

SFA[®] OS

Background Verify Scans are MANDATORY on All Storage Pools

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Determination of Best Practice

Background Verifies Required

DDN has determined that, during normal operation, background verify scans **must** be enabled on **all** storage pools on **all** SFA storage arrays in **all** configurations and in **all** application environments, including test environments. This requirement applies to SSDs, high-RPM SAS, near-line SAS, and SATA drive pools without exception.

If background verifies are turned off briefly for diagnostic purposes at the direction of a DDN engineer, they must be resumed immediately thereafter.

When enabled, a background verify scan continuously scans the designated storage pools for medium errors, recovered errors, and inconsistencies between data and parity or error detection checksums

(when the DirectProtect DIF feature is enabled). Errors are automatically repaired in the background if sufficient redundancy exists in the pool. A user-configurable policy setting allows customers to manage the overhead imposed by the verification process and minimize its impact on performance.

ALERT! Background verify scans are **MANDATORY** on all pools on all SFA platforms. Failure to enable background verify scans can result in:

- Uncorrected medium errors
- Risk of data loss if a pool gets into a nonredundant state

Affected Products

All models of the S2A6620, SFA7700, SFA10K, SFA12K, and SFA14K storage arrays running any version of SFA OS are subject to this requirement.

Determining Current Verify Status

Background verifies are enabled at two levels: (1) globally for the storage subsystem as a whole; and (2) locally for each pool. Background verify status must be checked at both levels.

Determining Global Verify Status for the Subsystem

To determine whether the background verify feature is enabled globally for the SFA subsystem, log in to either controller using SSH and enter the following command at the command line:

```
show subsystem
```

The resulting output should show the **Verify Policy** value as **ENABLED**. For example:

```
*****
*      Subsystem      *
*****
Name          |Time                | Licences | Locate | Fast | Verify
              |                    |          | Dwell  | Time  | Policy | UUID
-----|-----|-----|-----|-----|-----|-----
L1_7700SFX    |Thu May 28 17:45:46 2015| R D X E | 0 seconds | OFF | ENABLED | ...
```

Determining Local Verify Status for Each Pool

Once the verify scan feature is enabled globally for the SFA storage array as a whole, the verify status of each storage pool must be checked individually. A given pool is protected by background verify scans only if both of the following conditions are met:

- **Verify scans are enabled** for that particular pool
- **Verify jobs** for that pool are running continuously and successfully

To determine whether verify scans are locally enabled for each storage pool, enter the following line command:

```
show pool
```

If verify scans are enabled correctly, the **Settings** and **Jobs** columns in the command output will *both* show a "v" entry for every pool on the SFA subsystem. For example:

```
*****
*       Pools       *
*****
```

Idx	Name	State	Chunk	Raid	Faults	Total cap GB	Free cap GB	Max VD GB	Settings	Jobs	Disk T/O	...
1	pool-1	NORMAL	128K	6		9040	0	0	DWMR IV	V	10	...
2	pool-2	NORMAL	128K	6		9040	0	0	DWMR IV	V	10	...
3	pool-3	NORMAL	128K	6		9040	0	0	DWMR IV	V	10	...
4	pool-4	NORMAL	128K	6		9040	0	0	DWMR IV	V	10	...
5	pool-5	NORMAL	128K	6		9040	0	0	DWMR IV	V	10	...

Total Storage Pools: 5

Then check the status of the verify jobs themselves. Enter the line command:

```
show job
```

In the **Background Jobs** section of the command output, ensure that all of the following are true:

- A verify job is running for every pool (see the job **Type**, **Target** and **State** columns)
- No error conditions for those jobs are shown in the **Status** column
- The **Fraction Complete** increments at least *daily*
- *100% completion* is seen in the **Fraction Complete** column for each pool as often as expected from the scan cycle time established by the verify policy number (shown in the **Priority** column here)

```
*****
*       Background Jobs       *
*****
```

Idx	Type	Target	(Sub)	State	Fraction Complete	Priority	Status	Time
0	VERIFY	POOL: 0	(NA)	RUNNING	29%	5%		NA
1	VERIFY	POOL: 1	(NA)	RUNNING	29%	5%		NA
2	VERIFY	POOL: 2	(NA)	RUNNING	29%	5%		NA
3	VERIFY	POOL: 3	(NA)	RUNNING	29%	5%		NA
4	VERIFY	POOL: 4	(NA)	RUNNING	92%	70%		NA

Total Background Jobs: 5

Enabling Background Verifies

Background verifies are enabled at two levels: (1) globally for the SFA subsystem as a whole; and (2) locally for each pool. Background verifies must be enabled at both levels.

Enabling Background Verifies Globally for the Subsystem

First, enable background verifies globally for the SFA subsystem with the line command:

```
set subsystem verify true
```

Enabling Background Verifies for Each Pool

Then, *for each pool* defined on the subsystem, enable verifies by setting the pool verify policy to an integer value **greater than zero**. The syntax for the line command that sets pool verify policy is:

```
set pool <pool-idx> verify_policy <policy-number>
```

where

<pool-idx> = index of the pool to be enabled

Wild card (*) enables all pools at once with the same verify policy.

<policy-number> = value from 1 - 99 (or 0 to disable)

Low values use fewer system resources but scans takes longer.

High values use many system resources but scans complete more quickly.

Policy number is sometimes referred to as “verify priority” in SFA reports.

(See [Verify Policy Numbers and Scan Completion Times](#) below for details.)

For example, to enable background verifies on pool 3 with a low-resource, long-duration verify policy number of 5, enter:

```
set pool 3 verify_policy 5
```

Since background verify scans are meant to run in the background with minimal impact to foreground I/O, a low verify policy number is advisable. A **verify policy number between 5 and 10** is suggested as a rule of thumb in the absence of specific data protection or performance goals. These values will verify an entire pool over the course of about 44.5 to 47 days, and will cycle through repeated verify scans of this duration with little impact to overall performance.

Requirements When Enabling Verifies After a Period of Disuse

If background verifies have been disabled on your DDN storage equipment, ***you may have experienced data corruption without knowing it.*** Consequently, it is strongly recommended that, when enabling background verifies for the first time after a period of verify disuse, you observe the following requirements.

Step 1. First run ***two full passes*** of ***force verifies*** on each pool with the command:

```
verify pool <pool-idx>  
force_consistency  
priority <policy-number>
```

where

`<pool-idx>` is the index of the pool to be enabled (wild card * not allowed).

`<policy-number>` takes the same values as in the `set pool` command.

`force_consistency` causes the verify job to immediately correct any errors it finds based on the current redundancy in the pool.

Running this command twice enables the *second* pass to take advantage of corrections made during the *first* pass to find more redundancies that can be used to recover data.

Step 2. If medium errors or uncorrected bad blocks remain after the second force verify job completes, contact DDN Support for assistance with data recovery.

Step 3. Once the second (or a subsequent) force verify job completes cleanly, with no medium errors or uncorrected bad blocks reported, enable background verifies on the pool.

Step 4. Repeat Step 1 through Step 3 on all pools which have not been running background verifies.

ALERT! *Do NOT update the SFA OS firmware* or major storage component firmware if background verifies have been suspended on any storage pool for any length of time. Perform the above procedure on all affected pools first before updating SFA firmware.

Verify Policy Numbers and Scan Completion Times

The verify policy number determines the duration of a scan cycle through a pool, with longer scan cycles taking fewer storage system resources at any given time. In this way the policy number regulates the performance impact of background verifies on foreground I/O. The verify policy number is related to resource consumption and scan cycle completion time as shown in the table.

Verify Policy Number (<i>n</i>)	Subsystem Resource Utilization	Scan Cycle Completion Time
0	Verify disabled, no resource impact	Not applicable
1 - 98	1% to 98% of maximum, minor to major I/O performance impact	$(99 - n) / 2$ days
99	Maximum, major I/O performance impact	< 0.5 day

For example, if the verify policy number *n* on a pool is set to 5, the time to complete one full verify scan of the pool is approximately $(99 - 5) / 2 = 47$ days. If the verify policy number on a pool is set to 10, the time to complete one full verify scan of the pool is approximately $(99 - 10) / 2 = 44.5$ days.

To complete each verify scan cycle in a desired number of days *d*, set the verify policy number *n* according to the formula:

$$n = 99 - (2 \times d)$$

For example, if you want to be sure a full verify scan is completed on a particular pool once every 30 days, choose a verify policy number equal to $99 - (2 \times 30) = 39$. But be prepared to take a corresponding performance hit to foreground I/O.

Refer to the *SFA OS User Guide* for more information about background verify scans.

Contacting DDN Technical Support

Please contact DDN Technical Support at any time if you have questions or require assistance. Support can be reached by phone, by email, or on the web as listed below.

Web

DDN Community Support Portal <https://community.ddn.com/login>
Support Portal Assistance webportal.support@ddn.com

Telephone

DDN Support Worldwide Directory <http://www.ddn.com/support/contact-support>

Email

Support Email support@ddn.com

Bulletins

Support Bulletins <http://www.ddn.com/support/technical-support-bulletins>
End-of-Life Notices <http://www.ddn.com/support/end-of-life-notices>
Bulletin Subscription Requests support-tsb@ddn.com