



Using Network Attached Storage with VOB Server and View Server Hosts

ABSTRACT: ClearCase users can now put all VOB and view storage, including the VOB and view databases, on Network Attached Storage devices from selected manufacturers. This document describes procedures for creating and managing VOBs and views that have their storage wholly or partly on such devices.

NOTE: No ClearCase LT server, whether running UNIX or Windows NT, can use a NAS device to hold VOB or view storage

1 An Overview of Network Attached Storage

Network-attached storage (NAS) is a term used to describe one or more shared storage devices that communicate with other hosts on the local area network using a network file system protocol like the Network File System (NFS) or the Common Internet File System (CIFS). Unlike Storage Area Networks (SANs), which are separate networks dedicated to providing on-line and near-line storage, NAS devices are optimized to be part of a local area network and support storage access requests from other hosts on the LAN that are essentially the same types of requests that these hosts would make of their own local storage devices. NAS devices have their own operating systems and provide a highly integrated hardware/software environment dedicated to servicing network file system requests with the lowest possible latency.

2 NAS and ClearCase

NAS devices have long been supported to provide storage for ordinary files—for example, VOB storage pools, view-private files and directories, snapshot view directories, and networkwide release areas—that are created and used by ClearCase. Until now, however, Rational has not been able to support configurations that host a VOB or view database on a NAS device. VOB and view databases have unique requirements that, in the past, could only be met by having the database reside on the same host as the VOB- or view-server that managed it. Recent advances in NAS device hardware and software have made it possible to lift this restriction and allow ClearCase users to place UNIX VOB and view storage—including the databases—on properly configured NAS devices as long as a few simple procedures are followed.

Putting view and (especially) VOB storage on a NAS device can provide several advantages:

- ▶ **Enhanced scalability.** VOB storage can grow well beyond the physical limits typically imposed when a VOB is stored on a ClearCase server host.
- ▶ **Enhanced flexibility.** By separating the `vob_server` process from the VOB storage, VOB server hosts can be upgraded more easily
- ▶ **Simplified administration.** NAS devices often have enhanced backup and restore features that can simplify this process for ClearCase administrators. When you use the ClearCase 4.1 `mkstgloc` command to create ClearCase server storage location on NAS devices, VOB and view creation and administration can be further simplified.

CAUTION: Every NAS device must be configured to support ClearCase. Configuration requirements for each device are described in *Device-Specific Procedures* on page 12. If you do not configure your NAS device as described in this section, you will put all ClearCase data on the NAS device at risk.

ClearCase Patches Are Required

ClearCase 4.0 and 4.1 hosts must be patched before they can access VOBs or views stored on a NAS device. The following patches are required:

Table 1 ClearCase 4.0 and 4.1 Patches Required for NAS Support

ClearCase Release	Platform	Patch Required
ClearCase 4.1	UNIX	4.1-9 or later
ClearCase 4.1	Windows NT	4.1.NT-14 or later
ClearCase MultiSite 4.1	Windows NT	4.1.NT-3 or later
ClearCase 4.0	UNIX	4.0-19 or later
ClearCase MultiSite 4.0	UNIX	4.0-4 or later
ClearCase 4.0	Windows NT	4.0-20.NT or later
ClearCase MultiSite 4.0	Windows NT	4.0-4.NT or later

Supported Platforms and Protocols

Rational currently supports the following NAS devices for the uses described in this paper. Not all NAS devices can support VOB or view servers on Windows NT or Windows 2000.

Table 2 Supported NAS Devices

Vendor	Product	Software Versions	VOB or view server platforms supported
Auspex	4Front NS2000	NetOS 3.0.1	UNIX
EMC	Celerra File Server	2.2 (contact EMC Customer Service for ClearCase patch)	UNIX, Windows NT, Windows 2000
Network Appliance	Series 7xx Filer Series 8xx Filer	DataOnTAP OS V5.3.6 DataOnTAP OS V6.0.1	UNIX, Windows NT, Windows 2000

NOTE: Rational only supports use of the NFS protocol to connect a UNIX VOB server host with a VOB database on a NAS device. You must use the CIFS protocol to connect with NAS devices from Windows hosts. Use of NFS software to connect Windows hosts to NAS devices is not supported by Rational.

3 Configuring Network Access to the NAS Device

A NAS device used for UNIX VOB or view storage should be on a robust network, preferably on the same subnet as the ClearCase VOB or view server hosts that use it, but at most no more than one hop away. Network access to the NAS device can be configured as follows:

- UNIX VOB or view server hosts must mount the NAS device using an NFS hard mount (the default for most systems). If a soft mount is used, the VOB or view server will fail at startup and write an error message in its log file.
- Windows NT hosts must establish access to the NAS device with the **net use** command (or Map Network Drive in the Windows Explorer).

The examples in this paper assume that you have configured a NAS device on your local area network, and that it can be accessed by UNIX hosts at **/net/nasdevice** and by Windows hosts at **\\nasdevice**.

4 New and Changed Procedures

When a UNIX VOB or view has its database on a NAS device, the ClearCase server process that manages access to the VOB or view runs on a ClearCase host and accesses its storage over the network. This configuration, while fundamentally different from the configurations that Rational has supported in the past, requires only a few changes to the standard procedures that we recommend for creating and managing VOBs and views.

The following procedures are based on ones that are, for the most part, documented in *Administering ClearCase*. In this section, we assume that the reader is familiar with ClearCase administrative procedures described in that document.

Additional Options Are Required for Several Commands

When VOB or view storage is located on a NAS device, ClearCase needs additional information to create the storage and the tags that refer to it. Most of the procedural changes described in this paper are necessary because **cleartool** commands that deal with creating, registering, or tagging VOB or view storage—including **mkvob**, **mkview**, **register**, **mktag**, and **mkstgloc**—need to be invoked with the **-host**, **-hpath**, and **-gpath** options when the VOB or view has its storage on a NAS device.

Many of these commands will generate a warning that the storage pathname may not reside on the local host when run on a UNIX computer. On a ClearCase host patched to support creation of VOB and view storage on a NAS device, this is simply an informational message.

Creating a Storage Location on NAS

If you are running ClearCase 4.1, creating ClearCase server storage locations on a NAS device provides an easy way to start taking advantage of the device's storage capacity. This example uses the **cleartool mkstgloc** command to create a VOB storage location named **ccnasvobstg** in a UNIX region.

```
cleartool mkstgloc -vob -host ccvobsvr1
    -gpath /net/nasdevice/vobstg/nasvobstg
    -hpath /net/nasdevice/vobstg/nasvobstg
    ccnasvobstg /net/nasdevice/vobstg/nasvobstg
```

A similar example creates a storage location in a Windows region:

```
cleartool mkstgloc -vob -host ccvobsvr1
    -gpath \\nasdevice\vobstg\nasvobstg
    -hpath \\nasdevice\vobstg\nasvobstg
    ccnasvobstg \\nasdevice\vobstg\nasvobstg
```

Use **cleartool mkstgloc -view** with similar options to create a view storage location.

NOTE: You cannot use the ClearCase Server Storage Wizard to create a server storage location on a NAS device. You cannot use the ClearCase 4.0 **cleartool register -storage** command to create a server storage location on a NAS device.

Creating a VOB on NAS

We recommend creating one or more VOB storage locations on your NAS device and then using the **mkvob -stgloc** option to create new VOBs with storage on the NAS device. The following command would create a VOB with storage in the **ccnasvobstg** storage location created in the previous section.

```
cleartool mkvob -tag /vobs/nasvob -stgloc ccnasvobstg
```

You can also use the **mkvob** command to create a VOB that has all of its storage on a NAS device as long as you specify the host name, global path, host-local path, and VOB-storage pathname. For example, the following command would create a new VOB in a UNIX region with the VOB-tag **nasvob**. The VOB would be served by a **vob_server** process running on ClearCase host **ccvobsvr1** and would have all of its storage on NAS device mounted by **ccvobsvr1** at **/net/nasdevice**.

```
cleartool mkvob -tag /vobs/nasvob -host ccvobsvr1
-gpath /net/nasdevice/vobstg/nasvob.vbs
-hpath /net/nasdevice/vobstg/nasvob.vbs /net/nasdevice/vobstg/nasvob.vbs
```

NOTE: When you use **mkvob** on UNIX to create a VOB with storage on a NAS device, **mkvob** prints a warning that the storage pathname may not reside on the local host. On a ClearCase host patched to support creation of VOB and view storage on a NAS device, this is simply an informational message.

To create a similar VOB in a Windows region with a Windows NT VOB server host, the command would be:

```
cleartool mkvob -tag \nasvob -host ccvobsvr2
-gpath \\nasdevice\vobstg\nasvob.vbs
-hpath \\nasdevice\vobstg\nasvob.vbs \\nasdevice\vobstg\nasvob.vbs
```

Moving a VOB to NAS

All of the procedures for moving VOBs described in *Administering ClearCase* refer to the architecture of the VOB host. VOB database formats are architecture-dependent, and the database must be reformatted if the VOB is moved from a host of one architecture to a host of another architecture (for example, from Solaris to HP-UX).

When a VOB's database resides on a NAS device, the host architecture is determined by the architecture of the VOB server host, not the NAS device. You will only need to reformat a VOB database if you are changing the architecture of the server host. If you move a VOB from one NAS

device to another one—even if the device comes from a different manufacturer—you do not have to reformat the VOB database as long as the VOB server host architecture does not change.

Moving a VOB That Has No Remote Pools

To move a VOB that has no remote pools from a ClearCase host running UNIX to a NAS device, follow the procedures described in Chapter 14 of *Administering ClearCase* (Release 4.1 and later) for *Moving a VOB on Windows NT* or *Moving a VOB on UNIX (Same Architecture)* with the change noted here.

In **Step 10, Register the VOB at its new location**, you must use the **-host**, **-hpath**, and **-gpath** options to **cleartool register**. The example here has been modified to register the VOB **libpub** that has been moved to **/net/nasdevice/vobstg** and is served by the UNIX ClearCase host **ccvobsvr1**.

```
cleartool register -vob -host ccvobsvr1 -hpath /net/nasdevice/vobstg/libpub.vbs
                  -gpath /net/nasdevice/vobstg/libpub.vbs /net/nasdevice/vobstg/libpub.vbs
cleartool mktag -vob -public -tag /vobs/libpub -host ccvobsvr1
                  -hpath /net/nasdevice/vobstg/libpub.vbs -gpath /net/nasdevice/vobstg/libpub.vbs
                  /net/nasdevice/vobstg/libpub.vbs
Vob tag registry password: <enter password>
```

Consolidating Remote Pools

A VOB hosted on a UNIX platform can have one or more of its storage pools located on a remote UNIX host and accessed via a symbolic link. If you move a VOB with this configuration to a NAS device, you may want to consolidate the remote pools by replacing the symbolic links with local directories. As long as the remote pools are accessible to the VOB server host—see Step 1 of *Moving a VOB on UNIX (Same Architecture)*—you do not need to consolidate them, but doing so will simplify VOB backups and other administrative tasks.

If you want to consolidate pools, do it during the move procedure, while the VOB is locked and ClearCase is stopped. After you have moved the VOB to the NAS device (after you have completed Step 9 of *Moving a VOB on UNIX*), take the following steps to consolidate each remote pool:

1. While ClearCase is stopped and the VOB is locked, log in to the VOB server as the VOB owner or **root**.
2. Go to the VOB storage directory and determine the locations of all remote pools and the links that point to them. In this example, the UNIX **find(1)** command shows a single symbolic link to a remote pool.

```
# cd /net/nasdevice/vobstg/bigvob.vbs
# find . -type l -exec ls -l {} \;
lrwxrwxrwx  1 root          12 Dec 30  1999
d/ddft_2 ->/net/ccsvr5/pools/libpub/d/ddft_2
```

3. For each remote pool, replace the link with a local copy of the pool. You must preserve file and directory protection and ownership information during this operation. These two UNIX commands would remove the symbolic link **d/ddft_2**, then replace it with the contents of the link's target, **/net/ccsvr5/pools/libpub/d/ddft_2**. (Note that if the target had a different

terminal leaf, you would need to ensure that the contents were copied into a local directory named `ddft_2`.)

```
# rm d/ddft_2
# cd /net/ccsvr5/pools/libpub/d; tar -cf - ddft_2 |
  (cd /net/nasdevice/vobstg/bigvob.vbs; tar -xBpf-)
```

4. If the consolidated VOB has a tag in a Windows region, the tag will need to be modified to remove the split pool map. You can do this using the ClearCase Administration Console's **Registry > Regions** node. The Properties page for the VOB-tag has a Mount Options tab that allows you to edit the split pool map if you are logged in as a member of the clearcase group (or another group that has permission to change the tag registry). If you cannot use the ClearCase Administration Console, you will have to use `cleartool mktag -replace` to remove the VOB-tag and re-create it without a split pool map.
5. After the VOB move procedure is complete and ClearCase has been restarted, verify that the VOB has no remote pools by using the `lspool` command.

```
cleartool lspool -long -invob /vobs/libpub
```

The output of `lspool` should list no link targets.

6. After you have tested the VOB, you may delete the old remote pool storage.

NOTE: Check and modify your VOB backup procedures after you have consolidated remote pools. Be sure the newly-consolidated pools are backed up with the rest of the VOB, and that the old remote pools are no longer being backed up. If you restore backups of the VOB that were made before the pools were consolidated, the remote pools will be re-created, and the restored VOB will not be usable.

Backing Up a VOB on NAS

Any of the VOB backup procedures described in *Administering ClearCase* are applicable to a VOB that has its database on a NAS device. In addition, many NAS devices provide platform-specific features that allow you to back up the contents of a NAS volume to another NAS volume or similar local device. See *Device-Specific Procedures* on page 12 for information about NAS device backup tools.

With any VOB backup method, it is imperative that you:

- Lock the VOB before you back it up.
- Stop ClearCase on the VOB server host if your backup software cannot capture files that are open for writing.
- Use backup software that preserves the VOB storage directory's ownership and protection information.

Restoring a VOB From Backup With `vob_restore`

You cannot restore a VOB from backup using `vob_restore` if the VOB database is stored on a NAS device. Use the procedure describe in *Restoring a VOB From Backup Without `vob_restore`* to restore a VOB to a NAS device.

Restoring a VOB From Backup Without `vob_restore`

If you are restoring a VOB with storage on a NAS device without using `vob_restore`, you must supply the `-host`, `-hpath`, and `-gpath` options to the `cleartool register` and `mktag` commands in Step 9 of the procedure documented in section 12.5 of *Administering ClearCase*, Release 4.1 and later. If the `/vobst_aux` directory used in that example were on a NAS device, the `register` and `mktag` command options would be:

```
cleartool register -vob -host ccvobsvr1 -hpath /net/nasdevice/vobst_aux/flex.vbs
-gpath /net/nasdevice/vobst_aux/flex.vbs /net/nasdevice/vobst_aux/flex.vbs
cleartool mktag -vob -replace -host ccvobsvr1 -tag /vobs/flex
-hpath /net/nasdevice/vobst_aux/flex.vbs -gpath /net/nasdevice/vobst_aux/flex.vbs
/net/nasdevice/vobst_aux/flex.vbs
```

Creating a View on NAS

We recommend creating one or more view storage locations on your NAS device and then using them for newly-created views. See *Creating a Storage Location on NAS* for an example of the appropriate `mkstgloc` syntax. To make a server storage location for view storage, use the `-view` option to `mkstgloc`.

The following command would create a dynamic view with storage in a storage location named `ccviewstg`. It makes no difference whether the storage location is on a NAS device or not.

```
cleartool mkview -tag viewtag -stgloc ccnasviewstg
```

You can also use the `mkview` command with `-host`, `-hpath`, and `-gpath` options to create a snapshot or dynamic view that has all of its storage on a NAS device. The following example would create a new dynamic view on a UNIX host. The view would be served by a view server process running on the ClearCase host `ccviewsvr-ux` and would have all of its storage on a NAS device mounted by `ccviewsvr-ux` at `/net/nasdevice`.

```
cleartool mkview -tag nasview -host ccviewsvr-ux
-gpath /net/nasdevice/viewstg/nasview.vws -hpath /net/nasdevice/viewstg/nasview.vws
/net/nasdevice/viewstg/nasview.vws
```

NOTE: When you use `mkview` on UNIX to create a view with storage on a NAS device, `mkview` prints a warning that the storage pathname may not reside on the local host. On a ClearCase host patched to support creation of VOB and view storage on a NAS device, this is simply an informational message.

To create a similar dynamic view on Windows NT, served by a view server process running on ClearCase host `ccviewsvr-nt` but with all view storage on a NAS device at `\\nasdevice`, the command would be:

```
cleartool mkview -tag nasview -host ccviewsvr-nt -gpath \\nasdevice\viewstg\nasview.vws
-hpath \\nasdevice\viewstg\nasview.vws \\nasdevice\viewstg\nasview.vws
```

Moving a View to NAS

View databases, like VOB databases, have formats that are specific to the view server host architecture. As we discussed in *Moving a VOB to NAS*, the host architecture is determined by the architecture of the view server host, and you need not reformat a view you are moving to a NAS device unless you are also changing the architecture of the view server host.

Moving a Dynamic View

To move a dynamic view from a ClearCase host running UNIX to a NAS device, follow the procedures described in *Administering ClearCase* for moving the view to different location on the same host. As with many other examples in this paper, the only significant procedural change is the need to use the `-host`, `-hpath`, and `-gpath` options to the `cleartool register` and `mktag` commands when you register and tag the view at its new location.

The command line example in Step 8 of the *Moving a View on UNIX* procedure described in *Administering ClearCase* could be modified as shown here to move the view to storage on the NAS device mounted by host `ccviewsvr1` at `/net/nasdevice`:

```
cleartool register -view -host ccviewsvr1 -hpath /net/nasdevice/viewstg/sue.vws
-gpath /net/nasdevice/viewstg/sue.vws /net/nasdevice/viewstg/sue.vws
cleartool mktag -view -view -tag sue -host ccviewsvr1 -nstart
-hpath /net/nasdevice/viewstg/sue.vws -gpath /net/nasdevice/viewstg/sue.vws
/net/nasdevice/viewstg/sue.vws
```

The command line modifications for the *Moving a View on Windows NT* procedure would be similar.

NOTE: When you use the `register` or `mktag` commands on UNIX to register a view with storage on a NAS device, `cleartool` prints a warning that the storage pathname may not reside on the local host. On a ClearCase host patched to support creation of VOB and view storage on a NAS device, this is simply an informational message.

Moving a Snapshot View

To move a snapshot view that has its view storage directory and snapshot view directory co-located, follow the procedure described in *Administering ClearCase* for moving the view to different location on the same host.

Backing Up a View on NAS

Any of the view backup procedures described in *Administering ClearCase* are applicable to a view that has its view storage or view database on a NAS device. In addition, many NAS devices provide platform-specific features that allow you to back up the contents of a NAS volume to another NAS volume or another local device. See *Device-Specific Procedures* on page 12 for information about NAS device backup tools.

Replacing a VOB or View Server Host

When you locate your VOB or view storage on a NAS device, you can easily designate a different ClearCase host of the same architecture to run the VOB or view server processes that manage access to the VOB or view without actually moving the VOB or view storage. This procedure—replacing a VOB or view host without moving the associated storage—is a new one, which we describe for the first time in this paper.

Replacing a VOB Server Host

The following procedure would replace the UNIX VOB server host **ccvobsvr3** for a VOB tagged **/vobs/libpub** with a different host of the same architecture, **ccvobsvr1**. The procedure locks the VOB, removes the old tag and registration, and then creates a new registration and tag specifying the replacement host and the existing storage.

1. **Deactivate the VOB.** Issue this command on each host where the VOB is currently active:

```
cleartool umount /vobs/libpub
```

NOTE: It may not be practical to unmount the VOB from all hosts. In this case, the VOB lock to be applied in Step #3 ought to prevent unintended VOB access.

2. (If applicable) **Disable VOB snapshots on the current host.** If VOB database snapshots are enabled for the VOB, disable them with the command:

```
vob_snapshot_setup rmparm /vobs/libpub
```

3. **Lock the VOB.** Do this as the **root** user.

```
rlogin ccvobsvr3 -l root
Password: <enter root password>
# cleartool lock vob:/vobs/libpub
Locked versioned object base "/vobs/libpub".
```

4. **Remove the VOB-tag and unregister the VOB.**

```
# cleartool rmtag -vob -all /vobs/libpub
# cleartool unregister -vob /net/nasdevice/vobstg/libpub.vbs
```

5. **Terminate the VOB's server processes on the current host.** Search the process table for the `vob_server` and `vobrpc_server` processes that service the old VOB. Use `ps -ax` or `ps -ef` and search for `libpub.vbs`. Use `kill(1)` to terminate any such processes.
6. **Register the VOB and create a new VOB-tag.** You can use the ClearCase Administration Console or the following commands. (In this example, the VOB-tag is public, so the tag registry password is required.)

```
cleartool register -vob -host ccvobsvr1 -hpath /net/nasdevice/vobstg/libpub.vbs
-gpath /net/nasdevice/vobstg/libpub.vbs /net/nasdevice/vobstg/libpub.vbs
cleartool mktag -vob -replace -host ccvobsvr1 -tag /vobs/libpub
-hpath /net/nasdevice/vobstg/libpub.vbs -gpath /net/nasdevice/vobstg/libpub.vbs
/net/nasdevice/vobstg/libpub.vbs
Vob tag registry password: <enter password>
```

7. **Reactivate the VOB.** On all client hosts:

```
cleartool umount /vobs/libpub           (if not already done)
cleartool mount /vobs/libpub
```

8. **Unlock the VOB.**

```
# rlogin ccsvr04
Password: <enter root password>
# cleartool unlock vob:/vobs/libpub
Unlocked versioned object base "/vobs/libpub".
```

9. (If applicable) **Enable VOB snapshots on the new host.** If you want to enable VOB database snapshots on the new VOB host, do so with `vob_snapshot_setup modparam`, supplying the appropriate parameters.

Replacing a View Server Host

The process for replacing a view server host is similar. The following procedure replaces the UNIX view server host for dynamic view `V4.1_Int`. It stops the view, removes the old view-tag and registration (object), then creates a new registration and tag specifying the replacement host and the existing storage.

1. **Log into the view's server host.** Log in as the view's owner.
2. **Deactivate the view.** Use the `cleartool endview` command to stop the view and terminate the view's `view_server` process:

```
cleartool endview -server V4.1_Int
```
3. **Delete the existing view-tag.** You can use the ClearCase Administration Console or the following command.

```
cleartool rmtag -view V4.1_Int
```
4. **Create a new view object and tag** specifying a new view server host and the existing storage. You can use the ClearCase Administration Console or the following commands.

```
cleartool register -view -replace -host ccviewsvr1
-hpath /net/nasdevice/viewstg/v4.1_int.vws
-gpath /net/nasdevice/viewstg/v4.1_int.vws /net/nasdevice/viewstg/v4.1_int.vws
cleartool mktag -view -tag V4.1_Int -host ccviewsvr1
-gpath /net/nasdevice/viewstg/v4.1_int.vws
-hpath /net/nasdevice/viewstg/v4.1_int.vws /net/nasdevice/viewstg/v4.1_int.vws
```

5. Reactivate the view on the replacement view server host.

```
cleartool startview V4.1_Int
```

6. Update corresponding VOB databases. The view's old location is still recorded in the databases of all VOBs that the view accessed with **checkout** and/or **clearmake**. For each such VOB, update the view-location information by checking out one of the VOB's elements in that view. (You can cancel the checkout with **cleartool uncheckout** immediately if you want.)

Reformatting a VOB or View

Like other commands we've described in this paper, **cleartool reformatvob** and **reformatview** need the **-host**, **-hpath**, and **-gpath** options when dealing with storage on a NAS device. The following example performs the **-dump** part of a VOB reformat on the VOB **libpub** that is stored at **/net/nasdevice/vobstg** and served by the UNIX ClearCase host **ccvobsvr1**.

```
cleartool reformatvob -dump -host ccvobsvr1 -hpath /net/nasdevice/vobstg/libpub.vbs
-gpath /net/nasdevice/vobstg/libpub.vbs /net/nasdevice/vobstg/libpub.vbs
```

Similar command options would be required to load a dumped VOB database, or to dump or load a view database.

NOTE: When you run **reformatvob** or **reformatview** on UNIX to reformat a VOB or view with storage on a NAS device, the command prints a warning that the storage pathname may not reside on the local host. On a ClearCase host patched to support creation of VOB and view storage on a NAS device, this is simply an informational message.

5 Device-Specific Procedures

This section describes procedures for configuring and using various NAS devices with ClearCase. In this section, we assume that:

- you are familiar with the basic configuration and operation the NAS device you are using
- you have already installed the device on your network and verified that it can be used with applications other than ClearCase

We also assume that you have established the appropriate level of cross-platform interoperability for your site if both UNIX and Windows computers are in use as ClearCase hosts. All the requirements detailed in *Administering ClearCase* for user and group accounts on both UNIX and Windows must be met if you are using a NAS device to host ClearCase data that is accessed from UNIX and Windows computers. NAS devices often provide their own implementation of cross-platform file-access solutions such as NFS and CIFS (SMB), but these implementations usually require that any user who must access files on the NAS device can be authenticated using the same user name and group name regardless the type of platform (UNIX or Windows) they are using. If ClearCase users at your site use UNIX and Windows computers, verify that users can create and delete file and directories on the NAS device from both UNIX and Windows before proceeding with additional NAS device configuration steps.

Auspex NS2000

This section describes configuration procedures that you must perform before you can use an Auspex NS2000 NAS device for VOB or view storage as described in this paper. For additional information about the NS2000, see www.auspex.com.

Data stored on an Auspex NS2000 can be organized into virtual file systems and shares on virtual partitions and RAID sets. A RAID set may be “sliced” into independent file systems using virtual partitions. A RAID set must contain at least three data disks. We recommend a RAID set with at least six data disks for frequently accessed ClearCase data.

Configuring the Auspex NS2000 for ClearCase

These are the steps you must take to configure the Auspex NS2000 for use by ClearCase.

1. **Create a filesystem if necessary.** You may use an existing file system or create a new one specifically for use by ClearCase.
2. **Create partitions.** For ease of administration, we recommend using virtual partitions on the NS2000 to hold ClearCase data. The remaining steps in this section assume you are using a virtual partition named `/dev/axvp/fsp n vp x` where n is the number of the file system partition and x is the virtual partition number:
3. **Create a file system mountpoint.** Log in to the NS2000 as **root**. Run the following command to create a mountpoint for the virtual filesystem you created in Step #2:

```
mkdir /vobstg
```

4. **Mount the virtual file system.** Run the following command to mount the virtual file system you created in Step #2 at the mountpoint you created in Step #3:

```
mount -F lfs /dev/axvp/fsp $n$ vp $x$  /vobstg
```

To ensure that a virtual file system is mounted at boot time, create an entry for it in `/usr/AXbase/etc/lfstab`.

5. **Enable read/write access for the albd_server.** All volumes used for VOB or view storage must be configured with read/write (rw) access by the **albd_server** account.

6. **Make the file system accessible.** Volumes that will only be accessed by UNIX computers must be shared using the NetOS **share** command. Volumes that will only be accessed by Windows computers must be shared using the NetOS **net share** command. Volumes that must be accessed by both UNIX and Windows computers must be made accessible using both commands. The following command makes the file system mounted at **/vobstg** accessible to NFS clients:

```
share -F NFS /vobstg
```

7. **Disable oplocks.** Opportunistic locking (CIFS oplocks) is enabled by default on the NS2000. You must disable oplocks by setting the NS2000 registry key:

```
HKLM\SYSTEM\CurrentControlSet\Services\AdvancedServer
  \FileServiceParameters\UseOplocks
```

to a value of 0 using the NetOS **regconfig** command or the Windows NT **regedt32** command. To use **regedt32** to edit the registry on the NS2000, click

```
Registry>Select Computer
```

and type the name of the NS2000 in the Select Computer dialog box.

Using NS2000 Snapshot Backups

The Auspex NS2000 snapshot backup tool **ax_snapshot** allows you to quickly make a read-only copy of a virtual file system. We support use of **ax_snapshot** to make backups of all ClearCase data, including VOB data. The following command line creates a snapshot on cache partition **fsp1m0rd1s0** of a virtual partition mounted at **/vobstg**:

```
ax_snapshot ckpt /vobstg fsp1m0rd1s0
```

As with any VOB backup strategy, you must lock the VOB before backing it up. Because the snapshot backup copy can be made quickly, lock time required for the backup will be minimal.

A cached snapshot backup should also be backed up to hard media such as tape or CD, using backup software (for example, the Auspex utility **ax_gtar**) that will preserve all file system information, including ACLs if the file system is used to hold VOBs or views served by a VOB or view server on Windows NT or Windows 2000.

NOTE: To back up a cached snapshot, you must first mount it.

By default, NS2000 file-based backup does not back up files larger than 2GB. VOBs using schema version 54 may include some files larger than 2GB. To ensure that these files are included in hard-media (file-based) backups of a snapshot cache, edit the file **/usr/AXndmp/etc/config** on the NS2000 as follows:

1. Locate the following line:

```
#ALLOW_TAR_EXTENSION # auspex extension to support large files (>=2GB)
```

2. Remove the first comment delimiter (#) to enable this feature.

ALLOW_TAR_EXTENSION # auspex extension to support large files (>=2GB)

NOTE: When this option is enabled and a large file is encountered during file-based backup, Auspex's proprietary extension to standard GNU-tar format is used instead of the standard GNU-tar format. With this option on, you may not be able to use the standard GNU-tar command to recover data from file-based backups

EMC Celerra File Server

This section describes configuration procedures that you must perform before you can use an EMC Celerra File Server for VOB or view storage as described in this paper. For additional information about the Celerra File Server, see www.emc.com.

Configuring a Celerra File Server for ClearCase

These are the steps you must take to configure a Celerra File Server for use by ClearCase.

1. **Configure storage.** Create an appropriate network interface, metavolume, and file system for use by ClearCase.
2. **Create a mountpoint** for the filesystem you created in Step #1.
3. **Mount the file system.** Use the **-o nooplock** option to **server_mount** to disable CIFS oplocks. The default access checking policy for **server_mount** is **NATIVE**. We recommend that you use this default.
4. **Export the file system** as needed for UNIX (NFS) and/or Windows (CIFS) clients. The following commands export the file system **/ufssc1** on Data Mover **server_2** for NFS and CIFS access.

```
server_export server_2 /ufssc1
server_export server_2 -P cifs -n ufssc1 /ufssc1
```

NOTE: You must also configure and start CIFS services if you are exporting a file system for CIFS access.

Using Celerra TimeFinder and SnapSure Backups

The EMC Celerra TimeFinder facility creates a mirrored copy of a file system on the Celerra device. The SnapSure facility creates a read-only copy of a Celerra file system on another volume on the device. We support use of either facility to make backups of all ClearCase data, including VOB data.

As with any VOB backup strategy, you must lock the VOB before backing it up. Because these copies can be made quickly, lock time required for the backup will be minimal.

Network Appliance Filer

This section describes configuration procedures that you must perform before you can use a Network Appliance Filer for VOB or view storage as described in this paper. For additional information about Network Appliance Filers, see www.netapp.com.

Data on a Network Appliance filer is organized in volumes. A volume is an independent file system with its own RAID group(s). Every RAID group must contain at least two disks (the default is 8). We recommend creating volumes with at least four data disks if they contain frequently accessed ClearCase data. Smaller volumes may be adequate for storage pools containing infrequently accessed or read-only data.

In addition to creating volumes to hold ClearCase data on a Network Appliance Filer, you must also create qtrees to manage access control for the files and directories in these volumes, and you must use the appropriate commands to make these volumes accessible to UNIX and/or Windows clients.

Configuring a Network Appliance Filer for ClearCase

These are the steps you must take to configure a Network Appliance Filer for use by ClearCase.

1. **Create volumes.** Create one or more volumes on the Filer for use by ClearCase. You must use the **nvfail on** option to the Data ONTAP **vol** command. The following commands create a volume named **ccvol** that uses 10 disks.

```
vol create ccvol 10
vol options ccvol nvfail on
```

NOTE: Network Appliance Filers provide a specialized snapshot backup facility (not related to the ClearCase snapshot backup program), which is managed at the volume level. Keep backup considerations in mind when allocating volumes to hold VOB data or other ClearCase data. It will simplify implementation of Network Appliance snapshot VOB backups if you dedicate one or more volumes exclusively to VOB storage.

2. **Disable quotas on volumes to be used for VOB storage.** If quotas are enabled, we recommend disabling them on volumes used for VOB storage. The following Data ONTAP command reports on whether the volume **ccvol** has quotas enabled:

```
quota report ccvol
```

The following Data ONTAP command disables quotas on the volume **ccvol**.

```
quota off ccvol
```

3. **Make the volume(s) accessible.** Volumes that will only be accessed by UNIX computers must be exported using the Data ONTAP **exportfs** command. Volumes that will only be accessed by Windows computers must be shared using the Data ONTAP **cifs_shares** command. Volumes that must be accessed by both UNIX and Windows computers must be exported and shared.

4. **Enable read/write access for the albd_server.** All volumes used for VOB or view storage must be configured with read/write (rw) access by the **albd_server** account.
5. **Create qtrees.** A qtree is a special subdirectory of the root directory of a volume. The following Data ONTAP command creates a qtree named **vobstg** in a volume named **ccvol**.

```
qtree create /vol/ccvol/vobstg
```

6. **Specify each qtree's security style.** The Data ONTAP **qtree** command allows you to specify the type of access checking (security style) that will be used when determining whether a user has rights to access a file or directory. You can specify any of three security styles:
 - > **unix** evaluates user access rights by considering the UID and GID of the user and the access mode of the file or directory
 - > **ntfs** evaluates user access rights by considering the SID of the user and the ACL of the file or directory
 - > **mixed** provides support for both security styles

The following Data ONTAP command specifies that the **unix** security style will be implemented in the qtree named **vobstg**

```
qtree security vobstg unix
```

NOTE: For any qtree used to provide VOB storage server by a VOB server running Windows NT or Windows 2000, you must set the qtree security style to **ntfs**.

7. **Disable oplocks.** Opportunistic locking (CIFS oplocks) is enabled by default when a qtree is created. The following Data ONTAP command disables oplocks on the qtree named **vobstg**:

```
qtree oplocks vobstg disable
```

Using Network Appliance Snapshot Backups

The Network Appliance snapshot backup facility creates a read-only copy of a volume on another volume on the Filer. We support use of this facility to make backups of all ClearCase data, including VOB data.

As with any VOB backup strategy, you must lock the VOB before backing it up. Because the snapshot backup copy can be made quickly, lock time required for the backup will be minimal.

