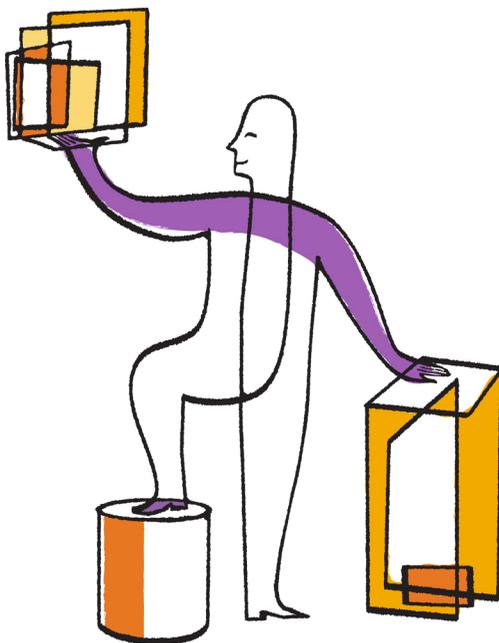




## Clustered Data ONTAP<sup>®</sup> 8.2

### System Administration Guide for Vserver Administrators



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# Contents

|   |           |
|---|-----------|
| <b>Understanding Vserver administration .....</b>   | <b>6</b>  |
| What a Vserver is .....   | 6         |
| Why you use Vservers .....  | 7         |
| Differences between cluster and Vserver administrators .....                              | 8         |
| <b>Data ONTAP management interface basics .....</b>                                       | <b>9</b>  |
| Using the Data ONTAP command-line interface .....   | 9         |
| Methods of navigating CLI command directories .....                                       | 9         |
| Rules for specifying values in the CLI .....  | 10        |
| Methods of viewing command history and reissuing commands .....                           | 10        |
| Keyboard shortcuts for editing CLI commands .....   | 11        |
| Use of administrative privilege levels .....  | 12        |
| Setting the privilege level in the CLI .....  | 12        |
| Setting display preferences in the CLI .....  | 13        |
| Methods of using query operators .....  | 14        |
| Methods of using extended queries .....   | 15        |
| Methods of customizing show command output by using fields .....                          | 15        |
| Methods of accessing Data ONTAP man pages .....   | 16        |
| <b>Accessing a Vserver .....</b>  | <b>17</b> |
| Access methods for user accounts .....  | 17        |
| Authentication methods for user accounts .....  | 17        |
| Logging in to a Vserver .....   | 18        |
| <b>Managing Vserver authentication .....</b>  | <b>20</b> |
| Changing the login password .....   | 20        |
| Managing public keys .....  | 21        |
| Commands for managing public keys .....   | 21        |
| Managing digital certificates for server or client authentication .....                   | 22        |
| Generating and installing a CA-signed digital certificate for server authentication ..... | 23        |
| Installing a server intermediate certificate .....  | 25        |
| Providing mutual authentication .....   | 25        |
| Commands for managing digital certificates .....  | 28        |
| Managing SSL .....  | 29        |

|   |           |
|---|-----------|
| Commands for managing SSL .....   | 29        |
| <b>Administering a Vserver .....</b>  | <b>30</b> |
| Identifying the commands that you can execute .....                         | 31        |
| Displaying ONTAP APIs .....   | 32        |
| Managing jobs and schedules .....   | 33        |
| Commands for managing jobs .....  | 33        |
| Commands for managing job schedules .....                                   | 34        |
| Monitoring Vserver performance .....  | 35        |
| What objects, instances, and counters are .....                             | 35        |
| Decisions to make before you view performance data .....                    | 36        |
| Viewing performance data for a time period .....                            | 37        |
| Viewing continuously updated performance data .....                         | 38        |
| Commands for monitoring Vserver performance .....                           | 39        |
| Displaying information about Vservers .....                                 | 40        |
| Displaying information about Vserver peer relationships .....               | 41        |
| Displaying information about network configuration .....                    | 42        |
| Monitoring Vservers using dashboard .....                                   | 43        |
| Commands for managing dashboards .....                                      | 43        |
| Data access protocols configuration .....                                   | 44        |
| Commands for configuring data access protocols .....                        | 45        |
| Data security management .....  | 46        |
| Commands for setting up security settings on files and managing tracing ... | 46        |
| Services configuration .....  | 47        |
| Commands for configuring services .....                                     | 48        |
| Storage management .....  | 48        |
| Commands for managing storage .....   | 49        |
| LUN management .....  | 50        |
| Commands for managing LUNs .....  | 50        |
| Backup management .....   | 51        |
| Snapshot copy management .....  | 51        |
| SnapMirror management .....   | 52        |
| NDMP management .....   | 52        |
| Commands for managing backup .....  | 53        |
| Policy Management .....   | 54        |
| Commands for managing policies .....  | 55        |
| <b>Glossary .....</b>   | <b>56</b> |

|  |           |
|--|-----------|
| <b>Copyright information .....</b>     | <b>59</b> |
| <b>Trademark information .....</b>     | <b>60</b> |
| <b>How to send your comments .....</b> | <b>61</b> |
| <b>Index .....</b>                     | <b>62</b> |

## Understanding Vserver administration

A Vserver administrator can administer a Vserver and its resources, such as volumes, protocols, and services, depending on the capabilities assigned by the cluster administrator. To administer a Vserver efficiently, you must understand what a Vserver is, its benefits, and the types of administrators.

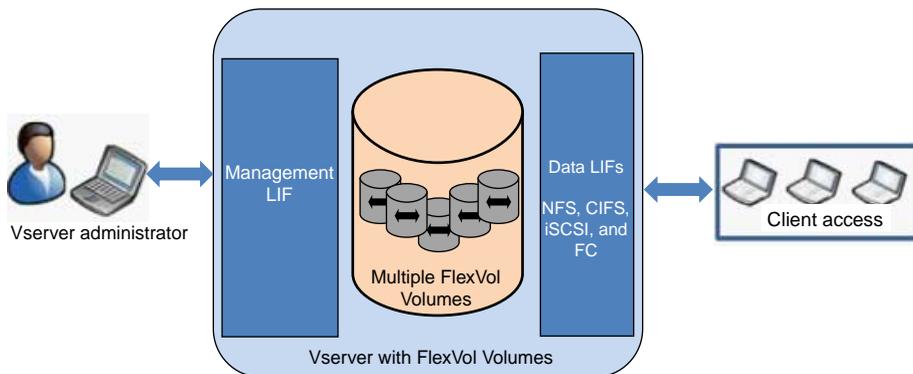
### What a Vserver is

A *virtual storage server (Vserver)* contains data volumes and one or more LIFs through which it serves data to the clients. Starting with clustered Data ONTAP 8.1.1, a Vserver can either contain one or more FlexVol volumes, or a single Infinite Volume.

A Vserver securely isolates the shared virtualized data storage and network, and appears as a single dedicated server to its clients. Each Vserver has a separate administrator authentication domain and can be managed independently by a Vserver administrator.

A cluster can have one or more Vservers with FlexVol volumes and Vservers with Infinite Volumes.

#### Vserver with FlexVol volumes

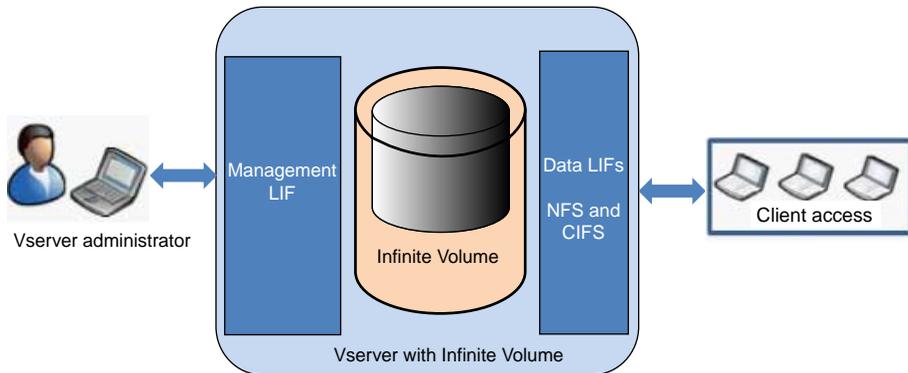


A Vserver with FlexVol volumes in a NAS environment presents a single directory hierarchical view and has a unique namespace. Namespace enables the NAS clients to access data without specifying the physical location of the data. Namespace also enables the cluster and Vserver administrators to manage distributed data storage as a single directory with multiple levels of hierarchy.

The volumes within each NAS Vserver are related to each other through junctions and are mounted on junction paths. These junctions present the file system in each volume. The root volume of a Vserver is a FlexVol volume that resides at the top level of the namespace hierarchy; additional volumes are mounted to the Vserver's root volume to extend the namespace. As volumes are created for the Vserver, the root volume of a Vserver contains junction paths.

A Vserver with FlexVol volumes can contain files and LUNs. It provides file-level data access by using NFS and CIFS protocols for the NAS clients, and block-level data access by using iSCSI, and Fibre Channel (FC) protocol (FCoE included) for SAN hosts.

### Vserver with Infinite Volume



A Vserver with Infinite Volume can contain only one Infinite Volume to serve data. A Vserver with Infinite Volume includes only one junction path, which has a default value of `/NS`. The junction provides a single mount point for the large namespace provided by the Vserver with Infinite Volume. You cannot add more junctions to a Vserver with Infinite Volume. However, you can increase the size of the Infinite Volume.

A Vserver with Infinite Volume can contain only files. It provides file-level data access by using NFS and CIFS (SMB 1.0) protocols. A Vserver with Infinite Volume cannot contain LUNs and does not provide block-level data access.

## Why you use Vservers

Vservers provide data access to clients without regard to physical storage or controller, similar to any storage system. When you use Vservers, they provide benefits such as nondisruptive operation, scalability, security and support unified storage.

A Vserver has the following benefits:

- **Nondisruptive operation**  
Vservers can operate continuously and nondisruptively for as long as they are needed. Vservers help clusters to operate continuously during software and hardware upgrades, addition and removal of nodes, and all administrative operations.
- **Scalability**  
Vservers meet on-demand data throughput and the other storage requirements.
- **Security**

A Vserver appears as a single independent server, which enables multiple Vservers to coexist while ensuring no data flows among them.

- **Unified Storage**

Vservers can serve data concurrently through multiple data access protocols. A Vserver provides file-level data access by using NAS protocols, such as CIFS and NFS, and block-level data access by using SAN protocols, such as iSCSI and FC (FCoE included). A Vserver can serve data to SAN and NAS clients independently at the same time.

**Note:** A Vserver with Infinite Volume can serve data only through NFS and CIFS (SMB 1.0) protocols.

- **Easy Management of large datasets**

With Vserver with Infinite Volume, management of large and unstructured data is easier as the Vserver administrator has to manage one data container instead of many.

## Differences between cluster and Vserver administrators

Cluster administrators administer the entire cluster and the virtual storage servers (Vservers) it contains. Vserver administrators administer only their own data Vservers.

Cluster administrators can administer the entire cluster and its resources. They can also set up data Vservers and delegate Vserver administration to Vserver administrators. The specific capabilities that cluster administrators have depend on their access-control roles. By default, a cluster administrator with the “admin” account name or role name has all capabilities for managing the cluster and Vservers.

Vserver administrators can administer only their own data Vservers' storage and network resources, such as volumes, protocols, LIFs, and services. The specific capabilities that Vserver administrators have depend on the access-control roles that are assigned by cluster administrators.

# Data ONTAP management interface basics

---

You administer the Vserver by using the Data ONTAP command-line interface (CLI). The CLI provides a command-based mechanism that is similar to the UNIX `tcsh` shell.

## Using the Data ONTAP command-line interface

The Data ONTAP command-line interface (CLI) provides a command-based view of the management interface. You enter commands at the storage system prompt, and command results are displayed in text.

The CLI command prompt is represented as `vserver_name::>`.

If you set the privilege level (that is, the `-privilege` parameter of the `set` command) to `advanced`, the prompt includes an asterisk (\*), for example, `vserver_name::*>`.

## Methods of navigating CLI command directories

Commands in the CLI are organized into a hierarchy by command directories. You can run commands in the hierarchy either by entering the full command path or by navigating through the directory structure.

When using the CLI, you can access a command directory by typing the directory's name at the prompt and then pressing Enter. The directory name is then included in the prompt text to indicate that you are interacting with the appropriate command directory. To move deeper into the command hierarchy, you type the name of a command subdirectory followed by pressing Enter. The subdirectory name is then included in the prompt text and the context shifts to that subdirectory.

You can navigate through several command directories by entering the entire command. For example, you can display information about the volumes by entering the `volume show` command at the prompt. You can also run the command by navigating through one command directory at a time, as shown in the following example:

```
vs1::> volume
vs1::volume> show
```

You can abbreviate commands by entering only the minimum number of letters in a command that makes the command unique to the current directory. For example, to abbreviate the command in the previous example, you can enter `vol show`. You can also use the Tab key to expand abbreviated commands and to display a command's parameters, including default parameter values.

You can use the `top` command to go to the top level of the command hierarchy, and the `up` command or `..` command to go up one level in the command hierarchy.

**Note:** Commands and command options preceded by an asterisk (\*) in the CLI can be executed only at the advanced privilege level or higher.

## Rules for specifying values in the CLI

Most commands include one or more required or optional parameters. Many parameters require you to specify a value for them. A few rules exist for specifying values in the CLI.

- A value can be a number, a Boolean specifier, a selection from an enumerated list of predefined values, or a text string.  
Some parameters can accept a comma-separated list of two or more values. Comma-separated lists of values do not need to be in quotation marks (" "). Whenever you specify text, a space, or a query character (when not meant as a query or text starting with a less-than or greater-than symbol), you must enclose the entity in quotation marks.
- The CLI interprets a question mark ("?",) as the command to display help information for a particular command.
- Some text that you enter in the CLI, such as command names, parameters, and certain values, is not case-sensitive.  
For example, when you enter parameter values for the `vserver cifs` commands, capitalization is ignored. However, most parameter values, such as the names of nodes, Vservers, aggregates, volumes, and logical interfaces, are case-sensitive.
- If you want to clear the value of a parameter that takes a text string, you specify an empty set of quotation marks ("") or a dash ("-").
- The hash sign ("#"), also known as the pound sign, indicates a comment for a command-line input; if used, it should appear after the last parameter in a command line.  
The CLI ignores the text between "#" and the end of the line.

## Methods of viewing command history and reissuing commands

Each CLI session keeps a history of all commands issued in it. You can view the command history of the session that you are currently in. You can also reissue commands.

To view the command history, you can use the `history` command.

To reissue a command, you can use the `redo` command with one of the following arguments:

- A string that matches part of a previous command  
For example, if the only `volume` command you have run is `volume show`, you can use the `redo volume` command to reexecute the command.
- The numeric ID of a previous command, as listed by the `history` command  
For example, you can use the `redo 4` command to reissue the fourth command in the history list.
- A negative offset from the end of the history list  
For example, you can use the `redo -2` command to reissue the command that you ran two commands ago.

For example, to redo the command that is third from the end of the command history, you would enter the following command:

```
vs1::> redo -3
```

## Keyboard shortcuts for editing CLI commands

The command at the current command prompt is the current active command. You can edit the command by using key combinations. These key combinations are similar to those of the UNIX tcsh shell and the Emacs editor.

The following table lists the keyboard shortcuts for editing CLI commands. A caret (^) indicates that you must press the Ctrl key with the specified key.

| Edit Command | Action  |
|--------------|---|
| ^b           | Move the cursor back one character.   |
| ^f           | Move the cursor forward one character.  |
| ^a           | Move the cursor to the beginning of the line.   |
| ^e           | Move the cursor to the end of the line.   |
| ^k           | Remove the contents of the edit buffer, from the cursor to the end of the line, and save it in the cut buffer.  |
| ^y           | Yank the contents of the cut buffer, pushing it into the edit buffer at the cursor.   |
| ESC b        | Move the cursor back one word.  |
| ESC f        | Move the cursor forward one word.   |
| ESC d        | Cut the contents of the edit buffer, beginning at the cursor and continuing to the end of the following word.   |
| ^w           | Delete the word before the cursor.  |
| ^h           | Delete the character before the cursor.   |
| Backspace    | Delete the character before the cursor.   |
| ^d           | Delete the character after the cursor.  |
| ^p           | Replace the current contents of the edit buffer with the previous entry on the history list. For each successive ^p action, the history cursor moves to the previous entry. |
| ^n           | Replace the current contents of the edit buffer with the next entry on the history buffer.  |
| Down arrow   | Down history.   |
| Up arrow     | Up history.   |

| Edit Command  | Action  |
|---------------|---|
| Back arrow    | Go backward one character.  |
| Forward arrow | Go forward one character.   |
| ^q            | TTY start output.   |
| ^s            | TTY stop output.  |
| ^u            | Clear the current edit buffer.  |
| ^v            | Escapes a special mapping for the following character. For instance, to enter a question mark into a command's arguments, press ^v, then press ?. |
| ?             | Display context-sensitive help.   |

## Use of administrative privilege levels

Data ONTAP commands and parameters are defined at three privilege levels: *admin*, *advanced*, and *diagnostic*. The privilege levels reflect the skill levels required in performing the tasks.

- admin** Most commands and parameters are available at this level. They are used for common or routine tasks.
- advanced** Commands and parameters at this level are used infrequently, require advanced knowledge, and can cause problems if used inappropriately.  
You use advanced commands or parameters only with the advice of support personnel.
- diagnostic** Diagnostic commands and parameters are potentially disruptive. They are used only by support personnel to diagnose and fix problems.

## Setting the privilege level in the CLI

You can set the privilege level in the CLI by using the `set` command. Changes to privilege level settings apply only to the session you are in. They are not persistent across sessions.

### Step

- To set the privilege level in the CLI, use the `set` command with the `-privilege` parameter.

#### Example of setting the privilege level

The following example sets the privilege level to advanced and then to admin:

```
vs1::> set -privilege advanced
Warning: These advanced commands are potentially dangerous; use
them only when directed to do so by technical support.
```

```
Do you wish to continue? (y or n): y
vs1::*> set -privilege admin
```

## Setting display preferences in the CLI

You can set display preferences for a CLI session by using the `set` command and `rows` command. The preferences you set apply only to the session you are in. They are not persistent across sessions.

### About this task

You can set the following CLI display preferences:

- The privilege level of the command session
- Whether confirmations are issued for potentially disruptive commands
- Whether `show` commands display all fields
- The character or characters to use as the field separator
- The default unit when reporting data sizes
- The number of rows the screen displays in the current CLI session before the interface pauses output

If you are connected to the system through a console connection, the default number of rows is 24. If you are connected to the system through an SSH connection, the number of default rows is determined by the terminal configuration.

- Whether a continuing command should stop if it encounters an error

### Step

1. To set CLI display preferences, use the `set` command.

To set the number of rows the screen displays in the current CLI session, you can also use the `rows` command.

For more information, see the man pages for the `set` command and `rows` command.

### Example of setting display preferences in the CLI

The following example sets a comma to be the field separator, sets GB as the default data-size unit, and sets the number of rows to 50:

```
vs1::> set -showseparator "," -units GB
vs1::> rows 50
```

## Methods of using query operators

The management interface supports queries and UNIX-style patterns and wildcards to enable you to match multiple values in command-parameter arguments.

The following table describes the supported query operators:

| Operator | Description  |
|----------|--|
| *        | Wildcard that matches all entries.<br>For example, the command <code>volume show -volume *tmp*</code> displays a list of all volumes whose names include the string <code>tmp</code> .   |
| !        | NOT operator.<br>Indicates a value that is not to be matched; for example, <code>!vs0</code> indicates not to match the value <code>vs0</code> .   |
|          | OR operator.<br>Separates two values that are to be compared; for example, <code>vs0   vs2</code> matches either <code>vs0</code> or <code>vs2</code> . You can specify multiple OR statements; for example, <code>a   b*   *c*</code> matches the entry <code>a</code> , any entry that starts with <code>b</code> , and any entry that includes <code>c</code> . |
| ..       | Range operator.<br>For example, <code>5..10</code> matches any value from 5 to 10, inclusive.  |
| <        | Less-than operator.<br>For example, <code>&lt;20</code> matches any value that is less than 20.  |
| >        | Greater-than operator.<br>For example, <code>&gt;5</code> matches any value that is greater than 5.  |
| <=       | Less-than-or-equal-to operator.<br>For example, <code>&lt;=5</code> matches any value that is less than or equal to 5.   |
| >=       | Greater-than-or-equal-to operator.<br>For example, <code>&gt;=5</code> matches any value that is greater than or equal to 5.   |
| {query}  | Extended query.<br>An extended query must be specified as the first argument after the command name, before any other parameters.<br>For example, the command <code>volume modify {-volume *tmp*} -state offline</code> sets offline all volumes whose names include the string <code>tmp</code> .   |

If you want to parse query characters as literals, you must enclose the characters in double quotes (""). For example, if you are using a query to identify antivirus policies that contain the characters

`^.*$`, you must enclose these characters in double quotes ("`^.*$`") for the correct results to be returned.

You can use multiple query operators in one command line. For example, the command `volume show -size >1GB -percent-used <50` displays all volumes that are greater than 1 GB in size and less than 50% utilized.

## Methods of using extended queries

You can use extended queries to match and perform operations on objects that have specified values.

You specify extended queries by enclosing them within curly brackets (`{}`). An extended query must be specified as the first argument after the command name, before any other parameters. For example, to set offline all volumes whose names include the string `tmp`, you run the command in the following example:

```
vs1::> volume modify {-volume *tmp*} -state offline
```

Extended queries are generally useful only with `modify` and `delete` commands. They have no meaning in `create` or `show` commands.

## Methods of customizing show command output by using fields

When you use the `-instance` parameter with a `show` command to display details, the output can be lengthy and include more information than you need. The `-fields` parameter of a `show` command enables you to display only the information you specify.

For example, running `volume show -instance` is likely to result in several screens of information. You can use `volume show -fields fieldname[,fieldname...]` to customize the output so that it includes only the specified field or fields (in addition to the default fields that are always displayed.) You can use `-fields ?` to display valid fields for a `show` command.

The following example shows the output difference between the `-instance` parameter and the `-fields` parameter:

```
vs1::> vservers show -instance

                Vserver: vs1
                Vserver Type: data
                Vserver UUID: 4e42c9cf-32f2-11e2-9103-123456789012
                Root Volume: vs1root
                Aggregate: aggr1
                Name Service Switch: nis
                Name Mapping Switch: file
                ...
                Allowed Protocols: nfs, cifs
                Disallowed Protocols: fcp, iscsi, ndmp
                ...

Press <space> to page down, <return> for next line, or 'q' to quit...
...
vs1::>

vs1::> vservers show -fields allowed-protocols,disallowed-protocols
vservers      allowed-protocols      disallowed-protocols
-----
```

```
vs1          nfs,cifs          fcp,iscsi,ndmp
vs1::>
```

## Methods of accessing Data ONTAP man pages

Data ONTAP manual (man) pages explain how to use Data ONTAP commands. They are available at the command line and on the NetApp Support Site.

The `man command_name` command displays the man page of the specified command. If you do not specify a command name, the man page index is displayed. You can use the `man man` command to view information about the `man` command itself. You can exit a man page by entering `q`.

The *Clustered Data ONTAP Commands: Manual Page Reference* is a compilation of man pages for the admin-level and advanced-level Data ONTAP commands. It is available on the NetApp Support Site.

### Related information

*NetApp Support Site: [support.netapp.com](http://support.netapp.com)*

# Accessing a Vserver

---

As a Vserver administrator, you can access a Vserver by using different access methods. Your user account can be authenticated by using several authentication methods, as specified by the cluster administrator.

## Access methods for user accounts

Depending on how the cluster administrator sets up a Vserver user account, a Vserver administrator can access a Vserver for administration by using certain access methods.

You can access a Vserver by using the following access methods:

- SSH
- Data ONTAP APIs

**Note:** Data ONTAP APIs access method is over HTTPS.

- SNMP

## Authentication methods for user accounts

The method used to authenticate a Vserver user account depends on the access method used by the cluster administrator to set up the Vserver user account.

Your user account can be authenticated by using one of the following authentication methods:

- Network Information Service (NIS) and Lightweight Directory Access Protocol (LDAP)  
`nsswitch`

**Note:** Clustered Data ONTAP supports only the RFC 2307 schema for LDAP authentication of Vserver accounts. It does not support any other schemas, such as Active Directory Identity Management for UNIX (AD-IDMU) and Active Directory Services for UNIX (AD-SFU).

- Windows Active Directory (`domain`)
- User password (`password`)
- SSH public key (`publickey`)
- SNMP user-based security model (`usm`)
- SNMP community strings (`community`)
- SSL certificate authentication (`cert`)

## Logging in to a Vserver

To manage the Vserver resources, a Vserver administrator logs in to a Vserver by using the user name and password provided by the cluster administrator. A Vserver administrator can use an appropriate Secure Shell client application, such as PuTTY for Windows operating system and OpenSSH for UNIX operating system.

### Before you begin

You must have the management IP address of the Vserver, user name, and password.

### About this task

After you log in, you might be able to manage all or some of the following Vserver resources depending on the capabilities assigned to your account by the cluster administrator:

- Data access protocols, such as NFS, CIFS, iSCSI, and FC (FCoE included)
- Services, such as NIS, LDAP, and DNS
- Volumes, qtrees, quotas, Snapshot copies, and files
- Data backup with SnapMirror and NDMP
- Data security and policies

You can also monitor the network connection, network interface, LDAP client configuration, and Vserver health.

**Note:** Clustered Data ONTAP supports only the AES and 3DES encryption algorithms (also known as ciphers) for SSH.

### Step

1. To log in to a Vserver by using SSH application, perform the appropriate action depending on the operating system:

| If your host has...            | Then...  |
|--------------------------------|--|
| Windows operating system       | <ol style="list-style-type: none"> <li>a. Enter the management IP address of the Vserver in the SSH application.</li> <li>b. At the login prompt, enter the user name and password.</li> </ol>   |
| UNIX or Linux operating system | <p>Enter the following command from the client application:</p> <pre><b>ssh vserver_admin_name@vserver_ip_address</b></pre> <p><i>vserver_admin_name</i> is the user name.</p> <p><i>vserver_ip_address</i> is the management IP address of the Vserver.</p> |

**Note:** If you or the cluster administrator has created a public key for your user account, you do not require a password to log in to the Vserver.

**Related tasks**

*Identifying the commands that you can execute* on page 31

## Managing Vserver authentication

---

As a Vserver administrator, you can manage the security aspects of accessing a Vserver such as managing your own user accounts and passwords, public keys, digital certificates, and SSL protocol.

You can perform the following tasks to manage the Vserver authentication:

- Changing the login password
- Managing public keys
- Managing digital certificates for server or client authentication
- Managing SSL

### Changing the login password

After a Vserver administrator logs in to the Vserver by using the user name and password provided by the cluster administrator, the Vserver administrator can change the login password.

#### About this task

You must remember the following default rules when you change the login password:

- A password cannot contain the user name.
- A password must be at least eight characters long.
- A password must contain at least one letter and one number.
- A password cannot be the same as the last six passwords.

#### Steps

1. Change the login password by using the `security login password` command.
2. Enter your current password.
3. Enter a new password.
4. Confirm the password by entering the new password again.

#### Result

Your user account is updated with the new password. You must enter the new password on the subsequent login.

#### Example

The following example shows how to change a user password:

```
vs1.example.com::~> security login password
Please enter your current password:
Please enter a new password:
Please enter it again:
vs1.example.com::~>
```

## Managing public keys

You can associate, modify, or delete a public key to manage a user's authentication.

You can manage public keys in the following ways:

- Adding a public key by associating an existing public key in a valid OpenSSH format with a user account

Multiple public keys are allowed for a user account.

- Loading a public key from a universal resource identifier (URI), such as FTP or HTTP, and associating it with a user account

You can also overwrite an existing public key with the one you are loading.

- Displaying information about public keys
- Modifying a public key that is associated with a specific user
- Deleting a public key that is associated with a specific user

To create or modify a public key or load a public key from a URI, your user account must be configured with the `publickey` login method (created by using the `security login create` command with the `-authmethod` parameter set to `publickey`).

You use the `security login publickey` commands to manage public keys. For information about these commands, see the appropriate man pages.

## Commands for managing public keys

You use the `security login publickey` commands to manage public keys.

| If you want to...   | Use this command...                                 |
|---|---|
| Associate an existing public key with a user account      | <code>security login publickey create</code>        |
| Load a public key from a URI and associate it with a user | <code>security login publickey load-from-uri</code> |
| Display information about public keys                     | <code>security login publickey show</code>          |
| Modify a public key for a specific user                   | <code>security login publickey modify</code>        |
| Delete a public key for a specific user                   | <code>security login publickey delete</code>        |

For more information, see the man pages for the `security login publickey` commands.

## Managing digital certificates for server or client authentication

A digital certificate ensures that web communications are transmitted in encrypted form. It also ensures that information is sent privately and unaltered to only the specified server or from the authenticated client. Data ONTAP enables you to generate, install, and manage a self-signed or Certificate Authority (CA) signed digital certificate for server or client authentication.

The following facts apply to digital certificates (sometimes called public key certificates):

- A digital certificate is an electronic document that verifies the owner of a public key.
- A digital certificate can be either self signed (by owner) or CA signed.  
Which way to have a digital certificate signed depends on your security requirements and budget. You can obtain a self-signed digital certificate for free, but a digital certificate signed by a trusted CA can incur a considerable expense. A self-signed digital certificate is not as secure as a digital certificate signed by a CA. Therefore, it is not recommended in a production environment. A CA-signed digital certificate helps prevent man-in-the-middle attacks and provides better security protection than a self-signed digital certificate.
- By default, Data ONTAP uses the SHA256 cryptographic hashing function for signing a CSR or digital certificate, and the SHA1 and MD5 cryptographic hashing functions are also supported. Private keys generated by Data ONTAP are 2048-bit by default. Data ONTAP also enables you to generate a 512-bit, 1024-bit, or 1536-bit private key. However, the higher the value, the more secure the key is.

You can manage digital certificates in the following ways:

- Creating a self-signed or CA-signed digital certificate  
To obtain a self-signed digital certificate, you simply create one on the Vserver.  
To obtain a CA-signed digital certificate, you generate a digital certificate signing request (CSR), which contains a private key and information that identifies you as the applicant. You then send the CSR to a CA electronically to apply for a digital certificate. After the CA sends you the signed digital certificate, you install it with the associated private key on the Vserver.
- Create a self-signed root CA digital certificate and self-signed digital certificates for clients to mutually authenticate the server and clients
- Display information about the installed digital certificates
- Revoke a compromised CA-issued digital certificate
- Delete self-signed or CA-signed digital certificates  
Before reverting to a release earlier than Data ONTAP 8.2, all digital certificates except for the server type (`security certificate show -type server`) must be deleted. Otherwise, the revert procedure fails.

You use the `security certificate` commands to manage digital certificates. For information about these commands, see the man pages.



```
AQoCggEBAK3azmz6UniWYDKVjA4iD3ImclAJ0sst3jPH2VqFwKbR9+srrC7l7yt8
1s3JMDFBZVXxv+GmBYWfOuzvMzajR2G7fg6/U2Z9XviXQo0m+FsqYt5H3ZEzhkK6
G8rIEqKPL9yY3RFxfVCwoRn7k/Q9IvKwjlvxywjkVYijN9o7l9G159jBvmAKKyH0
SXz6lIwGzC8so8jiUm6QqdU5viDNBxeo+tkHy12gKDEjy5TGnuOcvVQ56CxoZyWg
cgg32elgMo3MFUFV+TtAVoPkBibC9AuZfrXfMBJW/IR4mDs+qFL0Q5becWzETCwu
9mY4kPt0YvyJiPXuJmWg144giQMi6cUCAwEAAaAAMA0GCSqGSIb3DQEBCwUAA4IB
kYz7hzkFpuMibAaCkp54Qrho
-----END CERTIFICATE REQUEST-----
```

Private Key:

```
-----BEGIN RSA PRIVATE KEY-----
MIIBPAIBAAJBAM16ytrK8nQj82UsWeHOeT8gk0BPX+Y5MLycsUdXA7hXhumHNpvF
C61X2G32Sx8VEalth94tx+vOEzq+UaqHlt0CAwEAAQJBAMZjDwlgm1m3qIr/n8VT
PFnnZnbVcXVM7OtbUsgPKw+QCCh9dF1jmuQKeDr+wUMWknlDeGrfhILpzfJGHRlJ
z7UCIQDr8d3gO71UyX+BbFmo/N0uAKjS2cvUU+Y8a8pDxGLLwIhANqa99SuS18U
DiPvdaKTj6+EcGuXfCXz+G0rfgTZK8uzAiEArlnmrFYC8Kwe9k7A0y1RzBLdUwK9
AvuJDn+/z+HlBdOCIQDD93P/xpaJETNz53Au49VE5Jba/Jugckrbosd/lSd7nQIG
aEMAZt6qHHT4mmdi8Bo8sDGedG2SKx6Qbn2IpuNZ7rc
-----END RSA PRIVATE KEY-----
```

Note: Please keep a copy of your private key and certificate request for future reference.

The following command installs a CA-signed digital certificate for a Vserver named vs1:

```
vs1::> security certificate install -vserver vs1 -type server
Please enter Certificate: Press <Enter> when done
-----BEGIN CERTIFICATE-----
MIIB8TCCAZugAwIBAwIBADANBgkqhkiG9w0BAQQFADBfMRMwEQYDVQQDEwpuZXRh
cHAuY29tMQswCQYDVQQGEwJVUzEUMAcGALUECBMAMQkwBwYDVQQHEwAxCTAHEgNV
BAoTADAEJMACGALUECXMAMQ8wDQYJKoZIhvcNAQkBFgAwHhcNMTAwNDI2MTk0OTI4
...
-----END CERTIFICATE-----
```

Please enter Private Key: Press <Enter> when done

```
-----BEGIN RSA PRIVATE KEY-----
MIIBPAIBAAJBAM16ytrK8nQj82UsWeHOeT8gk0BPX+Y5MLycsUdXA7hXhumHNpvF
C61X2G32Sx8VEalth94tx+vOEzq+UaqHlt0CAwEAAQJBAMZjDwlgm1m3qIr/n8VT
PFnnZnbVcXVM7OtbUsgPKw+QCCh9dF1jmuQKeDr+wUMWknlDeGrfhILpzfJGHRlJ
...
-----END RSA PRIVATE KEY-----
```

Do you want to continue entering root and/or intermediate certificates {y|n}: y

Please enter Intermediate Certificate: Press <Enter> when done

```
-----BEGIN CERTIFICATE-----
MIIE+zCCBGsgAwIBAgICAQ0wDQYJKoZIhvcNAQEFBQAwbGsxJDAiBgNVBACzG1ZhbG1dZXJ0IFZhbG1kYXRpb24gTmV0d29yazEXMBUGALUEChMOVmFsaUNlcnQsIElu
Yy4xNTAzBgNVBAsTLFZhbG1dZXJ0IENsYXNzIDIUG9saWN5IFZhbG1kYXRpb24g
...
-----END CERTIFICATE-----
```

Do you want to continue entering root and/or intermediate certificates {y|n}: n

Note: You should keep a copy of your certificate and private key for future reference.

If you revert to an earlier release, the certificate and private key are deleted.

## Installing a server intermediate certificate

You must install the intermediate certificate on the Vserver if a certificate chain that begins at the trusted root CA, and ends with the SSL certificate issued to you, is missing the intermediate certificates.

### About this task

An intermediate certificate is a subordinate certificate issued by the trusted root specifically to issue end-entity server certificates. The result is a certificate chain that begins at the trusted root CA, goes through the intermediate, and ends with the SSL certificate issued to you.

### Step

1. Install the intermediate certificate by using the `security certificate install` command.

## Providing mutual authentication

You can configure a Vserver to provide mutual authentication for greater security between the Vserver and a group of clients.

### About this task

When using mutual authentication, also called *two-way authentication*, both the Vserver and the client present their certificates to each other and validate their respective identities to each other. To configure mutual authentication using a self-signed root CA certificate, you must create a self-signed root CA certificate, enable client authentication, generate and sign a certificate signing request (CSR) for each user, and install the client certificate on the client side.

You can also provide client authentication using a CSR signed by a third-party CA that is installed on the client and installing intermediate certificates of the CA that signed the certificate.

### Steps

1. Create a self-signed root CA certificate for the Vserver by using the `security certificate create` command.

### Example

The following command creates a root CA certificate for Vserver `vs1` for a software group in the IT department of a company whose custom common name is `lab.companyname.com`:

```
vs1::> security certificate create -vserver vs1 -common-name  
lab.companyname.com -type root-ca
```

2. Enable client authentication on the Vserver by using the `security ssl modify` command and the `-client-enabled true` parameter.
3. Generate a CSR for a client by using the `security certificate generate-csr` command. You do this for every client that you need to authenticate.

### Example

The following command generates a CSR whose custom common name is `vsldadmin`:

```
vs1::> security certificate generate-csr -common-name vsldadmin

Certificate Signing Request :
-----BEGIN CERTIFICATE REQUEST-----
MIICojCCAYoCAQAwXTERMA8GA1UEAxMI d n M x Y W R t a W 4 x C z A J B g N V B A Y T A l V T M Q k w
B w Y D V Q Q I E w A x C T A H B g N V B A c T A D E J M A c G A l U E C h M A M Q k w B w Y D V Q Q L E w A x D z A N B g k q
h k i G 9 w 0 B C Q E W A D C C A S I w D Q Y J K o Z I h v c N A Q E B B Q A D g g E P A D C C A Q o C g g E B A L 6 o h d T 5
m M t V b Z p H + i P P p k V z s v 5 v t 5 v z t b B I l C C 2 6 K c 0 5 U 7 v d o o K h M w 2 0 F u q u y q E Z H E m t s f 2
Z + i E z a s S q 0 G 7 l A C b w F A 4 X F e 2 5 / T Q M 7 / S R N Y / + v t E W C F U e h 6 + k J w k U r I 5 S w 8 Q Z l d 7
m b v F j Y I a W y C / f E D + K M c E b u x t B 0 L D p X j t x z G s z h c r l l 7 / M + + 2 2 9 Y G s m g l J 7 G h u M a t
M U Z c U T i Y e q e s o I Q i 4 Y C g M a h J G r 0 o Q Z K r 8 u O t B s 8 L i N M 8 Y H F P 2 x M X C H / B n V 5 W Y S T D
Q 0 W 4 e t t m B R I R + c m B e s b N y L + A k Q i + 6 8 3 + 8 d 4 m Y m N j m F m E Z L I p L H U V 4 h e B 8 F a L O 7 c B
j p T c O A D x e q a q Y 5 s C A w E A A a A A M A 0 G C S q G S I b 3 D Q E B C w U A A 4 I B A Q a n m w 5 U 4 1 l G 2 0 f z
l j c E l i z O 2 E T 4 H z x T n U U 3 Y a c K p s m F 6 P 6 g B 2 n n 2 8 U 1 P W H 8 p H J a m Z G w o K 4 Z i m N Z G l d y
A G m O H C b k t a m y P C 2 I z h q E m X C 3 7 D h V 7 X a D G p 3 d P S e T P n Z i z 8 b F l y p K L z c O X 8 4 y 7 J 6 g
B y v q h z l 5 4 e b a 7 + D G M s k 3 4 2 9 X v i C v w 6 o E + A q 6 0 V r V 5 I j l Y P + X M g j l Q A 7 Z R d V K h 3 E G
i R r n D C X Z I L L U n j 4 u 6 d 7 X e a h T S k x b y V W 2 8 H T 9 a Y X j y E S I r X Y v b J G K l 9 D T 0 V D 2 l G 4 K
/ R L w c V 5 j i h J / A i r r n f Z 4 l h c s w x 8 n 6 Y H 0 E w 6 h w A e f 7 r a e O U h C U 8 G D q 4 d X 3 U m w / F 2 8
m g F f s O 2 o
-----END CERTIFICATE REQUEST-----

Private Key :
-----BEGIN RSA PRIVATE KEY-----
MIIEowIBAAKCAQEA v q i F l P m Y y l V t m k f 6 I 8 + m R X O y / m + 3 m / O l s E j U I L b o p z T l T u 9 2
i g q E z D Y 4 W 6 q 7 K o R k c S a 2 x / Z n 6 I R l q x K r Q b v U A J v A U D h c V 7 b n 9 N a z v 9 J E l j / 6 + 0 R Y
I V R 6 H r 6 Q n C R S s j l L D x B n V 3 u Z u 8 W N g h p b I L 9 8 Q P 4 o x w F u 7 G 0 H Q s O l e O 3 H M a z O F y v W
X v 8 z 7 7 b b l g a y a C U n s a G 4 w C 0 x R l x R O J h 6 p 6 y g h C L h g K A x q E k a v S h B k q v y 4 6 0 G z w u I
0 z x g c U / b E x c I f 8 G d X l Z h J M N D R b h 6 2 2 Y F E h H 5 y Y F 6 x s 3 I v 4 C R L 7 r z f 7 x 3 i Z i Y 2 0 Y
W Y R k s i k s d R X i F 4 H w V o s 7 t w G o l N w 4 A P F 6 p q B j m w I D A Q A B A o I B A Q C t 4 N G V R 0 D D C B k a
I F S P f l v 8 c S u O C M j h 8 K S d r f 3 Q D C A o B g S v N Z L d F / S + r S A + 8 X k a s H 1 N + G m v + h g P p V d 3
a m J H Y 7 5 Y A 7 o j N Z N 5 5 3 S p / 4 u C g I i J A P a r W 0 w o s X t i O J d 3 3 2 S P 5 9 J 9 X Y 9 x 6 G Z v K h 8 B
L X o 4 Z o o y V 9 j m j X c V J e X + T K H H p M s K k C G W u D g N T U 0 r x 5 U M y r b M u v h n z l 5 4 j r b 6 C c t e
3 Z H q W H 3 F d t J m D a q y u r 3 0 h 4 U p S l J Z E 4 J r x c j I l t Q e b B Z z D Y I N 0 0 8 o O L I 6 Z e u A i 8 s s
2 t L E u / H m d b P i M 9 b / M v 5 Q 6 p t w f t S 4 S P v e I N v g 8 z i X X Y s Y X 2 T T b a p 2 x z j M o h l v A p w
q 0 D J v B q J A o G B A P o 6 L / b P 5 4 8 T y U 8 x X z / k o / 4 D Q p T d / b W m h V q + J j / 8 o 2 L f Q w y 2 V F E
P v X 9 C v M u y + y P P S s k 7 v F f e s V Z 0 g E o l m S 6 x g N r 3 Z a h x R V U R 7 Z c M n A 6 v K u Y q q w Y 6 U d c
A k F A O l R Z G F v E c N X J N 8 I 5 a j Z i G r l i Y x f w g 0 Z l H y 4 t O s H Q Y k l j k W h K z C T N A o G B A M M O
h y m a 7 a N b n t Q 9 M y t 2 o p i Q + v W P E y z d k L z n / l O v y 7 0 D b 9 a a X H e 6 + f j 0 R w 0 i A L 9 l i V e
z E R m c Q y p s j + B g X x P x l A M l l Y s F B R l e W d S l X d M P k n 8 R X 7 Y j d S i y l I T P O l W W i L r 6 1 G /
N F 9 r J I s 4 c N d i 9 L b m g Z 8 a r s v Y o C M 2 m n W K S V x H C O o H A o G A M r R X w 8 u d Q I d h 6 g o 2 x 3 2 C
V W o O 0 m l v h b U 2 w + B J P 7 e d j t E V J c O o B a + u k m o U L f L t n 6 H m 4 e Y K B R 8 z 4 Y m x 5 E o l L 3 Q p
a f 8 g P v t Z i + W l 6 n p l Q H y 3 H z X 3 C F 9 1 0 Z + F d E 5 v Q N g d X y E C m H K W j G H H 8 + M s 8 6 d c L R 2 v
f D R B f T n t D h k L 0 m K 6 t E d z l o E C g Y A F h i P N y d M f G G J I m 8 J T C Z l m 0 e G a j D a o 9 W j + U J O
q i w / 6 C l 7 g d P 6 p Z W i u 6 r w Y Y x 4 i T f H V y f x x / T r p u K l a c W A / 8 F l Q v Y G o r l W 2 o j v P E E X
```

```
X9Fjl+FF9kIOA44+hMz0zr0+v++qIQAas64VQ0PulZ6Yj26cUuUgYMIoPSOisIfj
VR+rgQKBgCeScBiGK8p5Q/+x/5zEZxiT9fwPO3RC4OK07aOrYf+Y3p4JdL2nZLfp
QsTf/H02X5BI2kvSHbndyrbsHvu+V0X5n+8paAR+IJkm+QTUE1SCxuMYRk27r277
iUU3p8z4K6JWWGH1tKHR/NQ/gqLCKbUeetcoqf/RKo7LxsyNESLr
-----END RSA PRIVATE KEY-----
```

Note: Please keep a copy of your certificate request and private key for future reference.

#### 4. If you self-sign the certificate, complete the following steps:

- a) Copy the certificate request and private key to a file for reference when you sign the CSR.

You do this for every client that you need to authenticate.

- b) View the root CA certificate you created by using the `security certificate show` command.

You need the following information before you can sign the CSR:

- Certificate authority (CA)
- Serial number of the certificate
- Vserver name

You do this for every client that you need to authenticate.

#### Example

```
vs1::> security certificate show -instance -vserver vs1
Vserver: vs1
FQDN or Custom Common Name: lab.companyname.com
Serial Number of Certificate: 50F84392
Certificate Authority: lab.companyname.com
Type of Certificate: root-ca
Size of Requested Certificate(bits): 2048
Certificate Start Date: Thu Jan 17 18:31:47 2013
Certificate Expiration Date: Fri Jan 17 18:31:47 2014
Public Key Certificate: -----BEGIN CERTIFICATE-----
MIID
+zCCAuOgAwIBAgIEUPhDkjANBgkqhkiG9w0BAQsFADBbMQ8wDQYDVQQDEwZt
.
.
.
```

- c) Sign the CSR with the root CA generated previously by using the `security certificate sign` command.

You do this for every user client that you need to authenticate.

#### Example

```
vs1::> security certificate sign -vserver vs1 -ca
lab.companyname.com -ca-serial 50F84392
```

5. If you have a third-party CA sign the CSR, complete the following steps:
  - a) Have the third-party CA sign the CSR by following the steps listed in [Generating and installing a CA-signed digital certificate for server authentication](#) on page 23.
  - b) Install the root certificate and each intermediate certificate of the CA that signed the certificate by using the `security certificate install` command with the `-type client-ca` parameter.

You do this for each certificate.

6. If a Vserver user is not set up to be authenticated by digital certificates, contact the cluster administrator to have the user account set up for digital certificate authentication.

For Vserver user accounts, digital certificate authentication is supported only with the `ontapi` access method.

7. Install the certificate that you generated and signed on the user's client.

## Commands for managing digital certificates

You use the `security certificate` commands to generate and install self-signed certificates, generate certificate signing requests for certificate authorities (CA) to sign, install CA-signed certificates, create your own CA-signed certificates, and view installed certificates.

| If you want to...   | Use this command...                                |
|---|--|
| Display CA-issued digital certificates  | <code>security certificate ca-issued show</code>   |
| Revoke a compromised CA-issued digital certificate                                    | <code>security certificate ca-issued revoke</code> |
| Create and install a self-signed digital certificate                                  | <code>security certificate create</code>           |
| Delete a self-signed or CA-signed digital certificate                                 | <code>security certificate delete</code>           |
| Generate a digital certificate signing request that you will send to a CA for signing | <code>security certificate generate-csr</code>     |
| Install a CA-signed digital certificate   | <code>security certificate install</code>          |
| Display information about installed digital certificates                              | <code>security certificate show</code>             |
| Sign a digital certificate using a self-signed root CA                                | <code>security certificate sign</code>             |

For more information, see the man pages for the `security certificate` commands.

## Managing SSL

The SSL protocol improves the security of web access by using a digital certificate to establish an encrypted connection between a web server and a browser.

You can manage SSL for a Vserver in the following ways:

- Enabling SSL
- Generating and installing a digital certificate and associating it with the Vserver
- Displaying the SSL configuration to see whether SSL has been enabled, and, if available, the SSL certificate name

### Commands for managing SSL

You use the `security ssl` commands to manage the SSL protocol for a Vserver.

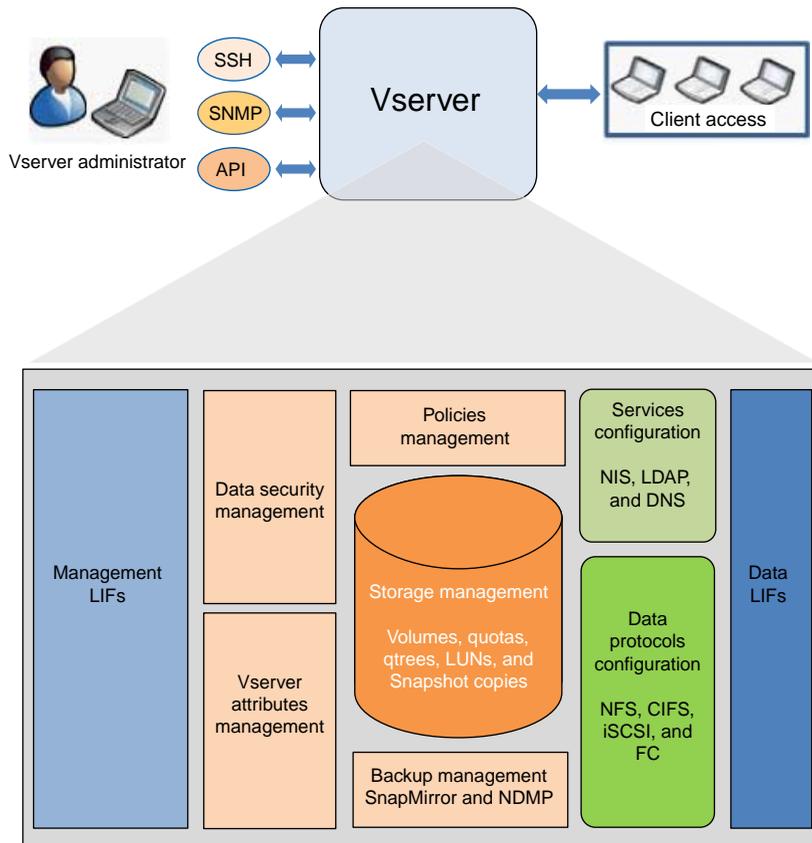
| If you want to...  | Use this command...              |
|--|----------------------------------|
| Enable SSL for the cluster or a Vserver, and associate a digital certificate with it | <code>security ssl modify</code> |
| Display the SSL configuration and certificate name for the cluster or a Vserver      | <code>security ssl show</code>   |

For more information, see the man pages.

## Administering a Vserver

Depending on the capabilities assigned by the cluster administrator, a Vserver administrator can perform various administration tasks on a Vserver. After logging in to the Vserver, a Vserver administrator can identify the capabilities assigned and the commands that are available for the administration.

The following illustration depicts the Vserver administrative components:



You might have all or some of the following administration capabilities:

- Jobs and schedules management  
You can manage jobs and schedules related to the Vserver.
- Data access protocol configuration  
You can configure data access protocols, such as NFS, CIFS, iSCSI, and Fibre Channel (FC) protocol (Fibre Channel over Ethernet included).
- Policy management

You can create and manage policies to manage data access from the Vserver.

- Data access security management  
You can set security on the Vserver's data without the need of a client.
- Services configuration  
You can configure services, such as LDAP, NIS, and DNS.
- Storage management  
You can manage volumes, quotas, qtrees, and files.
- LUN management  
You can manage LUNs in a SAN environment.
- Backup management  
You can back up and manage the Vserver's data by using SnapMirror technology and NDMP.
- Monitoring Vserver  
You can monitor performance data, network connection, information, and Vserver health.

**Note:** For troubleshooting or modifying Vserver configurations, Vserver administrator must contact the cluster administrator.

## Identifying the commands that you can execute

The capabilities to administer a Vserver and its resources depend on the capabilities of the user who logs in. After you log in as a Vserver administrator, you can identify the commands that you can execute on the Vserver.

### Steps

1. To identify the available commands, enter the following command:

```
?
```

The list of available commands is displayed.

2. To identify the available subcommands within a command, perform the following steps:

- a) Enter the name of the command directory.
- b) At the prompt, enter the following command:

```
?
```

The list of available subcommands is displayed.

### Example

The following example shows the commands and the volume subcommands that are available for a Vserver administrator in the Vserver vs1.example.com:

```
vs1.example.com:~> ?
      up                Go up one directory
      dashboard>       Display dashboards
```

```

    exit                Quit the CLI session
    .
    .
    volume>            Manage virtual storage, including volumes,
                       snapshots, and mirrors
    vservers>         Manage Vservers

```

```

vs1.example.com::>volume
vs1.example.com::volume> ?
  autosize            Set the autosize settings of the
                       flexible volume.
  clone>              Manage FlexClones
  .
  .
  .
  snapshot>          Manage snapshots
  unmount             Unmount a volume

```

## Displaying ONTAP APIs

A Vserver administrator can view the Data ONTAP APIs and their corresponding CLI commands by using the `security login role show-ontapi` command to execute administrative functions with a remote program.

### Step

1. Use the `security login role show-ontapi` to view the Data ONTAP APIs and their corresponding CLI commands.

### Example

The following example illustrates how to view the Data ONTAP APIs and their corresponding CLI commands for the Vserver `vs1.example.com`:

```

vs1.example.com::> security login role show-ontapi
ONTAPI                Command
-----
av-get-remedy-info     antivirus remedy show
av-on-access-policy-create
                       antivirus on-access policy create
av-on-access-policy-delete
                       antivirus on-access policy delete
av-on-access-policy-get
                       antivirus on-access policy show
...
...
...
waf1-get-sync-status   volume show

```

```
waf1-sync          volume modify
554 entries were displayed.
```

## Managing jobs and schedules

A *job* is any asynchronous task. Jobs are typically long-running volume operations such as copy, move, and mirror. You can monitor, pause, stop, and restart jobs, and configure them to run on specified schedules.

### Commands for managing jobs

Jobs are placed into a job queue and run when resources are available. If a job is consuming too many system resources, you can stop it or pause it until there is less demand on the system. You can also monitor and restart jobs.

| If you want to...                                  | Use this command...   |
|--|---|
| Display information about all jobs                 | <code>job show</code>   |
| Display information about jobs on a per-node basis | <code>job show-bynode</code>  |
| Display information about cluster-affiliated jobs  | <code>job show-cluster</code>   |
| Display information about completed jobs           | <code>job show-completed</code>   |
| Display information about job history              | <code>job history show</code><br>Up to 25,000 job records are stored for each node in the cluster. Consequently, attempting to display the full job history could take a long time. To avoid potentially long wait times, you should display jobs by node, Vserver, or record ID. |
| Display the list of private jobs                   | <code>job private show</code><br><b>Note:</b> This command is only available at the advanced privilege level.   |
| Display information about completed private jobs   | <code>job private show-completed</code><br><b>Note:</b> This command is only available at the advanced privilege level.   |
| Monitor a job's progress                           | <code>job watch-progress</code>   |

| If you want to...   | Use this command...   |
|---|---|
| Monitor a private job's progress  | <code>job private watch-progress</code><br><b>Note:</b> This command is only available at the advanced privilege level. |
| Pause a job   | <code>job pause</code>  |
| Pause a private job   | <code>job private pause</code><br><b>Note:</b> This command is only available at the advanced privilege level.          |
| Resume a paused job   | <code>job resume</code>   |
| Resume a paused private job   | <code>job private resume</code><br><b>Note:</b> This command is only available at the advanced privilege level.         |
| Stop a job  | <code>job stop</code>   |
| Stop a private job  | <code>job private stop</code><br><b>Note:</b> This command is only available at the advanced privilege level.           |
| Delete a job  | <code>job delete</code>   |
| Delete a private job  | <code>job private delete</code><br><b>Note:</b> This command is only available at the advanced privilege level.         |
| Disassociate a cluster-affiliated job with an unavailable node that owns it, so that another node can take ownership of the job | <code>job unclaim</code><br><b>Note:</b> This command is only available at the advanced privilege level.                |

For more information, see the man pages.

## Commands for managing job schedules

Schedules that run at specific times are called *cron* schedules (similar to UNIX *cron* schedules). Schedules that run at intervals are called *interval* schedules. You use the `job schedule` commands to view job schedules.

| If you want to...                       | Use this command...            |
|---|--------------------------------|
| Display information about all schedules | <code>job schedule show</code> |

| If you want to...                            | Use this command...                     |
|--|---|
| Display information about cron schedules     | <code>job schedule cron show</code>     |
| Display information about interval schedules | <code>job schedule interval show</code> |

For more information, see the man pages.

## Monitoring Vserver performance

You can view data about your Vservers to monitor Vserver performance. For example, you can monitor the performance of volumes by viewing statistics that show throughput and latency.

### What objects, instances, and counters are

You can view performance data for specific objects in your cluster. Objects are comprised of instances and counters. Counters provide data about the instances of an object.

An object is any of the following:

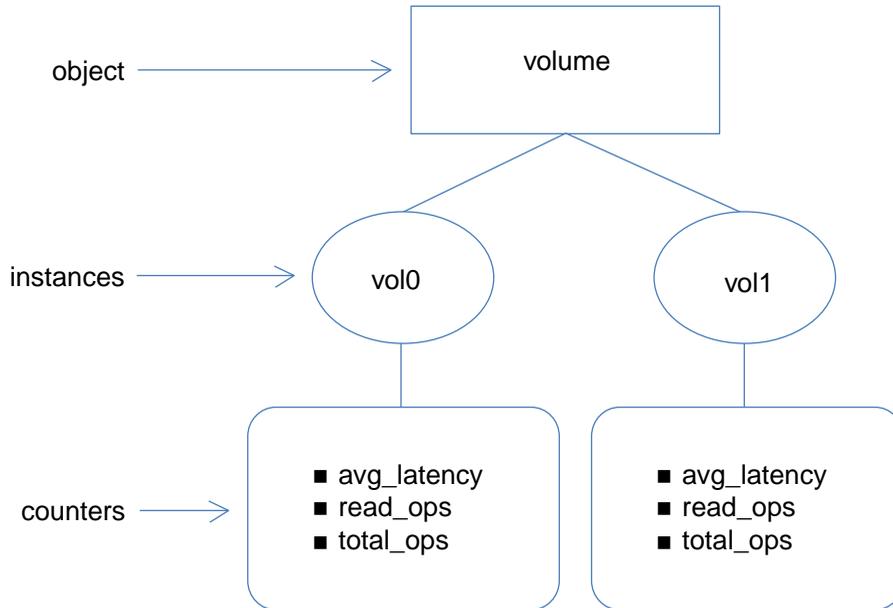
- Logical entities such as LUNs and volumes
- Protocols such as CIFS and NFS

Each object has zero or more instances. For example, the LUN object has an instance for each LUN in your cluster.

A counter is a predefined performance metric that provides data about an object. Examples of data that counters provide include the following:

- The average latency for a volume
- The number of established SMB and SMB2 sessions

The following illustration shows the relationship between an object and its instances and counters. In this illustration, the volume object has two instances: `vol0` and `vol1`. The object's counters provide data about each of these instances. The illustration shows three of the object's counters: `avg_latency`, `read_ops`, and `total_ops`.



### Decisions to make before you view performance data

You can view performance data in several ways. You should make a few decisions before you view the data.

You should decide the following before you view performance data:

| Decision  | Considerations   |
|---|--|
| How do you want to retrieve and display the data?             | You have two choices: <ul style="list-style-type: none"> <li>You can collect and view a set of data for a specific time period. If you choose this option, you can view data for several objects and instances at a time.</li> <li>You can view continuously updated data. If you choose this option, you can view data for only one object and one instance at a time.</li> </ul> |
| For which objects do you want to view data?                   | You need to specify at least one object for which you want to view data.   |
| Do you want data from all counters or from specific counters? | The default setting shows data for all counters in an object; however, you can specify specific counters to get the exact data that you need.  |

| Decision   | Considerations  |
|--|---|
| Do you want data for all instances of an object or for specific instances? | <ul style="list-style-type: none"> <li>• If you collect data for a time period, the default setting shows data for all instances; however, you can specify one or more instances.</li> <li>• If you view continuously updated data and specify any object other than <code>cluster</code>, you must specify an instance.</li> </ul> |

## Viewing performance data for a time period

You can monitor Vserver performance by collecting and viewing data for a specific time period (a sample). You can view data for several objects and instances at a time.

### About this task

You can collect more than one data sample at a time. You can collect more than one sample from the same object at the same time.

**Note:** You cannot collect and view data for an object that has more than 5,000 instances. If an object has more than 5,000 instances, you need to specify the specific instances for which you want data.

For more information about the `statistics` commands, see the man pages.

### Steps

1. Use the `statistics start` command to start collecting data.

If you do not specify the `-sample-id` parameter, the command generates a sample identifier for you and defines this sample as the default sample for the CLI session. If you run this command during the same CLI session and do not specify the `-sample-id` parameter, the command overwrites the previous default sample.

2. Optional: Use the `statistics stop` command to stop collecting data for the sample.

You can view data from the sample if you do not stop data collection. Stopping data collection gives you a fixed sample. Not stopping data collection gives you the ability to get updated data that you can use to compare against previous queries. The comparison can help you identify performance trends.

3. Use the `statistics show` command to view the sample data.

### Example: Monitoring NFSv3 performance

The following example shows performance data for the NFSv3 protocol.

The following command starts data collection for a new sample:

```
vs1::> statistics start -object nfsv3 -sample-id nfs_sample
```

The following command shows data from the sample by specifying counters that show the number of successful read and write requests versus the total number of read and write requests:

```
vs1::> statistics show -sample-id nfs_sample -counter read_total|
write_total|read_success|write_success
```

```
Object: nfsv3
Instance: vs1
Start-time: 2/11/2013 15:38:29
End-time: 2/11/2013 15:38:41
Cluster: cluster1
```

| Counter       | Value   |
|---------------|---------|
| read_success  | 40042   |
| read_total    | 40042   |
| write_success | 1492052 |
| write_total   | 1492052 |

## Viewing continuously updated performance data

You can monitor Vserver performance by viewing data that continuously updates with the latest status. You can view data for only one object and one instance at a time.

### About this task

For more information about the `statistics show-periodic` command, see the man page.

### Step

1. Use the `statistics show-periodic` command to view continuously updated performance data.

If you do not specify the `-object` parameter, the command returns summary data for the cluster.

### Example: Monitoring volume performance

This example shows how you can monitor volume performance. For example, you might want to monitor volume performance if critical applications run on those volumes. Viewing the performance data can help you answer questions such as:

- What is the average response time for a volume?
- How many operations are completing per second?

The following command shows performance data for a volume by specifying counters that show the number of operations per second and latency:

```
vs1::> statistics show-periodic -object volume -instance vol0 -
counter write_ops|read_ops|total_ops|read_latency|write_latency|
avg_latency
cluster1: volume.vol0: 1/7/2013 20:15:51
  avg      read      total      write      write
  latency  latency read_ops   ops        latency   ops
-----
  202us    218us     0          22         303us    7
  97us     43us     31         71         149us    34
  39us     0us      0          3          0us     0
  152us    0us      0          16         152us    16
  162us    0us      0          342        144us    289
  734us    0us      0          15         0us     0
  49us     0us      0          1          0us     0
cluster: volume.vol0: 1/7/2013 20:16:07
  avg      read      total      write      write
  latency  latency read_ops   ops        latency   ops
-----
Minimums:
  39us     0us      0          1          0us     0
Averages for 7 samples:
  205us    37us     4          67         106us    49
Maximums:
  734us    218us    31         342        303us    289
```

## Commands for monitoring Vserver performance

Use the `statistics` commands to display performance data and specify the settings for displaying the data. For more information about these commands, see the man pages.

### Collecting data for a time period

Use the following commands to collect data samples and to manage the samples that you collect. You need to collect a data sample before you can use the `statistics show` command.

| If you want to...                  | Use this command...                    |
|------------------------------------|--|
| Start data collection for a sample | <code>statistics start</code>          |
| Stop data collection for a sample  | <code>statistics stop</code>           |
| View all samples                   | <code>statistics samples show</code>   |
| Delete a sample                    | <code>statistics samples delete</code> |

## Viewing performance data

Use the following commands to view performance data. You need to collect a data sample before you can use the `statistics show` command.

| If you want to...                                  | Use this command...  |
|--|--|
| View performance data for a time period (a sample) | <code>statistics show</code><br><br><b>Note:</b> You should limit the scope of this command to only a few objects at a time to avoid a potentially significant impact on system performance. |
| View continuously updated performance data         | <code>statistics show-periodic</code>  |

## Viewing all objects, instances, and counters

Use the `statistics catalog` commands to view information about objects, instances, and counters.

| If you want to...                          | Use this command...                           |
|--|---|
| View descriptions of objects               | <code>statistics catalog object show</code>   |
| View all instances of an object            | <code>statistics catalog instance show</code> |
| View descriptions of counters in an object | <code>statistics catalog counter show</code>  |

## Displaying information about Vservers

A Vserver administrator can view the details of the Vserver that is assigned by using the `vserver show` command.

### Step

1. Enter the appropriate command to view details of the Vserver:

| If you want to...                           | Enter the following command...      |
|---|-------------------------------------|
| View basic information about the Vserver    | <code>vserver show</code>           |
| View detailed information about the Vserver | <code>vserver show -instance</code> |

For more information about this command, see the man pages.

The following example illustrates how to display the details of a Vserver:

```
vs2.example.com::> vserver show
```

| Vserver         | Type | Admin State | Root Volume | Aggregate | Name Service  | Name Mapping |
|-----------------|------|-------------|-------------|-----------|---------------|--------------|
| vs2.example.com | data | running     | root_vol2   | aggr2     | file,<br>ldap | file         |

```

vs2.example.com::> vsserver show -instance

Vserver: vs2
Vserver Type: data
Vserver UUID: 26faa83c-075b-11e2-9acb-123478563412
Root Volume: root_vol2
...
...
Disallowed Protocols: nfs, cifs, fcp, iscsi, ndmp
Is Vserver with Infinite Volume: false
QoS Policy Group: -

```

## Displaying information about Vserver peer relationships

Peer Vservers are fully functional Vservers which could be either local or remote. Cluster administrators and Vserver administrators can view the peers of the Vserver to set up peering applications such as SnapMirror between volumes of the peer Vservers by using the `vsserver peer show` command.

### About this task

You can also view the status of the Vserver peer relationships.

### Step

1. Use the `vsserver peer show` command to view the peered Vservers and the state of the Vserver peer relationship.

### Example

The following example illustrates how to view the information about peered Vservers:

```

vs1.example.com::> vsserver peer show

```

| Vserver          | Peer Vserver     | Peer State |
|------------------|------------------|------------|
| vs1.example0.com | vs5.example0.com | peered     |
| vs1.example0.com | vs3.example0.com | peered     |

For more information about this command, see the man pages.

## Displaying information about network configuration

A Vserver administrator can view the network configuration information such as LIFs, routing groups, and zones to monitor the network configuration of a Vserver.

### About this task

You can view the following aspects of a Vserver's network configuration:

- LIFs of a Vserver, their DNS zone names, and their routing groups
- Routing groups of the Vserver
- Active and listening network connections

### Step

1. Depending on what you want to view, use the appropriate command:

| If you want to view...                       | Enter the following command...  |
|--|---|
| The routing groups and subnet of a Vserver   | <code>network interface show-routing-group</code>   |
| The DNS zone names of the Vserver's LIFs     | <code>network interface show-zones</code>   |
| The static routes                            | <code>network routing-groups route show</code>  |
| The routing groups                           | <code>network routing-groups show</code>  |
| The active and listening network connections | <code>network connections active show</code><br>or<br><code>network connections listening show</code> |
| The LIFs of a Vserver                        | <code>network interface show</code>   |

### Example

The following example shows how to view the LIFs of a Vserver:

```
vs1.example.com::> network interface show
```

| Vserver         | Logical Interface | Status Admin/Oper | Network Address/Mask | Current Node | Current Port | Is Home |
|-----------------|-------------------|-------------------|----------------------|--------------|--------------|---------|
| vs1.example.com | lif1              | up/up             | 192.0.2.65/126       | node0        | e1b          | false   |
|                 | lif2              | up/up             | 192.0.2.1/62         | node1        | e0d          | false   |

2 entries were displayed.

## Monitoring Vservers using dashboard

You can monitor the critical aspects of the Vserver, such as the health of the Vserver and its volumes, aggregates, network interfaces, ports, and protocols from the dashboard to ensure that the Vserver is functional, and data access is nondisruptive.

For more information about viewing Vserver's health using dashboards, see the *Clustered Data ONTAP System Administration Guide for Cluster Administrators*.

### Related information

[Documentation on the NetApp Support Site: support.netapp.com](http://support.netapp.com)

## Commands for managing dashboards

You use the `dashboard` commands to configure dashboards, display dashboard information, and display health status for Vservers.

**Note:** The `dashboard health vserver` commands support the NFS and CIFS protocols. They do not support the FC and iSCSI protocols.

| If you want to...   | Use this command...                                  |
|---|--|
| Display information about general Vserver health, including the current operational status, issues, critical alerts, warnings, and informational messages | <code>dashboard health vserver show</code>           |
| Display the health status of aggregates, LIFs, ports, protocols, and volumes in Vservers  | <code>dashboard health vserver show-combined</code>  |
| Display the health status of aggregates in Vservers   | <code>dashboard health vserver show-aggregate</code> |
| Display the health status of volumes in Vservers  | <code>dashboard health vserver show-volume</code>    |
| Display the health status of LIFs in Vservers   | <code>dashboard health vserver show-lif</code>       |
| Display the health status of Vserver network ports  | <code>dashboard health vserver show-port</code>      |
| Display the health status of protocols in Vservers  | <code>dashboard health vserver show-protocol</code>  |

For more information, see the man pages.

## Data access protocols configuration

A Vserver administrator can configure a Vserver with FlexVol volumes with any combination of supported data access protocols, which are NFS, CIFS, iSCSI, and FC (FCoE included) to serve data. However, you can configure only NFS and CIFS protocols on a Vserver with Infinite Volume.

You can configure and manage the following protocols:

- NFS and CIFS protocols for file-level data access.
- iSCSI and FC (FCoE included) protocols for block-level data access.

**Note:** You can configure and manage only the protocols that are allowed on the Vserver by the cluster administrator.

### NAS protocols

NFS clients can access data on a Vserver by using the NFS protocol. You must configure an NFS server on a Vserver to provide data access to its NFS clients. You can set up authentication between the Vserver and NFS clients by configuring a network authentication protocol, such as NIS and LDAP.

CIFS clients can access data on a Vserver by using the CIFS protocol. You can create multiple CIFS shares for the clients. You can set up authentication between the Vserver and CIFS clients by configuring a network authentication protocol, such as Windows Active Directory.

In addition to NFS and CIFS protocols, you can also manage the following:

- Name mappings  
You can create and use name mappings to map your UNIX users and groups to Windows users and groups or Windows users and groups to UNIX users and groups.
- Export policies  
You can create and use export policies to restrict access to volumes for specific clients.
- Locks  
You can view and break a lock if it prevents a client's access to the files.

For more information about configuring NFS and CIFS protocols, see the *Clustered Data ONTAP File Access and Protocols Management Guide*.

### SAN protocols

You must configure the iSCSI protocol on a Vserver to export LUNs and transfer block data to the iSCSI initiator hosts.

You must configure the FC (FCoE included) protocol on a Vserver to export LUNs and transfer block data to the FC initiator hosts.

For more information about configuring iSCSI and FC (FCoE included) protocols, see the *Clustered Data ONTAP SAN Administration Guide*.

**Related information**

*[Documentation on the NetApp Support Site: support.netapp.com](http://support.netapp.com)*

**Commands for configuring data access protocols**

You can identify the list of commands to configure protocols by navigating to the respective command directories.

To identify the list of commands to configure NAS and SAN protocols, you must navigate to the protocol directory under vserversubdirectory.

**Example**

The following example shows how to identify the list of NFS protocol commands:

```
vs1.example.com::vserversub> ?
audit>          Manage auditing of protocol requests that the
                 Vserver services
cifs>           Manage the CIFS configuration of a Vserver
dashboard>     The dashboard directory
data-policy>   Manage data policy
export-policy> Manage export policies and rules
fcp>           Manage the FCP service on a Vserver
fpolicy>       Manage FPolicy
group-mapping> The group-mapping directory
iscsi>         Manage the iSCSI services on a Vserver
locks>         Manage Client Locks
name-mapping> The name-mapping directory
nfs>           Manage the NFS configuration of a Vserver
peer>          Create and manage Vserver peer relationships
security>      Manage ontap security
services>      The services directory
show           Display Vservers
smtape>        The smtape directory

vs1.example.com::vserversub nfs> ?
create         Create an NFS configuration for a Vserver
delete         Delete the NFS configuration of a Vserver
kerberos-config> Manage the Kerberos configuration for an NFS
                server
modify         Modify the NFS configuration of a Vserver
off            Disable the NFS service of a Vserver
on             Enable the NFS service of a Vserver
show           Display the NFS configurations of Vservers
start          Start the NFS service of a Vserver
status         Display the status of the NFS service of a
                Vserver
stop           Stop the NFS service of a Vserver
```



|         |  |
|---------|--|
| policy> | Manage file security policies            |
| show    | Display file/folder security information |

## Services configuration

Depending on the capabilities, a Vserver administrator can configure services such as Network Information Service (NIS), Domain Name Service (DNS), and Lightweight Directory Access Protocol (LDAP) for a Vserver. A Vserver administrator can configure these services to provide network directory information, authentication, and UNIX compatibility.

**Note:** The Active Directory service is configured as part of CIFS protocol configuration.

You can configure and manage the following services:

- Network Information Service (NIS)  
You can configure NIS domains on a Vserver to provide network information and authentication for the data access and management requests.
- Domain Name Service  
You can configure DNS servers on a Vserver for host-name resolution.
- LDAP Services  
You can configure LDAP services on a Vserver to provide network information and authentication for the data access and management requests.
- Local UNIX users  
You can set up UNIX user accounts on a Vserver to provide an authentication mechanism for NFS access.
- Local UNIX groups  
You can set up local UNIX groups on a Vserver along with local UNIX users.
- Local user and groups for Windows  
You can enable or disable local Windows users and groups for SMB access on a Vserver.
- Netgroups  
You can import UNIX netgroups from an FTP or HTTP site that is used by a Vserver.

For more information about configuring services, see the *Clustered Data ONTAP File Access and Protocols Management Guide* and *Clustered Data ONTAP Network Management Guide*.

### Related information

[Documentation on the NetApp Support Site: support.netapp.com](http://support.netapp.com)

## Commands for configuring services

A Vserver administrator can identify the list of commands for configuring the services on a Vserver by navigating to the respective command directory.

To identify the list of commands available to configure services, you must navigate to the services directory under vservers subdirectory.

### Example

The following example shows how to identify the services commands:

```
vs1.example.com::vservers services> ?
dns>                Manage DNS service
ldap>               Manage LDAP configuration
ndmp>               Manage vservers scoped NDMP
netgroup>           Manage local netgroups
nis-domain>         Manage Network Information Service domains
unix-group>         Manage local UNIX group accounts
unix-user>          Manage local UNIX user accounts
```

## Storage management

A Vserver represents the logical layer of data storage. A Vserver can either contain one or more FlexVol volumes or a single Infinite Volume. The storage space available in a Vserver is scalable, thus enabling Vserver administrators to provision and manage storage in a Vserver.

A Vserver with FlexVol volumes can also have quotas and qtrees. A Vserver with Infinite volume cannot have quotas and qtrees. Therefore, you cannot perform the quotas and qtrees related tasks on a Vserver with Infinite Volume.

Depending on your capabilities, you can perform the following tasks to manage volumes on a Vserver:

- Creating, modifying, renaming, or deleting volumes

You can view the list of aggregates that are available to create volumes by using the `volume create` command with the `aggregate` option. The number of volumes you can create on the Vserver is defined by the cluster administrator.

**Note:** It is best not to store user data in the root volume of a Vserver. Root volume of a Vserver should be used for junction paths and user data should be stored in non root volumes of a Vserver.

- Mounting or unmounting volumes
- Removing junctions from volumes
- Viewing volume status
- Creating quotas, qtrees, and files

**Note:** You cannot copy or move volumes between aggregates.

Depending on your capabilities, you can manage volume qtrees and volume quotas by performing the following tasks:

- Creating, modifying, renaming, or deleting qtrees
- Viewing qtree status and statistics
- Creating, modifying, renaming, or deleting quota policy and policy rules
- Viewing quota policy and policy rules

For more information about managing storage on a Vserver, see the *Clustered Data ONTAP Logical Storage Management Guide*.

### Related information

[Documentation on the NetApp Support Site: support.netapp.com](http://support.netapp.com)

## Commands for managing storage

A Vserver administrator can identify the list of commands for managing storage on a Vserver by navigating to the respective command directory.

To identify the list of commands available to manage storage, you must navigate to the volume directory.

### Example

The following example shows how to identify the storage commands:

```
vs1.example.com::volume> ?
autosize                Set/Display the autosize settings of the
                        flexible volume.
clone>                  Manage FlexClones
create                  Create a new volume
delete                  Delete an existing volume
file>                   File related commands
...
...
...
show-space              Display a list of volumes and their space usage
show-space-old          Display a list of volumes and their space usage
size                    Set/Display the size of flexible volume.
snapshot>              Manage snapshots
unmount                 Unmount a volume
```

## LUN management

In a SAN environment, a Vserver administrator can provision storage by creating LUNs, igroups, and mapping the LUNs to the igroups. After creating LUNs, Vserver administrator can manage their availability, mapping, and accessibility.

**Note:** A Vserver with Infinite Volume cannot have LUNs. Therefore, you cannot perform LUN related tasks on a Vserver with Infinite Volume.

Depending on your capabilities, you can perform the following tasks to manage LUNs:

- Creating, modifying, renaming, or deleting LUNs
- Modifying LUN size
- Managing igroups and port sets
- Mapping LUNs to the initiators
- Unmapping LUNs
- Viewing list of LUNs

For more information about managing LUNs, see the *Clustered Data ONTAP SAN Administration Guide*.

### Related information

[Documentation on the NetApp Support Site: support.netapp.com](http://support.netapp.com)

## Commands for managing LUNs

A Vserver administrator can identify the list of commands for managing LUNs on your Vserver by navigating to the respective command directory.

To identify the list of commands available to manage storage, you must navigate to the lun directory.

### Example

The following example shows how to identify the lun commands:

```
vs1.example.com::lun> ?
create          Create a new LUN
delete         Delete the LUN
igroup>       Manage initiator groups
map           Map LUN to all the initiators in the group
mapped>       The mapped directory
maxsize       Display the maximum possible size of a LUN on a
              given volume or qtree.
modify        Modify a LUN
move          Move (rename) a LUN
portset>     Manage portsets
resize        Changes the size of the LUN to the input value
              size.
```

|       |  |
|-------|--|
| show  | Display a list of LUNs                 |
| unmap | Remove a previously configured mapping |

## Backup management

A Vserver administrator can back up Vserver's data volumes by using Snapshot copy and NDMP technology. A Vserver administrator can also set up SnapMirror relationship between volumes of the peered Vservers to protect data volumes of a Vserver.

Starting with clustered Data ONTAP 8.2, you can perform tape backup and restore operations for your Vserver's data by using NDMP and set up SnapMirror relationships between volumes of the peered Vservers. You can create and manage data protection (DP), vault (XDP), and transition (TDP) relationships. You cannot create or manage load-sharing relationship (LS) SnapMirror relationships.

**Note:** Infinite Volumes do not support NDMP, vault relationships (XDP), transition relationships (TDP), and load-sharing relationships (LS).

For more information about the SnapMirror relationship types, see the *Clustered Data ONTAP Data Protection Guide*.

## Snapshot copy management

A Vserver uses Snapshot copy technology to back up its data volumes. The Snapshot copies of the volumes reside within the Vserver. A Vserver administrator can manage the Snapshot copies and restore files from the Snapshot copies if data is corrupted.

Depending on your capabilities, you can perform the following tasks to manage Snapshot copies of FlexVol volumes of a Vserver:

- Creating, modifying, renaming, or deleting Snapshot copies
- Managing Snapshot policies
- Computing reclaimable space for Snapshot copies
- Viewing the list of Snapshot copies
- Restoring files from Snapshot copies

Depending on your capabilities, you can perform the following tasks to manage Snapshot copies of Infinite Volumes of a Vserver:

- Creating or deleting Snapshot copies
- Managing Snapshot policies
- Viewing the list of Snapshot copies
- Restoring Snapshot copies

For more information about managing Snapshot copies, see the *Clustered Data ONTAP Data Protection Guide*.

### Related information

[Documentation on the NetApp Support Site: support.netapp.com](http://support.netapp.com)

## SnapMirror management

A Vserver administrator can create and manage SnapMirror relationships with types data protection (DP), vault (XDP), and transition (TDP) between volumes of the peered Vservers to replicate data of the primary Vserver. A Vserver administrator cannot create or manage load-sharing relationship (LS) SnapMirror relationships.

Depending on your capabilities, you can perform the following tasks to manage SnapMirror relationships of a Vserver:

- Creating, modifying, or deleting SnapMirror relationships
- Initializing baseline transfer
- Displaying a list of destinations and SnapMirror relationships
- Managing SnapMirror policies
- Aborting, resuming, and disabling transfer of data
- Starting an incremental transfer of data
- Breaking the SnapMirror relationship to make the destination writable

For more information about SnapMirror operations, see the *Clustered Data ONTAP Data Protection Guide*.

### Related information

[Documentation on the NetApp Support Site: support.netapp.com](http://support.netapp.com)

## NDMP management

A Vserver administrator can perform NDMP operations such as creating and managing NDMP sessions to back up Vserver with FlexVol volume's data and restore the data whenever needed. Vservers with Infinite Volumes do not support NDMP.

Depending on your capabilities, you can perform the following tasks to manage NDMP sessions of a Vserver:

- Enabling and disabling NDMP service
- Terminating the NDMP sessions
- Modifying NDMP properties
- Displaying list of NDMP sessions, properties, and NDMP version

For more information about the NDMP operations, see the *Clustered Data ONTAP Data Protection Tape Backup and Recovery Guide*.

### Related information

[Documentation on the NetApp Support Site: support.netapp.com](http://support.netapp.com)

## Commands for managing backup

A Vserver administrator can identify the list of commands for managing backups on a Vserver by navigating to the respective command directory.

To identify the list of commands available for:

- Managing Snapshot copies, you must navigate to the snapshot directory under volume directory.
- Managing SnapMirror relationships, you must navigate to the SnapMirror directory.
- Managing NDMP, you must navigate to the ndmp directory under Vserver services directory.

### Example

The following example illustrates how to identify the backup commands:

```
vs1.example.com::volume snapshot> ?
autodelete>          Manage snapshot autodelete settings
create               Create a snapshot
delete               Delete a snapshot
modify               Modify snapshot attributes
partial-restore-file Restore part of a file from a snapshot
policy>              Manage snapshot policies
rename               Rename a snapshot
restore-file          Restore a file from a snapshot
show                 Display a list of snapshots

vs1.example.com::snapmirror> ?
abort                Abort an active transfer
break                Make SnapMirror destination writable
create               Create a new SnapMirror relationship
...
...
update               Start an incremental transfer

vs1.example.com::vserver services ndmp> ?
generate-password    Display NDMP password for a user
kill                  Kill the specified NDMP session
...
...
version              Display default NDMP version
```

## Policy Management

A Vserver administrator can create and manage a collection of rules called policies to manage the data access from a Vserver. Depending on the capabilities assigned to you, you can create policies such as SnapMirror policy and Snapshot policy.

You can manage the following policies of a Vserver:

- Export policies
- File policies
- Quota policies
- SnapMirror policies
- Snapshot copy policies
- Data policies

Each Vserver with Infinite Volume has one data policy. When an Infinite Volume contains two or more storage classes, you can use a data policy and its rules to automatically filter incoming data into different storage classes.

Depending on your capabilities, you can perform the following tasks to manage policies of a Vserver:

- Creating, renaming, copying, displaying, or deleting export policies  
For more information about export policies, see the *Clustered Data ONTAP File Access and Protocols Management Guide*.
- Creating, modifying, displaying, or deleting file policies  
For more information about file policies, see the *Clustered Data ONTAP File Access and Protocols Management Guide*.  
**Note:** Vservers with Infinite Volume do not support file policies.
- Creating, renaming, copying, displaying, or deleting quota policies  
For more information about quota policies, see the *Clustered Data ONTAP Logical Storage Management Guide*.  
**Note:** Vservers with Infinite Volume do not support quota policies.
- Creating, renaming, copying, displaying, or deleting SnapMirror policies and rules  
For more information about SnapMirror policies, see the *Clustered Data ONTAP Data Protection Guide*.
- Creating, renaming, copying, displaying, or deleting Snapshot copy policies and schedules  
For more information about Snapshot copy policies, see the *Clustered Data ONTAP Data Protection Guide*.
- Exporting, importing, and validating data policies in JSON format for Vservers with Infinite Volume.  
For more information about data policies, see the *Clustered Data ONTAP Logical Storage Management Guide*.

**Related information**

*[Documentation on the NetApp Support Site: support.netapp.com](http://support.netapp.com)*

**Commands for managing policies**

A Vserver administrator can identify the list of commands for managing policies on a Vserver by navigating to the respective command directory.

To identify the list of commands available to manage policies, you must navigate to the parent directory of the type of policy. For example, if you want to know about SnapMirror policy, you must navigate to the snapmirror policy directory.

**Example**

The following example shows how to identify the SnapMirror policy commands:

```
vs1.example.com::snapmirror policy> ?
add-rule          Add a new rule to SnapMirror policy
create           Create a new SnapMirror policy
delete           Delete a SnapMirror policy
modify           Modify a SnapMirror policy
modify-rule      Modify an existing rule in SnapMirror
                 policy
remove-rule       Remove a rule from SnapMirror policy
show            Show SnapMirror policies
```

## Glossary

---

|                                    |   |
|------------------------------------|---|
| <b>administrator</b>               | The account that has the required permission to administer aNetApp storage system.  |
| <b>aggregate</b>                   | A manageable unit of RAID-protected storage, consisting of one or two plexes, that can contain one traditional volume or multiple FlexVol volumes.  |
| <b>CIFS</b>                        | See <i>Common Internet File System (CIFS)</i> .   |
| <b>CIFS share</b>                  | <ul style="list-style-type: none"> <li>In Data ONTAP, a directory or directory structure that has been made available to network users and can be mapped to a drive letter on a CIFS client. Also known simply as a <i>share</i>.</li> <li>In OnCommand Insight (formerly SANscreen suite), a service exposed from a NAS device to provide file-based storage through the CIFS protocol. CIFS is mostly used for Microsoft Windows clients, but many other operating systems can access CIFS shares as well.</li> </ul> |
| <b>client</b>                      | A workstation or PC in a client-server architecture; that is, a computer system or process that requests services from and accepts the responses of another computer system or process.   |
| <b>cluster Vserver</b>             | Previous name for a <i>data Vserver</i> . See <i>data Vserver</i> .   |
| <b>credential</b>                  | The configuration of a user account name and password that provide administrative privileges on the storage system.   |
| <b>domain name server (DNS)</b>    | In OnCommand Insight (formerly SANscreen suite), a resource that resolves domain names to their equivalent IP addresses so that IP traffic can be transported to the correct destination. Each domain name is associated with, at a minimum, a primary and a secondary DNS.   |
| <b>FC (Fibre Channel Protocol)</b> | An interface protocol for SCSI transport when mapping block-oriented storage data over Fibre Channel networks.  |
| <b>FlexVol volume</b>              | A logical entity contained in a Vserver—referred to as <i>Vserver with FlexVol volumes</i> . FlexVol volumes typically hold user data, although they also serve as node or Vserver root volumes and metadata containers. A FlexVol volume obtains its storage from a single aggregate.  |
| <b>igroup</b>                      | initiator group. A collection of unique identifiers, either FC WWPNs (World Wide Port Names) in a SCSI network or iSCSI node names of initiators (hosts) in an IP network, that are given access to LUNs when they are mapped to those LUNs.  |

|   |  |
|---|--|
| <b>initiator</b>                                    | The system component that originates an I/O command over an I/O bus or network. The target is the component that receives this command.  |
| <b>Infinite Volume</b>                              | A logical entity contained in a Vserver—referred to as <i>Vserver with Infinite Volume</i> —that holds user data. An Infinite Volume obtains its storage from multiple aggregates.   |
| <b>iSCSI</b>  | Internet Small Computer Systems Interface (iSCSI) protocol. A licensed service on the storage system that enables you to export LUNs to hosts using the SCSI protocol over TCP/IP.   |
| <b>LIF</b>  | logical interface. Formerly known as <i>VIF</i> (virtual interface) in Data ONTAP GX. A logical network interface, representing a network access point to a node. LIFs currently correspond to IP addresses, but could be implemented by any interconnect. A LIF is generally bound to a physical network port; that is, an Ethernet port. LIFs can fail over to other physical ports (potentially on other nodes) based on policies interpreted by the LIF manager. |
| <b>Lightweight Directory Access Protocol (LDAP)</b> | A client-server protocol for accessing a directory service. NetCache can be configured to point to an LDAP server for authentication of user requests; later versions of Data ONTAP can use Microsoft Active Directory, which uses LDAP.   |
| <b>LUN (Logical Unit Number)</b>                    | The identifier of an FC or iSCSI logical unit. A logical unit typically corresponds to a storage volume and is represented within a computer operating system as a device.   |
| <b>move (v)</b>                                     | To physically move data and any needed associated configuration of an object from one aggregate to another within a cluster, including within a single node.   |
| <b>namespace</b>                                    | In network-attached storage (NAS) cluster environments, an abstraction layer for data location that provides a single access point for all data in the system. It enables users to access data without specifying the physical location of the data, and enables administrators to manage distributed data storage as a single file system. Sometimes referred to as <i>global namespace</i> .   |
| <b>Network File System (NFS) export</b>             | A service exposed from a NAS device to provide file-based storage through the NFS protocol. NFS is mostly used for UNIX-like operating systems, but other operating systems can access NFS exports as well.  |
| <b>policies</b>                                     | The collection of management options, controls, and specifications for directing the automated management of data.   |
| <b>qtree</b>  | A special subdirectory of the root of a volume that acts as a virtual subvolume with special attributes.   |
| <b>root volume</b>                                  | A special traditional volume or FlexVol volume on each V-Series system. The root volume contains system files and configuration information, and can also contain data. It is required for the system to be able to boot and to function   |

properly. Core dump files, which are important for troubleshooting, are written to the root volume if there is enough space.

|                                    |  |
|------------------------------------|--|
| <b>SAN host</b>                    | Any storage area network (SAN) device, such as a UNIX or Windows system, that sends requests to other SAN devices in a SAN to perform tasks. To be monitored through Operations Manager console on the DataFabric Manager server, a SAN host must be running the NetApp Host Agent software.   |
| <b>Snapshot copy</b>               | An online, read-only copy of an entire file system that protects against accidental deletions or modifications of files without duplicating file contents. Snapshot copies enable users to restore files and to back up the storage system to tape while the storage system is in use.   |
| <b>throughput</b>                  | The rate at which data is transferred to or from the storage device, measured in megabytes per second (MBps).  |
| <b>Vserver</b>                     | In clustered Data ONTAP, a virtual storage server that provides network access through unique network addresses, that might serve data out of a distinct namespace, and that is separately administrable from the rest of the cluster. There are three types of Vservers— <i>admin</i> , <i>node</i> , and <i>cluster</i> (“cluster Vserver” is called “data Vserver” in Data ONTAP 8.2 and later)—but unless there is a specific need to identify the type of Vserver, Vserver usually refers to the cluster/data Vserver.  |
| <b>volume</b>                      | <ul style="list-style-type: none"> <li>• For Data ONTAP, a logical entity that holds user data that is accessible through one or more of the supported access protocols, including Network File System (NFS), Common Internet File System (CIFS), Fibre Channel (FC), and Internet SCSI (iSCSI). V-Series treats an IBM volume as a disk.</li> <li>• For IBM, the area on the storage array that is available for a V-Series system or non V-Series host to read data from or write data to. The V-Series documentation uses the term <i>array LUN</i> to describe this area.</li> </ul> |
| <b>WWPN (World Wide Port Name)</b> | A unique identifier assigned to a port on a Fibre Channel device. Ports on some storage arrays, for example, Hitachi storage arrays, have a unique WWPN.   |

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# Index

- A**
- accessing
    - Data ONTAP man pages [16](#)
  - admin
    - use of administrative privilege levels [12](#)
  - administrative privileges
    - use of levels [12](#)
  - administrators
    - differences between cluster and Vserver [8](#)
  - advanced
    - use of administrative privilege levels [12](#)
  - authentication
    - providing mutual, for Vservers [25](#)
    - ways to manage digital certificates for [22](#)
- C**
- CA-signed digital certificates
    - generating and installing for server authentication [23](#)
  - certificates
    - commands for managing digital [28](#)
    - generating and installing CA-signed digital for server authentication [23](#)
    - installing intermediate [25](#)
    - ways to manage digital, for authentication [22](#)
  - CLI
    - keyboard shortcuts [11](#)
    - methods of navigating command directories [9](#)
    - overview of using Data ONTAP [9](#)
    - rules for specifying values [10](#)
    - setting display preferences in [13](#)
    - setting privilege levels [12](#)
  - clusters
    - administrators, definition [8](#)
  - command directories
    - methods of navigating CLI [9](#)
  - command-line interface
    - See* CLI
  - commands
    - for managing job schedules [34](#)
    - for managing jobs [33](#)
    - for managing public keys [21](#)
    - for managing SSL [29](#)
    - methods of customizing show output by using fields [15](#)
    - methods of viewing history and reissuing [10](#)
  - configuring
    - protocols
      - CIFS [44](#)
      - FC [44](#)
      - iSCSI [44](#)
      - NFS [44](#)
  - counters
    - what they are [35](#)
- D**
- dashboards
    - commands for managing [43](#)
  - data
    - commands for viewing [39](#)
  - Data ONTAP
    - accessing man pages [16](#)
    - overview of using the CLI [9](#)
  - diagnostic
    - use of administrative privilege levels [12](#)
  - digital certificates
    - commands for managing [28](#)
    - generating and installing CA-signed for server authentication [23](#)
    - installing intermediate [25](#)
    - ways to manage for server or client authentication [22](#)
  - directories
    - methods of navigating CLI command [9](#)
  - display preferences
    - setting in CLI [13](#)
- E**
- extended queries
    - methods of using [15](#)
- F**
- fields
    - methods of customizing show command output by using [15](#)

**H**

- health monitoring
  - commands for managing dashboards [43](#)
- history of commands
  - methods of viewing [10](#)

**I**

- instances
  - what they are [35](#)
- interfaces
  - overview of using Data ONTAP command line [9](#)

**J**

- job schedules
  - commands for managing [34](#)
- jobs
  - commands for managing [33](#)
  - managing schedules for [33](#)
  - viewing information about [33](#)

**K**

- keys
  - ways to manage public [21](#)

**L**

- levels
  - use of administrative privilege [12](#)
- LUNs
  - managing [50](#)

**M**

- man pages
  - accessing Data ONTAP [16](#)
- managing
  - qtree [48](#)
  - quotas [48](#)
  - volumes [48](#)
- monitoring
  - commands for managing dashboards [43](#)
  - Vserver health [43](#)
- mutual authentication
  - providing for Vservers [25](#)

**O**

- objects
  - what they are [35](#)
- operators
  - methods of using query [14](#)
- output
  - methods of customizing show command by using fields [15](#)

**P**

- performance
  - data
    - decisions before you view [36](#)
    - viewing continuously [38](#)
    - viewing for a time period [37](#)
    - what objects, instances, and counters are [35](#)
    - monitoring [35](#)
- preferences
  - setting display in CLI [13](#)
- privilege levels
  - setting in CLI [12](#)
  - use of administrative [12](#)
- prompts
  - overview of Data ONTAP command [9](#)
- public keys
  - commands for managing [21](#)
  - ways to manage [21](#)

**Q**

- queries
  - methods of using extended [15](#)
- query operators
  - methods of using [14](#)

**R**

- reissuing commands
  - methods of [10](#)

**S**

- schedules
  - commands for managing job [34](#)
  - managing jobs and [33](#)
- Secure Sockets Layer
  - See* SSL

- server authentication
  - generating and installing a CA-signed digital certificate for [23](#)
- show command output
  - methods of customizing by using fields [15](#)
- SSL
  - commands for managing [29](#)
  - managing [29](#)
- statistics
  - See* performance

## T

- two-way authentication
  - See* mutual authentication

## V

- values
  - rules for specifying in CLI [10](#)
- virtual storage servers
  - See* Vservers
- Vserver
  - access methods [17](#)
- Vserver access
  - changing password [20](#)
- Vserver administration
  - overview of [6](#)
- Vserver backup
  - commands for managing [53](#)
- Vserver peer relationship
  - displaying [41](#)
- Vserver policies
  - commands for managing [55](#)
- Vserver user account
  - authentication methods [17](#)
- Vserver with FlexVol volume
  - about [6](#)
- Vserver with Infinite Volume

- about [6](#)
- Vservers
  - about [6](#)
  - administration capabilities [30](#)
  - administrators, definition [8](#)
  - benefits [7](#)
  - data security [46](#)
  - displaying APIs [32](#)
  - displaying information about [40](#)
  - DNS
    - configuration [47](#)
  - file security commands [46](#)
  - identifying the commands [31](#)
  - LDAP
    - configuration [47](#)
  - local UNIX groups
    - configuration [47](#)
  - logging in [18](#)
  - LUN commands [50](#)
  - managing authentication [20](#)
  - managing backups [51](#)
  - managing NDMP [52](#)
  - managing policies [54](#)
  - managing SnapMirror [52](#)
  - managing Snapshot copies [51](#)
  - NIS
    - configuration [47](#)
    - performance [35](#)
    - providing mutual authentication for [25](#)
    - services commands [48](#)
    - services configuration [47](#)
    - storage commands [49](#)
    - viewing network configuration [42](#)
    - viewing protocol commands [45](#)
- Vservers user accounts
  - access methods [17](#)