. For more information and command syntax, see <a href="#">the ONTAP Command Reference</a>.</div>
<a href="#">SnapLock for SnapVault support for FlexGroup volumes</a>	SnapLock for SnapVault support for FlexGroup volumes

## SVM management enhancements

Update	Description
<a href="#">SVM data mobility enhancements</a>	Cluster administrators can non-disruptively relocate an SVM from a source cluster to a destination cluster using FAS, AFF platforms, on hybrid aggregates. Support for both disruptive SMB protocol and Autonomous Ransomware Protection have been added.

## System Manager

Beginning with ONTAP 9.12.1, System Manager is integrated with BlueXP. With BlueXP, administrators can manage the hybrid multicloud infrastructure from a single control plane while retaining the familiar System Manager dashboard. When signing into System Manager, administrators are given the option of accessing the System Manager interface in BlueXP or accessing System Manager directly. Learn more about [System Manager integration with BlueXP](#).

Update	Description
<a href="#">System Manager support for SnapLock</a>	SnapLock operations, including Compliance Clock initialization, SnapLock volume creation, and WORM file mirroring are supported in System Manager.
<a href="#">Hardware visualization of cabling</a>	System Manager users can view connectivity information about the cabling between hardware devices in their cluster to troubleshoot connectivity issues.
<a href="#">Support for multifactor authentication with Cisco DUO when logging in to System Manager</a>	You can configure Cisco DUO as a SAML identity provider (IdP), enabling users to authenticate using Cisco DUO when they log in to System Manager.
<a href="#">System Manager networking enhancements</a>	System Manager offers more control over the subnet and home port selection during network interface creation. System Manager also supports the configuration of NFS over RDMA connections.
<a href="#">System display themes</a>	System Manager users can select a light or dark theme for the display of the System Manager interface. They can also choose to default to the theme used for their operating system or browser. This capability allows users to specify a setting that is more comfortable for reading the display.
<a href="#">Improvements to local tier capacity details</a>	System Manager users can view capacity details for specific local tiers to determine if the space is over-committed, which might indicate that they need to add more capacity to ensure the local tier doesn't run out of space.
<a href="#">Improved searching</a>	System Manager has an improved search capability that lets users search and access relevant and context-sensitive support information and System Manager product document from the NetApp Support Site directly through the System Manager interface. This allows users to acquire information they need to take appropriate action without having to search in various locations on the support site.
<a href="#">Volume provisioning improvements</a>	Storage administrators can choose a Snapshot copy policy when creating a volume using System Manager rather than using the default policy.
<a href="#">Increase the size of a volume</a>	Storage administrators can view the impact on data space and Snapshot copy reserve when they use System Manager to resize a volume.
<a href="#">Storage pool and Flash Pool management</a>	Storage administrators can use System Manager to add SSDs to an SSD storage pool, create Flash Pool local tiers (aggregate) using SSD storage pool allocation units, and create Flash Pool local tiers using physical SSDs.
<a href="#">NFS over RDMA support in System Manager</a>	System Manager supports network interface configurations for NFS over RDMA and identifies RoCE capable ports.

## What's new in ONTAP 9.11.1

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Learn about new and enhanced support for [FAS, ASA, and AFF platforms and supported switches](#).

Learn about updates to the [ONTAP REST API](#).

To upgrade to the latest version of ONTAP, see [Prepare to upgrade ONTAP](#).

## Data protection

Update	Description
<a href="#">Cluster external key servers</a>	Clustered external key management servers support is added for NetApp partners who provide a clustered KMIP server solution. This allows primary and secondary KMIP servers to be added preventing duplication of encryption key data. For supported partners, see the <a href="#">Interoperability Matrix Tool</a> .
<a href="#">SnapMirror asynchronous policy in System Manager</a>	<p>You can use System Manager to add pre-created and custom mirror and vault policies, display legacy policies, and override the transfer schedules defined in a protection policy when protecting volumes and storage VMs. You can also use System Manager to edit your volume and storage VM protection relationships.</p> <div><p>If you are running ONTAP 9.8P12 or a later ONTAP 9.8 patch release, have configured SnapMirror using System Manager, and plan to upgrade to ONTAP 9.9.1 or ONTAP 9.10.1 releases, use ONTAP 9.9.1P13 or later and ONTAP 9.10.1P10 or later patch releases for your upgrade.</p></div>
<a href="#">SnapMirror Cloud single directory restore</a>	Enables cluster administrators at the admin privilege level to perform a single directory restore operation from a cloud endpoint. The source endpoint UUID must be provided to identify the backup endpoint from which you are restoring. Because multiple backups can use the same <code>cloud_endpoint_name</code> as the destination, the UUID associated with the backup must be provided for the restore command. You can use the <code>snapmirror show</code> command to obtain the <code>source_endpoint_uuid</code> .
<a href="#">Enhanced support for SnapMirror active sync</a>	<ul style="list-style-type: none"><li>• SnapMirror active sync supports AIX as a host</li><li>• SnapMirror active sync supports single-file SnapRestore, enabling you to restore an individual LUN or normal file in a SnapMirror active sync configuration.</li></ul>
<a href="#">SVM data replication quick resync</a>	SVM data replication quick resync provides storage admins with the ability to bypass a full data warehouse rebuild and to recover more quickly from a disaster recovery rehearsal.
<a href="#">SVM data replication support with MetroCluster</a>	SVM-DR source is supported on both ends of a MetroCluster configuration.
<a href="#">Two-phase consistency group Snapshot copy creation</a>	In the REST API, consistency groups support a two-phase Snapshot procedure, enabling you to conduct a precheck before committing the Snapshot.

## File access protocols

Update	Description
<a href="#">TLSv1.3 support</a>	ONTAP supports TLS 1.3 for HTTPS and REST API management protocols. TLS 1.3 is not supported with SP/BMC or with Cluster Peering Encryption.
<a href="#">LDAP fast bind support</a>	If supported by the LDAP server, you can use LDAP fast bind to authenticate ONTAP admin users quickly and simply.

## MetroCluster

Update	Description
<a href="#">ONTAP Mediator 1.4 support</a>	ONTAP Mediator software version 1.4 is supported in MetroCluster IP configurations.
<a href="#">Consistency group support</a>	Consistency groups are supported in MetroCluster configurations.
<a href="#">Transitioning from a MetroCluster FC configuration to an AFF A250 or FAS500f MetroCluster IP configuration</a>	You can transition from a MetroCluster FC configuration to an AFF A250 or FAS500f MetroCluster IP configuration.

To learn about platform and switch configuration enhancements for MetroCluster configurations, see the [ONTAP 9 Release Notes](#).

## Networking

Update	Description
<a href="#">Link Layer Discovery Protocol (LLDP)</a>	The cluster network supports LLDP to allow ONTAP to work with cluster switches that do not support Cisco Discovery Protocol (CDP).
<a href="#">LIF services</a>	New client-side LIF services provide more control over which LIFs are used for outbound AD, DNS, LDAP, and NIS requests.

## S3 object storage

Update	Description
<a href="#">Additional support for S3 object actions</a>	The following actions are supported by ONTAP APIs: CreateBucket, DeleteBucket, DeleteObjects. In addition, ONTAP S3 supports object versioning and associated actions with the PutBucketVersioning, GetBucketVersioning, ListBucketVersions.

## SAN

Update	Description
<a href="#">iSCSI LIF failover</a>	The new iSCSI LIF failover feature supports automatic and manual migration of iSCSI LIFs in an SFO partner failover and in a local failover. iSCSI LIF failover is available on All SAN Array (ASA) platforms.

Update	Description
Non-destructive migration from LUN to NVMe namespace and from NVMe namespace to LUN	Use the ONTAP CLI to in-place convert an <a href="#">existing LUN to an NVMe namespace</a> or an <a href="#">existing NVMe namespace to a LUN</a> .

## Security

Update	Description
<a href="#">Autonomous Ransomware Protection (ARP) enhancements</a>	The ARP detection algorithm has been enhanced to detect additional malware threats. Also, a new license key is used to activate Autonomous Ransomware Protection. For ONTAP systems upgrades from ONTAP 9.10.1 the previous license key still provides the same functionality.
<a href="#">Multi-admin verification</a>	When multi-admin verification is enabled, certain operations — such as deleting volumes or Snapshot copies — can be executed only after approvals from designated administrators. This prevents compromised, malicious, or inexperienced administrators from making undesirable changes or deleting data.

## Storage efficiency

Update	Description
<a href="#">View physical footprint savings</a>	When you have temperature sensitive storage efficiency enabled on a volume, you can use the volume show-footprint command to display the physical footprint savings.
<a href="#">SnapLock support for FlexGroup volumes</a>	SnapLock includes support for data stored on FlexGroup volumes. FlexGroup volumes support is available with SnapLock Compliance and SnapLock Enterprise modes.
<a href="#">SVM data mobility</a>	Increases the number of AFF arrays supported to three and adds support for SnapMirror relationships when the source and the destination are both running ONTAP 9.11.1 or later. External key management (KMIP) is also introduced and is available for both Cloud and on-premises installations.

## Storage resource management enhancements


Update	Description
<a href="#">Activity tracking at the SVM level in File System Analytics</a>	Activity Tracking is aggregated at the SVM level, tracking read/write IOPS and throughputs to provide instant and actionable insights into data.
<a href="#">Enable file access time updates</a>	When enabled, the access time updates at the FlexCache origin volume only if the age of the current access time is more than user-specified duration.
<a href="#">Asynchronous directory delete</a>	Asynchronous delete is available to NFS and SMB clients when the storage administrator grants them rights on the volume. When async delete is enabled, Linux clients can use the mv command and Windows clients can use the rename command to delete a directory and move it to a hidden .ontaptrashbin directory.


Update	Description
<a href="#">SnapLock support for FlexGroup volumes</a>	SnapLock includes support for data stored on FlexGroup volumes. FlexGroup volumes support is available with SnapLock Compliance and SnapLock Enterprise modes. SnapLock does not support the following operations on FlexGroup volumes: SnapLock for SnapVault, event-based retention, and Legal Hold.

## SVM management enhancements

Update	Description
<a href="#">SVM data mobility</a>	Increases the number of AFF arrays supported to three and adds support for SnapMirror relationships when the source and the destination are both running ONTAP 9.11.1 or later. External key management (KMIP) is also introduced and is available for both cloud and on-premises installations.

## System Manager

Update	Description
<a href="#">Manage SnapMirror asynchronous policies</a>	<p>Use System Manager to add pre-created and custom mirror and vault policies, display legacy policies, and override the transfer schedules defined in a protection policy when protecting volumes and storage VMs. You can also use System Manager to edit your volume and storage VM protection relationships.</p> <div>  <p>If you are using ONTAP 9.8P12 or later ONTAP 9.8 patch release and you configured SnapMirror using System Manager, and you plan to upgrade to ONTAP 9.9.1 or ONTAP 9.10.1 releases, you should use ONTAP 9.9.1P13 or later and ONTAP 9.10.1P10 or later patch releases for your upgrade.</p> </div>
<a href="#">Hardware visualization</a>	The hardware visualization feature in System Manager supports all current AFF and FAS platforms.
<a href="#">System analytics insights</a>	On the Insights page, System Manager helps you optimize your system by displaying additional capacity and security insights and new insights about the configuration of clusters and storage VMs.
Usability enhancements	<ul style="list-style-type: none"> <li>• <a href="#">Newly created volumes are not shareable by default</a>: you can specify the default access permissions, such as exporting via NFS or sharing via SMB/CIFS and specifying the permission level.</li> <li>• <a href="#">SAN simplification</a>: When adding or editing an initiator group, System Manager users can view the connection status of the initiators in the group and ensure that initiators that are connected are included in the group so LUN data can be accessed.</li> </ul>

Update	Description
<a href="#">Advanced local tier (aggregate) operations</a>	<p>System Manager administrators can specify the configuration of a local tier if they don't want to accept the recommendation from System Manager. Also, administrators can edit the RAID configuration of an existing local tier.</p> <div>  <p>If you are using ONTAP 9.8P12 or later ONTAP 9.8 patch release and you configured SnapMirror using System Manager, and you plan to upgrade to ONTAP 9.9.1 or ONTAP 9.10.1 releases, you should use ONTAP 9.9.1P13 or later and ONTAP 9.10.1P10 or later patch releases for your upgrade.</p> </div>
<a href="#">Manage audit logs</a>	You can use System Manager to view and manage ONTAP audit logs.

## What's new in ONTAP 9.10.1

Learn about the new capabilities available in ONTAP 9.10.1.

For details about known issues, limitations, and upgrade cautions in recent ONTAP 9 releases, refer to the [ONTAP 9 Release Notes](#). You must sign in with your NetApp account or create an account to access the Release Notes.

Learn about new and enhanced [ONTAP MetroCluster features](#).

Learn about new and enhanced support for [FAS, ASA, and AFF platforms and supported switches](#).

Learn about updates to the [ONTAP REST API](#).

To upgrade ONTAP, see [Prepare to upgrade ONTAP](#).

## Data protection

Update	Description
<a href="#">Set SnapLock retention period up to 100 years</a>	In releases earlier than ONTAP 9.10.1, the maximum supported retention time is January 19, 2071. Beginning with ONTAP 9.10.1 SnapLock Enterprise and Compliance support a retention time up to October 26, 3058 and a retention period up to 100 years. Older policies are automatically converted when you extend retention dates.
<a href="#">Ability to create SnapLock and non-SnapLock volumes on the same aggregate</a>	Beginning with ONTAP 9.10.1, SnapLock and non-SnapLock volumes can exist on the same aggregate, so it is no longer necessary to create a separate SnapLock aggregate for SnapLock volumes.
<a href="#">Consistency groups</a>	Organize volumes and LUNs in consistency groups to manage data protection policies and ensure write-order fidelity of workloads spanning multiple storage volumes.
<a href="#">Archive backups with the public cloud</a>	SnapMirror Cloud supports tiering of ONTAP backups to lower cost public cloud object storage classes in AWS and MS Azure for long-term retention.



Update	Description
<a href="#">AES support for secure Netlogon channel communication</a>	If you connect to Windows domain controllers using the Netlogon authentication service, you can use Advanced Encryption Standard (AES) for secure channel communications.
<a href="#">Kerberos for SMB domain-tunnel authentication</a>	Kerberos authentication is available for domain tunnel authentications for ONTAP management in addition to NTLM. This allows for more secure logins to the ONTAP CLI and System Manager GUI using Active Directory credentials.
<a href="#">Channel binding for increased LDAP communication security</a>	LDAP channel binding is supported by default for both Active Directory and name services LDAP connections. This provides better protection against man-in-the-middle attacks.

## File access protocols

Update	Description
<a href="#">NFS over RDMA (NVIDIA only)</a>	NFS over RDMA utilizes RDMA adapters, allowing data to be copied directly between storage system memory and host system memory, circumventing CPU interruptions and overhead. NFS over RDMA enables the use of NVIDIA GPUDirect Storage for GPU-accelerated workloads on hosts with supported NVIDIA GPUs.

## MetroCluster

Update	Description
<a href="#">Configuration of layer 3 MetroCluster IP address in MetroCluster IP configurations</a>	You can edit the MetroCluster IP address, netmask, and gateway for nodes in a layer 3 configuration.
<a href="#">Simplified controller upgrade of nodes in a MetroCluster FC configuration</a>	The upgrade procedure for the upgrade process using switchover and switchback has been simplified.

To learn about platform and switch configuration enhancements for MetroCluster configurations, see the [ONTAP 9 Release Notes](#).

## Networking

Update	Description
<a href="#">RDMA cluster interconnect</a>	With the A400 or ASA A400 storage system and an X1151A cluster NIC you can accelerate high-performance workloads in a multi-node cluster leveraging RDMA for intra-cluster traffic
Confirmation is required before setting status admin to down for a LIF in a system SVM	This protects you from accidentally taking down LIFs that are critical for proper cluster operation. If you have scripts that invoke this behavior at the CLI, you must update them to account for the confirmation step.



Update	Description
<a href="#">Automatic detection and repair recommendations for network wiring issues</a>	When a port reachability issue is detected, ONTAP System Manager recommends a repair operation to resolve the issue.
<a href="#">Internet Protocol security (IPsec) certificates</a>	IPsec policies support pre-shared keys (PSKs) in addition to certificates for authentication.
<a href="#">LIF service policies</a>	Firewall policies are deprecated and replaced with LIF service policies. A new NTP LIF service policy has also been added to provide more control over which LIFs are used for outbound NTP requests.

## S3 object storage

Update	Description
<a href="#">S3 object data protection, backup and disaster recovery</a>	S3 SnapMirror provides data protection services for ONTAP S3 object storage, including buckets mirroring to ONTAP S3 configurations, and bucket backup to NetApp and non-NetApp destinations.
<a href="#">S3 audit</a>	You can audit data and management events in ONTAP S3 environments. S3 audit functionality is similar to existing NAS auditing capabilities, and S3 and NAS auditing can coexist in a cluster.

## SAN

Update	Description
<a href="#">NVMe namespace</a>	You can use the ONTAP CLI to increase or decrease the size of a namespace. You can use System Manager to increase the size of a namespace.
<a href="#">NVMe protocol support for TCP</a>	The non-volatile memory express (NVMe) protocol is available for SAN environments over an TCP network.

## Security

Update	Description
<a href="#">Autonomous Ransomware Protection</a>	Using workload analysis in NAS environments, Autonomous Ransomware Protection alerts you about abnormal activity that might indicate a ransomware attack. Autonomous Ransomware Protection also creates automatic Snapshot backups when an attack is detected, in addition to existing protection from scheduled Snapshot copies.
<a href="#">Encryption key management</a>	Use Azure Key Vault and Google Cloud Platform Key Management Service to store, protect, and utilize ONTAP keys, streamlining key management and access.

## Storage efficiency

Update	Description
<a href="#">Temperature-sensitive storage efficiency</a>	You can enable temperature-sensitive storage efficiency using either "default" mode or "efficient" mode on new or existing AFF volumes.
<a href="#">Ability to non-disruptively move SVMs between clusters</a>	You can relocate SVMs between physical AFF clusters, from a source to a destination, for load balancing, performance improvements, equipment upgrades, and data center migrations.

## Storage resource management enhancements

Update	Description
<a href="#">Activity tracking for hot objects with File System Analytics (FSA)</a>	To improve system performance assessment, FSA can identify hot objects: files, directories, users, and clients with the most traffic and throughput.
<a href="#">Global file-read locking</a>	Enable a read lock from a single point across all caches and the origin; affected article in migration.
<a href="#">NFSv4 support for FlexCache</a>	FlexCache volumes support NFSv4 protocol.
<a href="#">Create clones from existing FlexGroup volumes</a>	You can create a FlexClone volume using existing FlexGroup volumes.
<a href="#">Convert a FlexVol volume to a FlexGroup in an SVM disaster recovery source</a>	You can convert FlexVol volumes to FlexGroup volumes in an SVM disaster recovery source.

## SVM management enhancements

Update	Description
<a href="#">Ability to nondisruptively move SVMs between clusters</a>	You can relocate SVMs between physical AFF clusters, from a source to a destination, for load balancing, performance improvements, equipment upgrades, and data center migrations.

## System Manager

Update	Description
<a href="#">Enable performance telemetry logging in System Manager logs</a>	Administrators can enable telemetry logging if they experience performance issues with System Manager, and then contact support to analyze the issue.
<a href="#">NetApp License Files</a>	All license keys are delivered as NetApp License Files instead of individual 28-character license keys, making it possible to license multiple features using one file.
<a href="#">Update firmware automatically</a>	System Manager administrators can configure ONTAP to automatically update firmware.
<a href="#">Review risk mitigation recommendations and acknowledge the risks reported by Active IQ</a>	System Manager users can view the risks reported by Active IQ and review recommendations about mitigating the risks. Beginning with 9.10.1, users can also acknowledge risks.

Update	Description
<a href="#">Configure administrator reception of EMS event notifications</a>	System Manager administrators can configure how Event Management System (EMS) event notifications are delivered so they are notified of system issues that require their attention.
<a href="#">Manage certificates</a>	System Manager administrators can manage trusted certificate authorities, client/server certificates, and local (onboard) certificate authorities.
<a href="#">Use System Manager to view historical use of capacity and to predict future capacity needs</a>	Integration between Active IQ and System Manager allows administrators to view data about historical trends in capacity use for clusters.
<a href="#">Use System Manager to back up data to StorageGRID using the Cloud Backup Service</a>	As a Cloud Backup Service administrator, you can back up to StorageGRID if you have Cloud Manager deployed on premises. You can also archive objects using Cloud Backup Service with AWS or Azure.
Usability enhancements	<p>Beginning with ONTAP 9.10.1, you can:</p> <ul style="list-style-type: none"> <li>• Assign QoS policies to LUNs instead of the parent volume (VMware, Linux, Windows)</li> <li>• Edit LUN QoS policy group</li> <li>• Move a LUN</li> <li>• Take a LUN offline</li> <li>• Perform a rolling ONTAP image upgrade</li> <li>• Create a port set and bind it to an igroup</li> <li>• Automatic detection and repair recommendations for network wiring issues</li> <li>• Enable or disable client access to Snapshot copy directory</li> <li>• Calculate reclaimable space before deleting Snapshot copies</li> <li>• Access continuously available field changes in SMB shares</li> <li>• View capacity measurements using more accurate display units</li> <li>• Manage host-specific users and groups for Windows and Linux</li> <li>• Manage AutoSupport settings</li> <li>• Resize volumes as a separate action</li> </ul>

## What's new in ONTAP 9.9.1

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To upgrade to the latest version of ONTAP, see [Prepare to upgrade ONTAP](#).

## Data protection

Update	Description
<a href="#">Storage efficiency support on SnapLock volumes and aggregates</a>	Storage efficiency capabilities for SnapLock volumes and aggregates have been extended to include data compaction, cross-volume deduplication, adaptive compression, and TSSE (Temperature Sensitive Storage Efficiency), allowing for greater space savings for WORM data.
<a href="#">Support for configuring different Snapshot policies on SVM DR source and destination</a>	SVM DR configurations can use the mirror-vault policy to configure different Snapshot policies on the source and destination, and the policies on the destination are not overwritten by the policies on the source.
<a href="#">System Manager support for SnapMirror Cloud</a>	SnapMirror Cloud is now supported in System Manager.
<a href="#">Auditing-enabled SVMs</a>	The maximum number of auditing-enabled SVMs supported in a cluster has been increased from 50 to 400.
<a href="#">SnapMirror Synchronous</a>	The maximum number of supported SnapMirror Synchronous endpoints per HA pair has increased from 80 to 160.
<a href="#">FlexGroup SnapMirror topology</a>	FlexGroup volumes support two or more fanout relationships; for example $A \rightarrow B$ , $A \rightarrow C$ . Like FlexVol volumes, FlexGroup fanout supports a maximum of 8 fanout legs, and cascading up to two-levels; for example, $A \rightarrow B \rightarrow C$ .

## File access protocols

Update	Description
<a href="#">LDAP referral chasing enhancements</a>	LDAP referral chasing is supported with LDAP signing and sealing, encrypted TLS connections, and communications over LDAPS port 636.
<a href="#">LDAPS support on any port</a>	LDAPS can be configured on any port; port 636 remains the default.
<a href="#">NFSv4.x versions enabled by default</a>	NFSv4.0, NFSv4.1, and NFSv4.2 are enabled by default.
<a href="#">Labeled NFSv4.2 support</a>	Mandatory Access Control (MAC) labeled NFS is supported when NFSv4.2 is enabled. With this functionality, ONTAP NFS servers are MAC-aware, storing and retrieving <code>sec_label</code> attributes sent by clients.

## MetroCluster

Update	Description
<a href="#">IP support for shared link at layer 3</a>	MetroCluster IP configurations can be implemented with IP-routed (layer 3) back-end connections.
<a href="#">Support for 8-node clusters</a>	Permanent 8-node clusters are supported in IP and Fabric-attached configurations. Additionally, AFF ASA platforms support 8-node MCC IP configurations.

To learn about platform and switch configuration enhancements for MetroCluster configurations, see the [ONTAP 9 Release Notes](#).

## Networking

Update	Description
<a href="#">Cluster resiliency</a>	<ul style="list-style-type: none"><li>• Port monitoring and avoidance for two-node switchless clusters (previously available only in switched configurations)</li><li>• Automatic node failover when a node cannot serve data across its cluster network</li><li>• New tools to display which cluster paths are experiencing packet loss</li></ul>
<a href="#">Virtual IP (VIP) LIF extension</a>	<ul style="list-style-type: none"><li>• Autonomous system number (ASN) for border gateway protocol (BGP) supports a 4-byte non-negative integer.</li><li>• Multi-exit discriminator (MED) enables advanced route selections with support for path prioritization. MED is an optional attribute in the BGP update message.</li><li>• VIP BGP provides default route automation using BGP peer grouping to simplify configuration.</li></ul>

## S3 object storage

Update	Description
<a href="#">S3 metadata and tag support</a>	The ONTAP S3 server provides enhanced automation capabilities to S3 clients and applications with support for user-defined object metadata and object tagging.

## SAN

Update	Description
<a href="#">Foreign LUN import (FLI)</a>	The SAN LUN Migrate App on the NetApp Support Site can be used to qualify a foreign array that is not listed in the FLI interoperability matrix.
<a href="#">NVMe-oF remote path access</a>	If direct path access is lost in failover, remote I/O allows the system to failover to a remote path and continue data access.
<a href="#">Support for 12-node clusters on ASAs</a>	12-node clusters are supported for AFF ASA configurations. ASA clusters can include a mix of various ASA system types.
<a href="#">NVMe-oF protocol on ASAs</a>	The NVMe-oF protocol support is also available with an AFF ASA system.
	<ul style="list-style-type: none"><li>• <a href="#">You can create an igroup that consists of existing igroups.</a></li><li>• You can add a description to an igroup or host initiators that serves as an alias for the igroup or host initiator.</li><li>• <a href="#">You can map igroups to two or more LUNs simultaneously.</a></li></ul>

Update	Description
<a href="#">Single LUN performance improvement</a>	Single LUN performance for AFF has been significantly improved, making it ideal for simplifying deployments in virtual environments. For example, A800 can provide up to 400% more Random Read IOPs.

## Security

Update	Description
<a href="#">Support for multifactor authentication with Cisco DUO when logging in to System Manager</a>	Beginning with ONTAP 9.9.1P3, you can configure Cisco DUO as a SAML identity provider (IdP), enabling users to authenticate using Cisco DUO when they log in to System Manager.

## Storage efficiency

Update	Description
<a href="#">Set number of files to maximum for volume</a>	Automate file maximums with the volume parameter <code>-files-set-maximum</code> , eliminating the need to monitor file limits.

## Storage resource management enhancements

Update	Description
<a href="#">File System Analytics (FSA) management enhancements in System Manager</a>	FSA provides additional System Manager capabilities for search and filtering, and for taking action on FSA recommendations.
<a href="#">Support for negative lookup cache</a>	Caches a "file not found" error on the FlexCache volume to reduce network traffic caused by calls to the origin.
<a href="#">FlexCache disaster recovery</a>	Provides non-disruptive migration of clients from one cache to another.
<a href="#">SnapMirror cascade and fanout support for FlexGroup volumes</a>	Provides support for SnapMirror cascade and SnapMirror fanout relationships for FlexGroup volumes.
<a href="#">SVM disaster recovery support for FlexGroup volumes</a>	SVM disaster recovery support for FlexGroup volumes provides redundancy by using SnapMirror to replicate and synchronize an SVM's configuration and data.
<a href="#">Logical space reporting and enforcement support for FlexGroup volumes</a>	You can display and limit the amount of logical space consumed by FlexGroup volume users.
<a href="#">SMB access support in qtrees</a>	SMB access is supported to qtrees in FlexVol and FlexGroup volumes with SMB enabled.

## System Manager

Update	Description
System Manager displays risks reported by Active IQ	Use System Manager to link to NetApp Active IQ, which reports opportunities to reduce risk and improve the performance and efficiency of your storage environment.
Manually assign local tiers	System Manager users can assign a local tier manually when they are creating and adding volumes and LUNs.
Fast directory delete	Directories can be deleted in System Manager with low-latency fast directory delete functionality.
Generate Ansible Playbooks	System Manager users can generate Ansible Playbooks from the UI for a few select workflows and can use them in an automation tool to repeatedly add or edit volumes or LUNs.
Hardware Visualization	First introduced in ONTAP 9.8, the Hardware Visualization feature now supports all AFF platforms.
Active IQ integration	System Manager users can view support cases associated with the cluster and download. They can also copy cluster details they need to submit new support cases on the NetApp Support site. System Manager users can receive alerts from Active IQ to inform them when new firmware updates are available. Then, they can download the firmware image and upload it using System Manager.
Cloud Manager integration	System Manager users can set up protection to back up data to public cloud endpoints using the Cloud Backup Service.
Data protection provisioning workflow enhancements	System Manager users can manually name a SnapMirror destination and igroup name when setting up data protection.
Enhanced network port management	The network interfaces page has enhanced capabilities to display and manage interfaces on their home ports.
System management enhancements	<ul style="list-style-type: none"> <li>• <a href="#">Support for nested igroups</a></li> <li>• <a href="#">Map multiple LUNs to an igroup in a single task and can use a WWPN alias for filtering during the process.</a></li> <li>• <a href="#">During the NVMe-oF LIF creation, you no longer need to select identical ports on both the controllers.</a></li> <li>• <a href="#">Disable FC ports with a toggle button for each port.</a></li> </ul>
Enhanced display in System Manager of information about Snapshot copies	<ul style="list-style-type: none"> <li>• System Manager users can view the size of Snapshot copies and the SnapMirror label.</li> <li>• Snapshot copy reserves are set to zero if Snapshot copies are disabled.</li> </ul>
Enhanced display in System Manager about capacity and location information for storage tiers	<ul style="list-style-type: none"> <li>• <a href="#">A new <b>Tiers</b> column identifies the local tiers (aggregates) in which each volume resides.</a></li> <li>• <a href="#">System Manager shows the physical used capacity along with the logical used capacity at the cluster level as well as the local tier (aggregate) level.</a></li> <li>• <a href="#">New capacity display fields allow monitor capacity, tracking volumes approaching capacity or that are underutilized.</a></li> </ul>

Update	Description
<a href="#">Display in System Manager of EMS emergency alerts and other errors and warnings</a>	The number of EMS alerts received in 24 hours, as well as other errors and warnings, are shown in the Health card in System Manager.

## Changes to ONTAP limits and defaults

Learn about some of the changes to limits and defaults implemented in ONTAP 9 releases. NetApp strives to help its customers understand the most important limits that change with each ONTAP release.

### ONTAP defaults

Feature	Default change	Changed in release...
<code>vserver object-store-server user show</code> command	In releases prior to ONTAP 9.15.1, the <code>vserver object-store-server user show</code> command would return the S3 user's secret keys. The command will no longer return secret key data for S3 users.	ONTAP 9.15.1
NAS audit	NAS audit configuration allows retaining all audit log records by default. A revised value for the <code>rotate-limit</code> parameter ensures the audit log is sized properly for the volume supporting it.	ONTAP 9.15.1
Space allocation	Space allocation is enabled by default for newly created VMware and Hyper-V LUNs and is disabled for all newly created LUNs not used by VMware and Hyper-V.	ONTAP 9.15.1
NVMe/TCP automated host discovery	Host discovery of controllers using the NVMe/TCP protocol is automated by default.	ONTAP 9.14.1
AES encryption for Kerberos-based communication	AES encryption for authentication is enabled by default for Kerberos-based communication with SMB servers. You can disable AES encryption manually if your environment does not support it.	ONTAP 9.13.1
TLS 1.1 disabled by default	TLS 1.1 is disabled by default for new installations of ONTAP. Systems that are upgraded to ONTAP 9.12.0 and later that already have TLS 1.1 enabled are not affected as the upgrade will leave TLS 1.1 in an enabled state. When disabled by default, TLS 1.1 can be manually enabled as needed.	ONTAP 9.12.0
TLS 1.0 disabled by default	TLS 1.0 is disabled by default for new installations of ONTAP. Systems that are upgraded to ONTAP 9.8 and later that already have TLS 1.0 enabled are not affected as the upgrade will leave TLS 1.0 in an enabled state. When disabled by default, TLS 1.0 can be manually enabled as needed.	ONTAP 9.8




## ONTAP limits

Feature	Limit change	Changed in release...
SnapMirror active sync: symmetric active/active	SnapMirror active sync supports 80 volumes in a consistency group	ONTAP 9.15.1
SnapMirror asynchronous	Consistency groups using SnapMirror asynchronous protection support up to 80 volumes in a consistency group.	ONTAP 9.15.1
File System Analytics	To mitigate performance issues, ONTAP enforces that 5-8% of a volume's capacity must be free when enabling File System Analytics.	ONTAP 9.15.1
SVM data mobility	The maximum number of supported volumes per SVM with SVM data mobility increases to 400 and the number of supported HA pairs increases to 12.	ONTAP 9.14.1
FlexGroup rebalancing	The minimum configurable file size for FlexGroup rebalancing operations is increased from 4 KB to 20 MB.	<ul style="list-style-type: none"> <li>• ONTAP 9.14.1</li> <li>• ONTAP 9.13.1P1</li> <li>• ONTAP 9.12.1P10</li> </ul>
FlexVol and FlexGroup volume size limit	The maximum supported FlexVol and FlexGroup volume constituent size on AFF and FAS platforms is increased from 100 TB to 300 TB.	ONTAP 9.12.1P2
LUN size limit	The maximum supported LUN size on AFF and FAS platforms is increased from 16 TB to 128 TB. The maximum supported LUN size in SnapMirror configurations (Synchronous and Asynchronous) is increased from 16 TB to 128 TB.	ONTAP 9.12.1P2
FlexVol volume size limit	The maximum supported volume size on AFF and FAS platforms is increased from 100 TB to 300 TB. The maximum supported FlexVol volume size in SnapMirror Synchronous configurations is increased from 100 TB to 300 TB.	ONTAP 9.12.1P2
File size limit	The maximum supported file size for NAS file systems on AFF and FAS platforms is increased from 16 TB to 128 TB. The maximum supported file size in SnapMirror Synchronous configurations is increased from 16 TB to 128 TB.	ONTAP 9.12.1P2
Cluster volume limit	Increase the ability for controllers to more fully utilize CPU and memory and increase maximum volume count for a cluster from 15,000 to 30,000.	ONTAP 9.12.1
SVM-DR relationships for FlexVol volumes	For FlexVol volumes, the maximum number of SVM-DR relationships has increased from 64 to 128 (128 SVMs per cluster).	ONTAP 9.11.1
SnapMirror Synchronous	The maximum number of SnapMirror Synchronous operations allowed per HA pair has increased from 200 to 400.	ONTAP 9.11.1

Feature	Limit change	Changed in release...
NAS FlexVol volumes	The cluster limit for NAS FlexVol volumes has increased from 12k to 15k.	ONTAP 9.10.1
SAN FlexVol volumes	The cluster limit for SAN FlexVol volumes has increased from 12k to 15k.	ONTAP 9.10.1
SVM-DR with FlexGroup volumes	<ul style="list-style-type: none"> <li>• A maximum of 32 SVM-DR relationships is supported with FlexGroup volumes.</li> <li>• The maximum number of volumes supported in a single SVM in an SVM-DR relationship is 300, which includes the number of FlexVol volumes and FlexGroup constituents.</li> <li>• The maximum number of constituents in a FlexGroup cannot exceed 20.</li> <li>• SVM-DR volume limits are 500 per node, 1000 per Cluster (including FlexVol volumes and FlexGroup constituents).</li> </ul>	ONTAP 9.10.1
Auditing-enabled SVMs	The maximum number of auditing-enabled SVMs supported in a cluster has been increased from 50 to 400.	ONTAP 9.9.1
SnapMirror Synchronous	The maximum number of supported SnapMirror Synchronous endpoints per HA pair has increased from 80 to 160.	ONTAP 9.9.1
FlexGroup SnapMirror topology	FlexGroup volumes support two or more fanout relationships; for example, A to B, A to C. Like FlexVol volumes, FlexGroup fanout supports a maximum of 8 fanout legs and cascading up to two-levels; for example, A to B to C.	ONTAP 9.9.1
SnapMirror concurrent transfer	The maximum number of asynchronous volume-level SnapMirror concurrent transfers has increased from 100 to 200. Cloud-to-cloud SnapMirror transfers has increased from 32 to 200 on high-end systems and from 6 to 20 SnapMirror transfers on low-end systems.	ONTAP 9.8
FlexVol volumes limit	The space consumed by FlexVol volumes has increased from 100 TB to 300 TB for All-Flash SAN Array.	ONTAP 9.8

## ONTAP 9 release support

Beginning with the ONTAP 9.8 release, NetApp delivers ONTAP releases twice per calendar year. Though plans are subject to change, the intent is to deliver new ONTAP releases in the second and fourth quarter of each calendar year. Use this information to plan the time frame of your upgrade to take advantage of the latest ONTAP release.

Version	Release date
9.15.1	May 2024
9.14.1	January 2024
9.13.1	June 2023
9.12.1	February 2023
9.11.1	July 2022
9.10.1	January 2022
9.9.1	June 2021
 If you are running an ONTAP version prior to 9.9.1, it is likely on Limited Support or Self-Service Support. Consider upgrading to versions with full support.	

## Support levels

The level of support available for a specific version of ONTAP varies depending upon when the software was released.

Support level	Full support			Limited support		Self-service support		
Year	1	2	3	4	5	6	7	8
Access to online documentation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Technical support	Yes	Yes	Yes	Yes	Yes			
Root-cause analysis	Yes	Yes	Yes	Yes	Yes			
Software downloads	Yes	Yes	Yes	Yes	Yes			
Service updates (patch releases [P-releases])	Yes	Yes	Yes					
Alerts about vulnerabilities	Yes	Yes	Yes					

To upgrade to the latest release of ONTAP, see [Upgrade to the latest version of ONTAP](#) and [When should I upgrade ONTAP?](#)

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