



Security

ONTAP 9

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Security

Client authentication and authorization

ONTAP uses standard methods to secure client and administrator access to storage and to protect against viruses. Advanced technologies are available for encryption of data at rest and for WORM storage.

ONTAP authenticates a client machine and user by verifying their identities with a trusted source. ONTAP authorizes a user to access a file or directory by comparing the user's credentials with the permissions configured on the file or directory.

Authentication

You can create local or remote user accounts:

- A local account is one in which the account information resides on the storage system.
- A remote account is one in which account information is stored on an Active Directory domain controller, an LDAP server, or a NIS server.

ONTAP uses local or external name services to look up host name, user, group, netgroup, and name mapping information. ONTAP supports the following name services:

- Local users
- DNS
- External NIS domains
- External LDAP domains

A *name service switch table* specifies the sources to search for network information and the order in which to search them (providing the equivalent functionality of the `/etc/nsswitch.conf` file on UNIX systems). When a NAS client connects to the SVM, ONTAP checks the specified name services to obtain the required information.

Kerberos support Kerberos is a network authentication protocol that provides “strong authentication” by encrypting user passwords in client-server implementations. ONTAP supports Kerberos 5 authentication with integrity checking (krb5i) and Kerberos 5 authentication with privacy checking (krb5p).

Authorization

ONTAP evaluates three levels of security to determine whether an entity is authorized to perform a requested action on files and directories residing on an SVM. Access is determined by the effective permissions after evaluation of the security levels:

- Export (NFS) and share (SMB) security

Export and share security applies to client access to a given NFS export or SMB share. Users with administrative privileges can manage export and share-level security from SMB and NFS clients.

- Storage-Level Access Guard file and directory security

Storage-Level Access Guard security applies to SMB and NFS client access to SVM volumes. Only NTFS access permissions are supported. For ONTAP to perform security checks on UNIX users for access to data on volumes for which Storage-Level Access Guard has been applied, the UNIX user must map to a Windows user on the SVM that owns the volume.

- NTFS, UNIX, and NFSv4 native file-level security

Native file-level security exists on the file or directory that represents the storage object. You can set file-level security from a client. File permissions are effective regardless of whether SMB or NFS is used to access the data.

Authentication with SAML

ONTAP supports Security Assertion Markup Language (SAML) for authentication of remote users. Several popular identity providers (IdPs) are supported. For more information on supported IdPs and instructions for enabling SAML authentication, refer to [Configure SAML authentication](#).

OAuth 2.0 with ONTAP REST API clients

Support for the Open Authorization (OAuth 2.0) framework is available beginning with ONTAP 9.14. You can only use OAuth 2.0 to make authorization and control access decisions when the client uses the REST API to access ONTAP. However, you can configure and enable the feature with any of the ONTAP administrative interfaces, including the CLI, System Manager, and REST API.

The standard OAuth 2.0 capabilities are supported along with several popular authorization servers. You can further enhance ONTAP security by using sender-constrained access tokens based on Mutual TLS. And there is a wide variety of authorization options available, including self-contained scopes as well as integration with the ONTAP REST roles and local user definitions. See [Overview of the ONTAP OAuth 2.0 implementation](#) for more information.

Administrator authentication and RBAC

Administrators use local or remote login accounts to authenticate themselves to the cluster and SVM. Role-Based Access Control (RBAC) determines the commands to which an administrator has access.

Authentication

You can create local or remote cluster and SVM administrator accounts:

- A local account is one in which the account information, public key, or security certificate resides on the storage system.
- A remote account is one in which account information is stored on an Active Directory domain controller, an LDAP server, or a NIS server.

Except for DNS, ONTAP uses the same name services to authenticate administrator accounts as it uses to authenticate clients.

RBAC

The *role* assigned to an administrator determines the commands to which the administrator has access. You

assign the role when you create the account for the administrator. You can assign a different role or define custom roles as needed.

Virus scanning

You can use integrated antivirus functionality on the storage system to protect data from being compromised by viruses or other malicious code. ONTAP virus scanning, called *Vscan*, combines best-in-class third-party antivirus software with ONTAP features that give you the flexibility you need to control which files get scanned and when.

Storage systems offload scanning operations to external servers hosting antivirus software from third-party vendors. The *ONTAP Antivirus Connector*, provided by NetApp and installed on the external server, handles communications between the storage system and the antivirus software.

- You can use *on-access scanning* to check for viruses when clients open, read, rename, or close files over SMB. File operation is suspended until the external server reports the scan status of the file. If the file has already been scanned, ONTAP allows the file operation. Otherwise, it requests a scan from the server.

On-access scanning isn't supported for NFS.

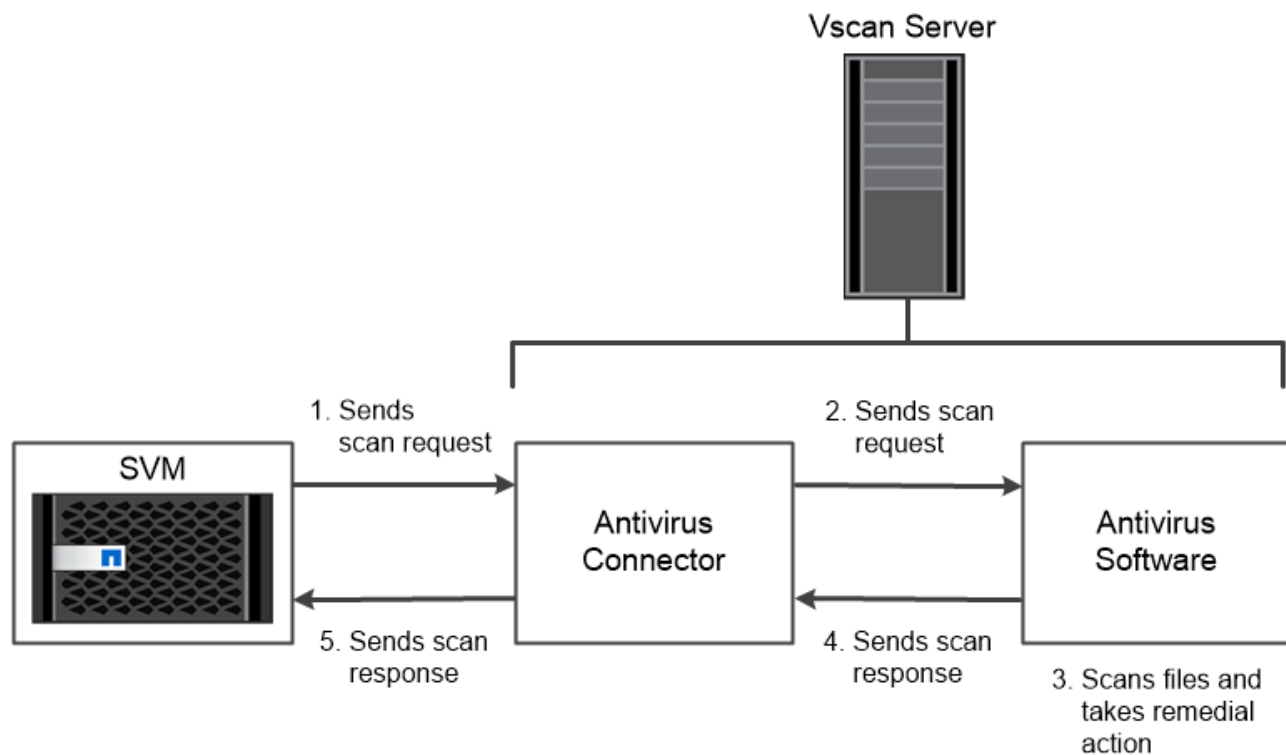
- You can use *on-demand scanning* to check files for viruses immediately or on a schedule. You might want to run scans only in off-peak hours, for example. The external server updates the scan status of the checked files, so that file-access latency for those files (assuming they have not been modified) is typically reduced when they are next accessed over SMB.

You can use on-demand scanning for any path in the SVM namespace, even for volumes that are exported only through NFS.

You typically enable both scanning modes on an SVM. In either mode, the antivirus software takes remedial action on infected files based on your settings in the software.

Virus scanning in disaster recovery and MetroCluster configurations

For disaster recovery and MetroCluster configurations, you must set up separate Vscan servers for the local and partner clusters.



The storage system offloads virus scanning operations to external servers hosting antivirus software from third-party vendors.

Encryption

ONTAP offers both software- and hardware-based encryption technologies to ensure that data at rest cannot be read if the storage medium is repurposed, returned, misplaced, or stolen.

ONTAP is compliant with the Federal Information Processing Standards (FIPS) 140-2 for all SSL connections. You can use the following encryption solutions:

- Hardware solutions:

- NetApp Storage Encryption (NSE)

NSE is a hardware solution that uses self-encrypting drives (SEDs).

- NVMe SEDs

ONTAP provides full disk encryption for NVMe SEDs that do not have FIPS 140-2 certification.

- Software solutions:

- NetApp Aggregate Encryption (NAE)

NAE is a software solution that enables encryption of any data volume on any drive type where it is enabled with unique keys for each aggregate.

- NetApp Volume Encryption (NVE)

NVE is a software solution that enables encryption of any data volume on any drive type where it is enabled with a unique key for each volume.

Use both software (NAE or NVE) and hardware (NSE or NVMe SED) encryption solutions to achieve double encryption at rest. Storage efficiency isn't affected by NAE or NVE encryption.

NetApp Storage Encryption

NetApp Storage Encryption (NSE) supports SEDs that encrypt data as it is written. The data cannot be read without an encryption key stored on the disk. The encryption key, in turn, is accessible only to an authenticated node.

On an I/O request, a node authenticates itself to an SED using an authentication key retrieved from an external key management server or Onboard Key Manager:

- The external key management server is a third-party system in your storage environment that serves authentication keys to nodes using the Key Management Interoperability Protocol (KMIP).
- The Onboard Key Manager is a built-in tool that serves authentication keys to nodes from the same storage system as your data.

NSE supports self-encrypting HDDs and SSDs. You can use NetApp Volume Encryption with NSE to double encrypt data on NSE drives.



If you are using NSE on a system with a Flash Cache module, you should also enable NVE or NAE. NSE does not encrypt data that resides on the Flash Cache module.

NVMe self-encrypting drives

NVMe SEDs do not have FIPS 140-2 certification; however, these disks use AES 256-bit transparent disk encryption to protect data at rest.

Data encryption operations, such as generating an authentication key, are performed internally. The authentication key is generated the first time the disk is accessed by the storage system. After that, the disks protect data at rest by requiring storage system authentication each time data operations are requested.

NetApp Aggregate Encryption

NetApp Aggregate Encryption (NAE) is a software-based technology for encrypting all data on an aggregate. A benefit of NAE is that volumes are included in aggregate level deduplication, whereas NVE volumes are excluded.

With NAE enabled, the volumes within the aggregate can be encrypted with aggregate keys.

Beginning with ONTAP 9.7, newly created aggregates and volumes are encrypted by default when you have the [NVE license](#) and onboard or external key management.

NetApp Volume Encryption

NetApp Volume Encryption (NVE) is a software-based technology for encrypting data at rest one volume at a time. An encryption key accessible only to the storage system ensures that volume data cannot be read if the underlying device is separated from the system.

Both data, including snapshots, and metadata are encrypted. Access to the data is given by a unique XTS-

AES-256 key, one per volume. A built-in Onboard Key Manager secures the keys on the same system with your data.

You can use NVE on any type of aggregate (HDD, SSD, hybrid, array LUN), with any RAID type, and in any supported ONTAP implementation, including ONTAP Select. You can also use NVE with NetApp Storage Encryption (NSE) to double encrypt data on NSE drives.

When to use KMIP servers Although it is less expensive and typically more convenient to use the Onboard Key Manager, you should set up KMIP servers if any of the following are true:

- Your encryption key management solution must comply with Federal Information Processing Standards (FIPS) 140-2 or the OASIS KMIP standard.
- You need a multi-cluster solution. KMIP servers support multiple clusters with centralized management of encryption keys.

KMIP servers support multiple clusters with centralized management of encryption keys.

- Your business requires the added security of storing authentication keys on a system or in a location different from the data.

KMIP servers stores authentication keys separately from your data.

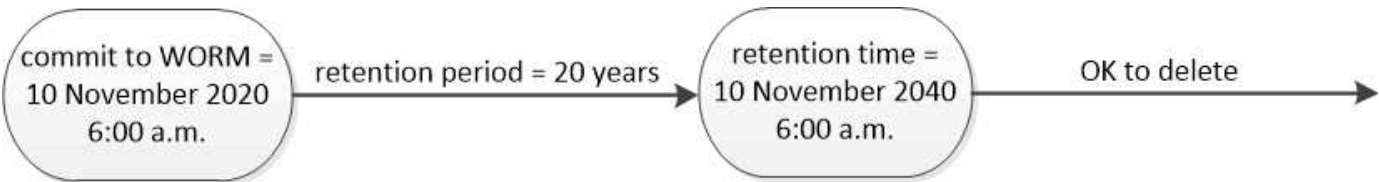
Related information
[FAQ - NetApp Volume Encryption and NetApp Aggregate Encryption](#)

WORM storage

SnapLock is a high-performance compliance solution for organizations that use *write once, read many (WORM)* storage to retain critical files in unmodified form for regulatory and governance purposes.

A single license entitles you to use SnapLock in strict *Compliance mode*, to satisfy external mandates like SEC Rule 17a-4(f), and a looser *Enterprise mode*, to meet internally mandated regulations for the protection of digital assets. SnapLock uses a tamper-proof *ComplianceClock* to determine when the retention period for a WORM file has elapsed.

You can use *SnapLock for SnapVault* to WORM-protect snapshots on secondary storage. You can use SnapMirror to replicate WORM files to another geographic location for disaster recovery and other purposes.



SnapLock uses a tamper-proof ComplianceClock to determine when the retention period for a WORM file has elapsed.

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