

**EMC Solutions Enabler
Symmetrix Double Checksum CLI**
Version 6.0

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As part of its effort to continuously improve and enhance the performance and capabilities of the EMC product line, EMC periodically releases new versions of both the EMC Enginuity Operating Environment and EMC Solutions Enabler. Therefore, some functions described in this guide may not be supported by all versions of Enginuity or Solutions Enabler currently in use. For the most up-to-date information on product features, see your product release notes.

If an EMC Solutions Enabler feature does not function properly or does not function as described in this guide, please contact the EMC Customer Support Center for assistance. If you are an EMC Development Partner, refer to the EMC Powerlink website.

Audience This manual provides both guide and reference information for command-line users and script programmers. The manual describes how to perform double checksum operations and execute certain control operations on your Oracle storage environment using the SYMCLI commands of the Solutions Enabler software.

Organization The following defines the structure of this manual:

Chapter 1, *Double Checksum Operations*, describes the concepts and identifies double checksum operations in an Oracle storage environment.

Note: Detailed manpage descriptions of all SYMCLI commands, environment variables, option file parameters, and error codes can now be found in the companion *EMC Solutions Enabler Symmetrix CLI Command Reference*.

Related Documentation

Other Symmetrix publications of related interest are:

- ◆ *EMC Solutions Enabler Symmetrix CLI Command Reference*
- ◆ *EMC Solutions Enabler Support Matrix*
- ◆ *EMC Solutions Enabler Installation Guide*
- ◆ *EMC Solutions Enabler Symmetrix Base Management CLI Product Guide*
- ◆ *EMC Solutions Enabler Symmetrix SRDF Family CLI Product Guide*
- ◆ *EMC Solutions Enabler Symmetrix TimeFinder Family CLI Product Guide*
- ◆ *EMC Solutions Enabler Symmetrix SRM CLI Product Guide*
- ◆ EMC host connectivity guides

Conventions Used in this Guide

The following conventions are used in this guide:

In this guide, every use of the word SYMCLI means EMC Solutions Enabler.

Note: A note calls attention to any item of information that may be of special importance to the reader.



CAUTION

A caution contains information essential to avoid damage or degraded integrity to storage of your data. The caution might also apply to protection of your software or hardware.

Typographical Conventions

EMC uses the following type style conventions in this guide:

AVANT GARDE	Keystrokes
Palatino, bold	◆ Dialog box, button, icon, and menu items in text ◆ Selections you can make from the user interface, including buttons, icons, options, and field names
<i>Palatino, italic</i>	◆ New terms or unique word usage in text ◆ Command line arguments when used in text ◆ Book titles

<i>Courier, italic</i>	Arguments used in examples of command line syntax.
Courier	System prompts and displays and specific filenames or complete paths. For example: working root directory [/user/emc]: c:\Program Files\EMC\Symapi\db
Courier, bold	◆ User entry. For example: symmpoll -p ◆ Options in command line syntax

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Double Checksum Operations

This chapter describes the concepts and indentifies the Double Checksum operations using SYMCLI.

- ◆ Overview 1-2
- ◆ Implementing EMC Double Checksum on Oracle 1-4

Overview

The EMC® Double Checksum feature provides a method to help minimize the impact of I/O errors on database consistency during I/O transfers between hosts and Symmetrix® storage devices. For each RDBMS write in the Symmetrix system, checksum values are computed and compared to test the data for any corruption picked up along the way from the host. Although errors of this kind are infrequent, they can have a considerable effect on data availability and recovery.

This feature is supported in the following environments using Oracle 8.0 and above:

- ◆ Sun Solaris
- ◆ IBM AIX
- ◆ Hewlett-Packard HP-UX

For exact details, see *Implementing EMC Double Checksum on Oracle* on page 1-4.

Traditional Methods of Preventing Data Corruption

Data corruption checking is an integral part of most RDBMS products. For instance, Oracle computes a checksum that verifies the data within each page. If corruption occurs, the checksum will be incorrect when the data is read. However, this checking only takes place within the host system — not the storage array.

As a result, if there is corruption after the data has left the host system, it will not be detected until that data is read back into the system, which can be some time — maybe months — later. The RDBMS will issue an alert, and then the data must be rebuilt from backups and database logs. While a corruption remains undetected, the number of database logs required for recovery increases. This causes the data recovery process to be more complex and time-consuming.

Data Corruption Between Host and Conventional Storage

Although data appears to the host to travel directly to the Symmetrix array, it passes through multiple hardware and software layers. These can lead to problems such as corruption introduced by errors in the operating system or the I/O driver. Hardware can also introduce corruption, such as errors in the host adapter, cable and connector problems, static electricity, and RF noise and interference.

This means that valid data within the RDBMS might arrive corrupted at the storage device. The storage device writes the data as is, because it has no way of validating the data.

Benefits of Checking Within the Symmetrix

With this feature, the Symmetrix system can perform error checks on data pages handled within a checksum extent *as they are written to the disk*. The check takes place before the write command is acknowledged. If an error is detected within the blocks of the extent, the I/O can be rejected and/or reported in a phone home connection or logged in the Symmetrix error log facilities. The error action can be specified by the administrator.

This checking feature minimizes the possibility of data corruption occurring between the host and the Symmetrix array. It improves the recovery time by flagging the error at the time of the "write". When this error condition is raised, and reject I/O is selected, Oracle takes an action, such as taking the tablespace offline.

Implementing EMC Double Checksum on Oracle

The `symchksum` command allows you to perform control operations that manage the checksum I/O extents.

For example, to enable Oracle checksum checking on the extents of all the devices that define the current database instance and then to phone home on error, enter:

```
symchksum enable -type Oracle -phone_home
```

This command requires an Oracle PAK license.

The following are current restrictions for this feature:

- ◆ Oracle databases version 8.0 and above are supported.
- ◆ Data block size is limited to 32 KB.
- ◆ Checksum data objects can only be Oracle data files, control files, and redo logs.

The Oracle instance being checked must be started with the following `init.ora` configuration parameter set to true:

```
db_block_checksum=true
```

Other Checksum Operations

The following checks are available:

- ◆ **MagicNumber**—Verify the magic number that appears in Oracle data blocks. (Selected by default.)
- ◆ **NonzeroDba**—Check for non-zero data block address. The dba stored in a data block is never zero. (Selected by default.)
- ◆ **Check_All_Blocks**—Apply checks to each block in a write.
- ◆ **Checksum**—Compare the checksum value embedded in Oracle blocks with a compatible value computed in real time. Applied to the entire I/O regardless of the `check_all_blocks` option. (Selected by default.)
- ◆ **Straddle**—Check that the write does not straddle known Oracle areas.
- ◆ **Check_dba**—Check that the logical address embedded by Oracle is compatible with the storage address of the writes.

Suppressing Default Features

To turn off any of the automatic checksum features, use the `-suppress_feature` option and supply the name of the feature, for example:

```
symchksum -type Oracle enable -suppress_feature MagicNumber
```

The `-suppress_feature` option is only for the operations that run by default. If you want to turn off an option that was manually enabled, such as `-phone_home`, you must disable the checksum operation and begin again with a new `symchksum enable` command.

With the addition of these new tests, the output when you list the extents will look similar to the following:

```
Symmetrix ID: 000000003122

      D E V I C E S      W I T H      C H E C K S U M      E X T E N T S

                                     Action      Checks
                                     R              A D
                                     e              C M      S l B
                                     j              k a      t l A
                                     L e              s g D r B
Device Name      Number      Block      o c              u i B a l N
Extents      Size      Type      g t              m c A d k Z
-----
/dev/vx/rdmp/c5t0d7s2      1      4b      Oracle      X X              X X . . . X

1 Devices with Checksum extents were found.

X - enabled
. - not available or not enabled
```

You can use this output to determine which features are enabled on the devices with checksum extents.

Enabling Checksum Options

When using the `symchksum enable` command, the user can decide if they would like to reject the I/O, or have the Symmetrix phone home when a checksum error is detected.

If an I/O is not a multiple of the object block size, the user can choose to reject the I/O. This is called a fractured I/O, and is selected with the `-fractured_reject_io` option. When using this option, the `-reject_io` option must also be used.

When extents are enabled with the `-discard` option, EMC Double Checksum writes blocks to disk until a failed block is detected. The `-discard` option divides a large I/O into smaller units of 32 KB each. When a checksum failure is detected, all blocks in that unit and subsequent units are discarded. When using this option, the `-reject_io` option must also be used.

The `symchksum enable` command understands the Oracle database structure. The feature can be enabled for tablespaces, control files, redo logs, or the entire database.

For Oracle 9i and above, if the block size for a tablespace is altered, then the user must disable and then re-enable the extents of the tablespace to ensure that the block size of the enabled extents match the block size of the tablespace.

Note: When FF or power down occurs, extents are lost. You must run the `symchksum enable` command again.

Validating for Checksum Operations

The `symchksum` command also allows you to validate your Oracle tablespace or instance for checksum operations without performing any active actions. This is helpful when you want to know if your database environment is configured to support Symmetrix checksum functionality without actually making any changes.

If the validate is successful, you can enable EMC Double Checksum on the specified Oracle database or tablespace. The following items are validated:

- ◆ Oracle version 8 or higher is installed

- ◆ Oracle's checksum initialization parameter is set (`db_block_checksum`)
- ◆ If the Oracle data file is created on a striped LVM, that the LVM stripe width is a multiple of the Oracle block size
- ◆ Oracle data file's block size is less than or equal to 32 KB
- ◆ The Symmetrix Engenuity™ version supports the checksum functionality
- ◆ Each Symmetrix device has the Checksum flag set
- ◆ Each Symmetrix device has a supportable number of extents defined

The `symchksum validate` command understands the Oracle database structure. The feature can be enabled for tablespaces, control files, redo logs, or the entire database.

Verifying Checksum is Enabled

The `symchksum` command also allows you to verify that the data file's extents are currently enabled for checksum checking. This provides an easy way to determine if the specified tablespace or instance is fully protected by the Symmetrix checksum feature. The `verify` action will report if all, some, or none of the Oracle data file's extents are enabled for checksum checking. This is useful in environments where the database configuration changes frequently. An example of this is if a new data file was added but checksum was not enabled for the new file.

The `symchksum verify` command understands the Oracle database structure. The feature can be enabled for tablespaces, control files, redo logs, or the entire database.

Disabling Checksum

The `symchksum disable` command understands the Oracle database structure. The feature can be enabled for tablespaces, control files, redo logs, or the entire database.

The `symchksum disable` command can also be used on a device basis. This capability is not normally used, but is provided in the event the tablespace was dropped before EMC Double Checksum was disabled for that object.

When the `disable` action is specified for a Symmetrix device, the `-force` flag is required. Disabling extents in this way can cause a mapped tablespace or database to be only partially protected, therefore, use this option with caution. All the extents being monitored for checksum errors on the specified Symmetrix device will be disabled.

Syntax and Examples

Refer to the `symchksum` command in the *EMC Solutions Enabler Symmetrix CLI Command Summary* for a description of the command syntax and more examples.

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