Windows Driver Configuration Utility (WDCFG) User Guide

Version 1.11

Revision History

Rev	Date	Description of Change
0.1	3/5/09	Initial Draft
1.1	4/6/10	Cleanups to produce first release version of User Guide
1.2	7/21/10	Redefined MaximumTargetQueueDepth, and added MaxSASQueueDepth and MaxSATAQueueDepth.
1.3	9/7/10	Removed list of configuration parameters form user guide, and referred to the WDCFG help system to obtain detailed documentation on specific parameters. This eliminates the need to maintain duplicate documentation of all supported parameters, increasing the chance of errors.
1.4	9/8/10	Added newly supported drivers: LSI_SSS, SRAMPT and SRATAPE. Also moved LSI_GEN2 from unsupported to the supported list of drivers.
1.5	5/4/11	Added newly supported driver: SRAMPT2
1.6	6/1/11	Added newly supported driver: SAS2XP86
1.7	1/17/12	Added newly supported drivers: SRAMPT3, SRATAPE2, SRATAPE3
1.8	4/3/12	Added newly supported driver: MEGASAS2
1.9	9/12/12	Added newly supported driver: PERCSAS2
1.10	10/15/12	Cleanup of various typos
1.11	6/26/13	Added newly supported driver: LSI_SAS3

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1. <u>Introduction</u>

This document serves as the User Guide for the LSI Windows Driver Configuration Utility (WDCFG).

WDCFG provides run-time control over various configuration parameters which configure LSI host storage drivers used on the Windows operating system.

2. <u>Scope</u>

2.1 Operating System Versions

The Microsoft requirement (DEVFUND-0046) established the need for a command line (CLI) utility to configure drivers installed on Windows Server versions of the OS. While the utility is required on all OS versions beginning with Windows Vista / Windows Server 2008 and newer, it specifically targeted those versions that can run in Server Core mode (no GUI); hence the need for a CLI based utility.

Supported versions of the Windows operating system are listed below.

- Windows Vista
- Windows Server 2008
- Windows 7
- Windows Server 2008 R2
- Future versions of Windows

2.2 Drivers Supported

Specific drivers covered include:
- LSI_SAS3   – SAS Gen 3
- LSI_SAS2   – SAS Gen 2
- LSI_GEN2   – SAS Gen 2 (ScsiPort – Windows XP x86 only)
- SAS2XP86   – SAS Gen 2 (ScsiPort – Windows XP x86 only)
  [NOTE: SAS2XP86 replaced LSI_GEN2 starting Phase 11]
- LSI_SAS   – SAS Gen 1
- LSI_SCSI   – Parallel SCSI
- LSI_FC   – Fibre Channel
- LSI_SSS   – Warhawk (PCIe Solid State Storage Card)
- MEGASAS2   – MegaSAS2 (MegaRAID Driver)
- PERCSAS2   – PercSAS2 (MegaRAID Driver)
- SRAMPT   – 3rd Party Supported Driver
- SRAMPT2   – 3rd Party Supported Driver
- SRAMPT3   – 3rd Party Supported Driver
- SRATAPE   – 3rd Party Supported Driver
- SRATAPE2   – 3rd Party Supported Driver
- SRATAPE3   – 3rd Party Supported Driver

Drivers not covered include:
- SYM_MPI – Legacy

2.3 Configuration Parameters

WDCFG allows manipulation over a variety of driver configuration parameters. Note that some parameters can have a seriously adverse affect upon system operation if set incorrectly, so the user is cautioned to exercise care when using WDCFG.

All configuration parameters controllable using WDCFG are documented in the utilities data file, DriverConfigParam.def. Detailed documentation on all supported configuration parameters is available from this data file using the WDCFG Help option, documented herein. This data file should never be edited directly, as failure of the configuration system can result. It is safe to view via the WDCFG Help option.

Not all parameters apply to all supported drivers. For example, SAS specific parameters do not apply to the Fibre Channel driver or to the SCSI driver. See the WDCFG Help option for full documentation on all supported parameters, including per-driver applicability.

3. <u>Notational Conventions</u>

The following conventions are used throughout this document.

Table 3-1   Conventions used specifically within command syntax descriptions

Normal Text	Normal text is used for strings which should be entered literally as shown, e.g. the command name.
< >	Angle brackets are used to enclose descriptions of data items which the user should replace with applicable data values.
[ ]	Square brackets are used to enclose optional data items which the user may supply if desired. Normally, each optional data item has a default value used if the data item is omitted. In this case, the syntax description indicates the default value.
|	A vertical bar separates alternative items in a list. Only one of the items should be entered.
*	An asterisk indicates the immediately preceding item may be entered once or repeated multiple times to form a list of like items, with items separated by a single comma character ",". No intervening spaces can exist between or within items.
()	Parentheses are used to group items into a single logical item.

Table 3-2   Conventions used generally throughout the document

AbCd	Courier 9-point bold font is used to indicate registry or directory paths, variables, values and source or pseudo code.

4. <u>WDCFG Installation</u>

4.1 Files Included

The WDCFG utility comprises 2 separate files, both required for operation. The WDCFG.EXE file is the executable, which reads the DriverConfigParam.def data file during operation.

To limit size of the WDCFG executable and to facilitate maintenance of the supported set of configuration parameters, WDCFG manipulates configuration parameters using a list of definitions contained within a file. The file is used for validation of items entered on the WDCFG command line, and to obtain data when displaying help information. This file must never be modified in any way by the user, or the WDCFG utility may malfunction.

The configuration parameter definition file is located at the following location on the system drive.

> **`<system_disk>:\ProgramData\LSI\Wdcfg\DriverConfigParam.def`**

The executable file is located at the following location on the system drive.

> **`<system_disk>:\Windows\System32\WDCFG.EXE`**

4.2 Installing WDCFG

WDCFG is automatically installed during driver installation on Windows operating systems beginning with Windows Vista / Windows Server 2008 and newer. The utility is included on the driver installation media for older operations systems, but may not be automatically installed. In those cases, it may be desirable to install WDCFG manually. This section details the steps necessary to manually install the WDCFG utility.

1. Copy the WDCFG.EXE file from the driver installation media to the following directory path on the system drive.

   `<system_disk>:\Windows\System32\WDCFG.EXE`

2. Copy the DriverConfigParam.def file form the driver installation media to the following directory path on the system drive. If this path does not exist, manually create it using Windows Explorer. Notice there is no space in the "ProgramData" directory name.

   `<system_disk>:\ProgramData\LSI\Wdcfg\DriverConfigParam.def`

3. If not already initialized, add the TargetDriver variable to the registry to identify the desired driver for WDCFG to configure. Note this may have already been initialized during driver installation, even though the utility was not installed.

   a. Form the Windows Start Menu, select *Run*.
   b. In the Run dialogue box, enter "RegEdit" (do not enter the quotes), and click OK.
   c. Using the RegEdit tool, create the following variable and initialize it to the REG_SZ value shown below. Note that it may be necessary to also create the "Wdcfg" key if it does not already exist in the registry.

NOTE: See documentation supplied by Microsoft for information on using the RegEdit utility program.

Registry Key:
[HKEY_LOCAL_MACHINE]SYSTEM\CurrentControlSet\Control\Wdcfg

Registry Variable:
TargetDriver = <DriverName>   (For Example: "LSI_SAS2")

5. <u>WDCFG Operation</u>

5.1 Command Line Interface (CLI)

Wdcfg is a command line interface (CLI) utility. A command is entered on a single line at the Windows command prompt. When a carriage return character is entered, the command is executed and the result is displayed in the command prompt window.

The standard command prompt IO streams are used, providing full support for IO redirection at the command prompt. Specifically, input is read via the STDIN stream, normal output is sent over the STDOUT stream, and error/warning messages are sent to the ERROUT stream.

This utility is a CLI based tool due to the normal usage scenario in server headless environments, where no graphical user interface (GUI) is available.

Wdcfg commands may be scripted in standard Windows batch files to help automate system management activities.

5.2 Functional Model

The functional model of WDCFG involves manipulating a persistent memory-based snapshot of the driver's configuration parameters, then activating the snapshot when ready. Modifying the snapshot has no effect upon driver operation, until the snapshot is activated.

The snapshot is manipulated by setting configuration parameters within the snapshot, which is a persistent memory-based shadow copy of actual driver configuration parameters. Changing parameters in the snapshot has no effect upon the driver until the snapshot is activated, at which time all values in the snapshot are sent to the driver for use following the next driver restart, which can be done using Windows Device Manager to disable and re-enable the driver. As an exception, the boot adapter driver instance cannot be reloaded dynamically and will require a system reboot to have new settings take effect. Note that no system reboot or driver restart is initiated by WDCFG. Instead, an appropriate message is displayed and the new settings take effect following the next system reboot or driver restart.

The snapshot is considered *clear* immediately following activation since all parameter values in the snapshot now match their corresponding parameters in-use by the driver.

The user may set the value of a single or of multiple driver configuration parameters in a single WDCFG command. A single, multiple or all driver configuration parameters may be cleared in a single WDCFG command, which sets their values in the snapshot to the values currently in-use by the driver.

5.3 Target Driver

A Windows system may have multiple LSI host drivers installed at any given time. Orderly configuration requires one specific driver be the target of each action performed by WDCFG.

When a driver is installed, the installation package sets TargetDriver to that driver's name. Therefore, the last driver installed will be the default target driver for WDCFG.

Wdcfg provides a command line option to set the target driver. Once set, it is persistent so it applies to all future commands until changed by installation of a new driver or by the user via WDCFG. When the target driver is entered on a command line along with other options, the target driver is set prior to processing other options.

5.4 Current Snapshot

The current snapshot is a shadow copy of the driver's configuration parameter list. The current snapshot is directly edited by WDCFG, and then used to change configuration parameters in-use by the driver through an activation event, as described in section 5.5.

5.5 Activation

To activate the current snapshot, WDCFG replaces the configuration set of driver configuration parameters with those currently defined in its snapshot, and then instructs the user to restart the driver. As the driver initializes and reads the new configuration parameters, the new values become active within the driver.

5.6 History Stack

When a snapshot is activated, a history record is created containing the values of all configuration parameters in-use by the driver prior to the activate operation. Up to ten history records are maintained in a stack-like manner, where they may be used to perform a revert of the driver to previous parameter values at a later time. Each time WDCFG performs an activate operation; a new history record is saved on the top of the stack. If stack space is full, the oldest item (on the bottom of the stack) is deleted to make space.

If a revert operation is performed, the history record from top of the stack (the last record placed there) is reactivated in the driver and that history record is deleted from the top of the stack. The values of configuration parameters in-use by the driver prior to the revert operation are lost. A second revert will use the next item from the top of the stack, and so on until the stack is empty. This provides a way to backup through previous configurations, by sequencing through them in the reverse order they were activated.

Optionally, an index may be specified for a revert operation. An index causes that number of history records to be popped off the top of the history stack and discarded before actually performing the revert as described above. Specifying an index of 0 is equivalent to omitting the index from the command.

5.7 Audit Log

Understanding the sequence of past configuration actions performed on a driver is crucial when troubleshooting field issues. Wdcfg maintains an audit log containing a large number of historical activations (configuration events).

Each configuration event is date and time stamped, maintained in chronological sequence and comprises the following data fields.

- Date
- Time
- Newly activated configuration parameter list

The audit log is maintained in a binary file at the following directory path on the system boot disk.

```
<system_disk>:\ProgramData\LSI\Wdcfg\Audit.log
```

Wdcfg provides a command line option to display contents of the audit log, and a command line option to purge the audit log on demand with the option of saving a copy to another file. The audit log continues to grow as new entries are appended until manually purged.

5.8 Help System

Wdcfg includes an elaborate help system allowing the user to display a variety of information. To use the help system, the user enters a WDCFG command line using the help option.

WDCFG displays complete command syntax information when the help option is specified without any parameters.

If the help option is entered with a single character parameter, once WDCFG has validated the letter specified matches one of its option specifiers, it displays a more detailed description and syntax information for that option.

If a multi-character word is supplied as the help parameter, WDCFG first matches it with one of the supported configuration option names, and then displays a detailed description of that configuration option.

If "all" is entered as the parameter, WDCFG lists detailed descriptions of all supported configuration parameters.

5.9 Query System

Wdcfg contains a query system to allow access to the current state of all configuration information. To use the query system, the user enters a WDCFG command line using the query option. The query option provides a variety of parameters, allowing the user to select the desired information to display.

If the query option is specified using the Snapshot parameter, or without any parameters (default), the current value of all configuration parameters in the snapshot are displayed.

If the query option is entered using the Driver option, the values of all configuration options currently in-use by the driver are displayed.

If the query option is entered with the History Stack parameter, all configuration parameter lists currently contained in the History Stack are displayed.

If the query command is entered with the Audit Log parameter, without any additional parameters, then the contents of the active audit log file from the local machine is displayed. If a file path is specified as a

second parameter to the query command following the Audit Log parameter, that file is assumed to be a properly formatted audit log and its contents are displayed.

5.10 Command Reference

5.10.1 Command Syntax

The general syntax of a WDCFG command line is shown below.

The command line consists of the command name "WDCFG", followed by zero or more options. The command name and each option are separated by at least one space. Any number of options may be specified on a single command line, and the sequence of options on the command line is insignificant.

Each option begins with an option specifier, followed by zero or more parameters. An option specifier begins with a single dash character "-", followed immediately (no spaces) by a single letter which uniquely distinguishes the specific option. The forward slash character "/" may be substituted for the dash character "-"within a command specifier.

Some options contain required and/or optional parameter(s) following the option specifier, using at least one space to separate each parameter.

Some options contain parameters which may be repeated to specify a list of like items. For example, see the <CfgParm> parameter for the –c option. When specifying a list of like items, the entire list is considered a single parameter, so it must not contain any intervening spaces. Like items within the list are separated using a single comma character ",".

Some options are mutually exclusive and cannot be processed along with other options. If a mutually exclusive option is entered along with other options, the mutually exclusive option is processed and all other options are ignored. If multiple mutual exclusive options are specified, then the one with highest precedence is processed and all others are ignored. The help option is mutually exclusive with precedence 1 (highest). The query option is mutually exclusive, with precedence 2.

Syntax:
    WDCFG [[option]*]

Options:
    -h [<option>|<ConfigParameter>|All]
        If the parameter is omitted, display this syntax message. If a single letter parameter is entered (matching one of the options listed herein), display a detailed help message specific to the specified option. If a multi-character word is entered as the parameter (matching one of the supported Driver Configuration Parameters), display a detailed description of the specific Driver Configuration Parameter. If "all" is entered, display a detailed description of all supported Driver Configuration Parameters. The help option is mutually exclusive, with precedence 1. If the help option is specified, any other options present on the command line are ignored and the help option is processed.

    -?
        Same as –h.

    -d [<lsi_fc>|<lsi_scsi>|<lsi_sas>|<lsi_sas2>|<lsi_gen2>|<sas2xp86>|<lsi_sss>|
        <megasas2>|<srampt>|<srampt2>|<srampt3>|<sratape>|<sratape2>|<sratape3>]
        Specify driver to configure. This value is saved in persistent memory when entered and reused if not specified again. When a driver is installed, this value is set to that driver, so the default target driver is the last driver installed. If no driver is entered with this option, the current target driver is displayed.

    -a
        Activate the snapshot by sending the values of all Driver Configuration Parameters currently in the snapshot to the driver. A history record is also saved.

    -c [<CfgParm>*|h [FilePath]]
        This option clears Driver Configuration Parameters, or it clears the History Log file while optionally saving its contents to another file. A Driver Configuration Parameter is cleared by setting its value in the snapshot to the value currently in-use by the driver. If no parameter is specified (CfgParm is omitted) on the command line, all configuration parameters in the snapshot are cleared. If the single-letter 'h' is specified as the parameter, then the History Log file is cleared by deleting all its contents. Optionally, by specifying a second parameter as a file path the contents of the History File are copied to that new file before the History File is cleared.

    -s (<CfgParm>=<value>)*
        Set a Driver Configuration Parameter (in the snapshot) to the specified value.

    -r [<index>]
        Revert the driver to a previous configuration from the history stack. By default, the last item placed on top of the history stack is used. If index is specified, then that number of history records are deleted from top of the history stack before actually performing the revert.

    -q [s|d|h|l [<filepath>]]
        Query (display) the current values of the Driver Configuration Parameters in the Snapshot (default), or those actively in-use by the Driver, or those in the History stack, or query the contents of the Audit Log. If the Audit Log is specified without a second parameter (filepath), the active audit log file from the local machine is displayed. The user may optionally specify an audit log file at an alternative location. The query option is mutually exclusive, with precedence

2. If the query option is specified and the help option is not, any other options present on the command line are ignored and the query option is processed. If the help option is specified along with the query option, the query option is ignored.

5.10.2 Example Console Session

Below is an example console session demonstrating WDCFG functionality. No attempt was made to cover all possible commands and/or permutations, although many are included. The intent is to provide adequate exposure to familiarize a new user with WDCFG concepts, facilitating rapid startup. Annotations are inserted using ***bold italic Roman font***, while all text entered or printed at the console is displayed using `standard courier font`. Annotations are positioned just prior to the command they apply to, unless stated otherwise within the annotation.

Console Session
Obtain general help from WDCFG.
```
C:\>wdcfg -?
LSI Windows Host Driver Configuration Utility (WDCFG)
Version 0.1, Built Sep 23 2009 16:47:01

Syntax:
 WDCFG [[option]*]

Options:
 -h [<option>|<ConfigParameter>|All]
     If the parameter is omitted, display this syntax message.  If a single-
     letter parameter is entered (matching one of the options listed herein),
     display a detailed help message specific to the specified option.  If
     a multi-character word is entered as the parameter (matching one of
     the supported Driver Configuration Parameters), display a detailed
     description of the specific Driver Configuration Parameter.  If 'all' is
     entered, display a detailed description of all supported Driver
     Configuration Parameters.  The help option is mutually exclusive, with
     precedence 1.  If the help option is specified, any other options present
     on the command line are ignored and the help option is processed.

 -?
     Same as -h.

 -d [<lsi_fc>|<lsi_scsi>|<lsi_sas>|<lsi_sas2>|<lsi_gen2>|<sas2xp86>|<lsi_sss>|
     <megasas2>|<srampt>|<srampt2>|<srampt3>|<sratape>|<sratape2>|<sratape3>]
     Specify driver to configure.  This value is saved in persistent memory
     when entered and reused if not specified again in future commands.  When a
     driver is installed, this value is set to that driver so the default
     target driver is the last driver installed.  If no driver is entered with
     this option, the current target driver is displayed.

 -a
     Activate the snapshot by sending the values of all Driver Configuration
     Parameters currently in the snapshot to the driver.  A history record is
     also saved.

 -c [<CfgParm>*|a [FilePath]]
     This option clears Driver Configuration Parameter(s), or it clears the
     Audit Log file while optionally saving its contents to another file.
     A Driver Configuration Parameter is cleared by setting its value in the
     snapshot to the value currently in-use by the driver.  If no parameter
     is specified (CfgParm is omitted) on the command line, all configuration
     parameters in the snapshot are cleared.  If the single-letter 'a' is
     specified as the first parameter, then the Audit Log file is cleared by
     deleting all its contents.  Optionally, by specifying a second parameter
     as a file path the contents of the Audit Log File is copied to that new
     file before the Audit Log File is cleared.

 -s (<CfgParm>=<value>)*
```

```
      Set a Driver Configuration Parameter (in the snapshot) to the specified
      value.

 -r [<index>]
      Revert the driver to a previous configuration from the history stack.
      By default, the last item placed on top of the history stack is used.
      If index is specified, then that number of history records are deleted
      from top of the history stack before actually performing the revert.

 -q [s|d|h|a [<filepath>]]
      Query (display) current values of Driver Configuration Parameters in
      the Snapshot (default), or those actively in-use by Driver, or in those
      in the History stack, or the contents of the Audit Log.  If the Audit Log
      is specified without a parameter, the active audit log file from the local
      machine is displayed.  The user may optionally specify an audit log file
      at an alternative location.  The query option is mutually exclusive, with
      precedence 2.  If the query option is specified and the help option is
      not, any other options present on the command line are ignored and the
      query option is processed.  If the help option is specified along with the
      query option, the query option is ignored.
```

Obtain detailed help specific to the query option. Notice the example commands below.

```
C:\>wdcfg -? q
LSI Windows Host Driver Configuration Utility (WDCFG)
Version 0.1, Built Sep 23 2009 16:47:01

The Query Option
----------------

Syntax:
  WDCFG -q [s|d|h|a [<filepath>]]

Overview:
  The Query option prints the current values of driver configuration
  parameters from any of the following sources:
     * Those currently in the snapshot
     * Those actively in-use by the driver
     * Those currently in the History Stack
  The Query option may also be used to print the contents of the Audit Log.

  The query option is mutually exclusive, with precedence 2.  If the query
  option is specified and the help option is not, any other options present on
  the command line are ignored and the query option is processed.  If the help
  option is specified along with the query option, the query option is ignored.

Example Commands:
  WDCFG -q
    This command prints the values of driver configuration parameters
    currently in the snapshot (same as following command).

  WDCFG -q s
    This command prints the values of driver configuration parameters
    currently in the snapshot (same as previous command).

  WDCFG -q d
    This command prints the values of driver configuration parameters
    currently in-use by the driver.

  WDCFG -q h
    This command prints the values of driver configuration parameters
    currently in the history stack.

  WDCFG -d a
    This command prints the contents of the active audit log file from the.
    local machine.

  WDCFG -q a <filepath>
    This command prints the values of the specified file, assuming it
    is a copy of an audit log file.
```

Query current configuration settings in-use by the driver. Note that if these have been modified since the driver was last restarted, they will not actually be loaded by the driver until it is restarted again. The "PlaceHolder=0" entry below indicates the driver is to use default settings for all configuration parameters.

```
C:\>wdcfg -q
LSI Windows Host Driver Configuration Utility (WDCFG)
Version 0.1, Built Sep 23 2009 16:47:01


======================================================
Snapshot Driver Configuration
Target Driver = LSI_SAS2
======================================================

PlaceHolder = 0
```

Obtain help information on the LogExceptionEvents configuration parameter. An alternative for of this command could have been "WDCFG –h all", which would have listed all available configuration parameters instead of just one. This alternative was omitted here due to the length of output it produces.

```
C:\>wdcfg -h LogExceptionEvents
LSI Windows Host Driver Configuration Utility (WDCFG)
Version 0.1, Built Sep 23 2009 16:47:01

Seeking Record 'LogExceptionEvents'
=============================================================================
Name:           LogExceptionEvents
MinValue:       0
MaxValue:       1
StabilityImpact: 0
LsiGen2:        1
LsiSas2:        1
LsiSas:         1
LsiScsi:        1
LsiFc:          1
Description:
This parameter controls whether or not the driver logs extra exception
information to the system error log.

0 = Do not log extra information.

1 = Log extra information.
=============================================================================
```

Set LogExceptionEvents to 1, to activate extra logging from within the driver. This sets it in the current snapshot, but not in the driver settings. If the driver is now restarted, it will NOT pick-up this new setting.

```
C:\>wdcfg -s LogExceptionEvents=1
LSI Windows Host Driver Configuration Utility (WDCFG)
Version 0.1, Built Sep 23 2009 16:47:01


Snapshot Before Changes:

PlaceHolder = 0


Snapshot After Changes:

LogExceptionEvents = 1

Config Params in Snapshot Updated to specified values
```

Query current contents of the snapshot. This shows the settings which would be sent to the driver if activated now.
```
C:\>wdcfg -q
LSI Windows Host Driver Configuration Utility (WDCFG)
Version 0.1, Built Sep 23 2009 16:47:01


======================================================
Snapshot Driver Configuration
Target Driver = LSI_SAS2
======================================================

LogExceptionEvents = 1
```

Query settings at the driver level. These are the settings which would be picked-up by the driver if it were restarted now. These settings would be replaced by the settings in currently in the snapshot if activated now.
```
C:\>wdcfg -q d
LSI Windows Host Driver Configuration Utility (WDCFG)
Version 0.1, Built Sep 23 2009 16:47:01


======================================================
Active Driver Configuration
Target Driver = LSI_SAS2
======================================================

PlaceHolder = 0
```

Activate the settings currently in the snapshot, by copying them to driver level to replace the setting currently there.
```
C:\>wdcfg -a
LSI Windows Host Driver Configuration Utility (WDCFG)
Version 0.1, Built Sep 23 2009 16:47:01

DRIVER HAS NOT BEEN RESTARTED.  RESTART DRIVER TO MAKE CHANGES ACTIVE.
Current snapshot activated to driver LSI_SAS2
```

Query settings currently in the snapshot. Notice they have not changed due to the activation.
```
C:\>wdcfg -q
LSI Windows Host Driver Configuration Utility (WDCFG)
Version 0.1, Built Sep 23 2009 16:47:01


======================================================
Snapshot Driver Configuration
Target Driver = LSI_SAS2
======================================================

LogExceptionEvents = 1
```

Query settings currently at the driver level. Notice they are now the same as settings in the snapshot, due to the activation. Also note these will not be picked-up by the driver until it is restarted. If these are modified again (due to another activation) before the driver is restarted, the new settings will be picked-up by the driver instead of these.
```
C:\>wdcfg -q d
LSI Windows Host Driver Configuration Utility (WDCFG)
Version 0.1, Built Sep 23 2009 16:47:01


======================================================
```

```
Active Driver Configuration
Target Driver = LSI_SAS2
=====================================================

LogExceptionEvents = 1
```

Query the history stack. It now contains a single level, comprising the driver level settings which were replaced by the activation. This allows for a revert to these settings if needed.
```
C:\>wdcfg -q h
LSI Windows Host Driver Configuration Utility (WDCFG)
Version 0.1, Built Sep 23 2009 16:47:01


=====================================================
History Stack Contents
Target Driver = LSI_SAS2
=====================================================


_____
History Stack Index: 0

PlaceHolder = 0
```

Query information for the MaximumTargetQueueDepth configuration parameter.
```
C:\>wdcfg -h MaximumTargetQueueDepth
LSI Windows Host Driver Configuration Utility (WDCFG)
Version 0.1, Built Sep 23 2009 16:47:01

Seeking Record 'MaximumTargetQueueDepth'
==============================================================================
Name:            MaximumTargetQueueDepth
MinValue:        1
MaxValue:        9999999
StabilityImpact: 0
LsiGen2:         1
LsiSas2:         1
LsiSas:          1
LsiScsi:         1
LsiFc:           1
Description:
The maximum number of concurrent I/Os that will be issued to a single target
ID. The default setting of 63 works well with U320 devices.  A setting of 31
may need to be used with U160 devices.  This setting prevents multiple Queue
Full returns back to the OS, which can cause Event 11 and Event 15 to appear
in the Windows Event Log.  The minimum value that can be specified is 1.

The default is 64 because that is what most drives currently shipping can
support, and it is large enough to provide good performance for random I/O.

Setting this parameter to anything larger than the maximum target queue depth
currently in-use by target devices will cause Queue Full status returns.

Note that the maximum target queue depth in-use by target devices is a very
nebulous number, which changes dynamically over time based upon the present
mixture of IO sizes, current workload and resources available in the target
device.

While this parameter affects storage system performance, it should NOT have
an impact upon storage system stability.
==============================================================================
```

Set MaximumTargetQueueDepth to 999 in the snapshot.
```
C:\>wdcfg -s MaximumTargetQueueDepth=999
LSI Windows Host Driver Configuration Utility (WDCFG)
Version 0.1, Built Sep 23 2009 16:47:01
```

```
Snapshot Before Changes:

LogExceptionEvents = 1


Snapshot After Changes:

LogExceptionEvents = 1
MaximumTargetQueueDepth = 999

Config Params in Snapshot Updated to specified values
```

Query the current snapshot. Notice it now contains 2 configuration parameter settings.
```
C:\>wdcfg -q
LSI Windows Host Driver Configuration Utility (WDCFG)
Version 0.1, Built Sep 23 2009 16:47:01


======================================================
Snapshot Driver Configuration
Target Driver = LSI_SAS2
======================================================

LogExceptionEvents = 1
MaximumTargetQueueDepth = 999
```

Query settings at the driver level. Since the snapshot has been modified since the last activation, driver level settings do not currently match those in the snapshot.
```
C:\>wdcfg -q d
LSI Windows Host Driver Configuration Utility (WDCFG)
Version 0.1, Built Sep 23 2009 16:47:01


======================================================
Active Driver Configuration
Target Driver = LSI_SAS2
======================================================

LogExceptionEvents = 1
```

Activate settings currently in the snapshot by copying them to the driver level. Again, the driver sill not pick-up the new settings at this time because it must be restarted to do so.
```
C:\>wdcfg -a
LSI Windows Host Driver Configuration Utility (WDCFG)
Version 0.1, Built Sep 23 2009 16:47:01

DRIVER HAS NOT BEEN RESTARTED.  RESTART DRIVER TO MAKE CHANGES ACTIVE.
Current snapshot activated to driver LSI_SAS2
```

Notice settings in the snapshot are unchanged by the activation.
```
C:\>wdcfg -q
LSI Windows Host Driver Configuration Utility (WDCFG)
Version 0.1, Built Sep 23 2009 16:47:01


======================================================
Snapshot Driver Configuration
Target Driver = LSI_SAS2
======================================================

LogExceptionEvents = 1
MaximumTargetQueueDepth = 999
```

Settings at the driver level now match those in the snapshot due to the activation.
```
C:\>wdcfg -q d
LSI Windows Host Driver Configuration Utility (WDCFG)
Version 0.1, Built Sep 23 2009 16:47:01


=====================================================
Active Driver Configuration
Target Driver = LSI_SAS2
=====================================================

LogExceptionEvents = 1
MaximumTargetQueueDepth = 999
```

The history stack now contains 2 levels since there have been 2 activations. The first level (oldest) at index 1 contains the settings originally in-use by the driver. Actually, since the driver has not been restarted these are the settings still in-use by the driver (until the next time it is restarted). The second level (newest) at index 0 contains the settings which were at the driver level at the time of the last activation. If a revert is now done, these will be removed from the history stack and used to restore the settings at the driver level.
```
C:\>wdcfg -q h
LSI Windows Host Driver Configuration Utility (WDCFG)
Version 0.1, Built Sep 23 2009 16:47:01


=====================================================
History Stack Contents
Target Driver = LSI_SAS2
=====================================================


_____
History Stack Index: 0

LogExceptionEvents = 1


_____
History Stack Index: 1

PlaceHolder = 0
```

Perform a revert to restore settings at the driver level from the newest entry on the history stack.
```
C:\>wdcfg -r
LSI Windows Host Driver Configuration Utility (WDCFG)
Version 0.1, Built Sep 23 2009 16:47:01

Driver config Reverted from history stack, Index = 0
```

The current snapshot is unaffected by the revert.
```
C:\>wdcfg -q
LSI Windows Host Driver Configuration Utility (WDCFG)
Version 0.1, Built Sep 23 2009 16:47:01


=====================================================
Snapshot Driver Configuration
Target Driver = LSI_SAS2
=====================================================

LogExceptionEvents = 1
MaximumTargetQueueDepth = 999
```

The driver level is restored to the settings from the newest entry on the history stack.

```
C:\>wdcfg -q d
LSI Windows Host Driver Configuration Utility (WDCFG)
Version 0.1, Built Sep 23 2009 16:47:01


=====================================================
Active Driver Configuration
Target Driver = LSI_SAS2
=====================================================

LogExceptionEvents = 1
```

The newest entry on the history stack has been removed. If another revert is now performed, the settings in the now newest entry on the history stack will be used to restore driver level settings.
```
C:\>wdcfg -q h
LSI Windows Host Driver Configuration Utility (WDCFG)
Version 0.1, Built Sep 23 2009 16:47:01


=====================================================
History Stack Contents
Target Driver = LSI_SAS2
=====================================================


_____
History Stack Index: 0

PlaceHolder = 0
```

Perform another revert.
```
C:\>wdcfg -r
LSI Windows Host Driver Configuration Utility (WDCFG)
Version 0.1, Built Sep 23 2009 16:47:01

Driver config Reverted from history stack, Index = 0
```

The snapshot is not affected by the revert.
```
C:\>wdcfg -q
LSI Windows Host Driver Configuration Utility (WDCFG)
Version 0.1, Built Sep 23 2009 16:47:01


=====================================================
Snapshot Driver Configuration
Target Driver = LSI_SAS2
=====================================================

LogExceptionEvents = 1
MaximumTargetQueueDepth = 999
```

Driver level is restored to the settings in the newest level of the history stack.
```
C:\>wdcfg -q d
LSI Windows Host Driver Configuration Utility (WDCFG)
Version 0.1, Built Sep 23 2009 16:47:01


=====================================================
Active Driver Configuration
Target Driver = LSI_SAS2
=====================================================

PlaceHolder = 0
```

The history stack is now empty. No more reverts are possible at this time.
```
C:\>wdcfg -q h
LSI Windows Host Driver Configuration Utility (WDCFG)
Version 0.1, Built Sep 23 2009 16:47:01


======================================================
History Stack Contents
Target Driver = LSI_SAS2
======================================================
```

Clear the LogExceptionEvents parameter from the snapshot.
```
C:\>wdcfg -c LogExceptionEvents
LSI Windows Host Driver Configuration Utility (WDCFG)
Version 0.1, Built Sep 23 2009 16:47:01

Specified Configuration Parameters in Snapshot Cleared (set to values in-use by
driver)
```

Only the MaximumTargetQueueDepth parameter setting remains in the snapshot.
```
C:\>wdcfg -q
LSI Windows Host Driver Configuration Utility (WDCFG)
Version 0.1, Built Sep 23 2009 16:47:01


======================================================
Snapshot Driver Configuration
Target Driver = LSI_SAS2
======================================================

MaximumTargetQueueDepth = 999
```

Driver level settings are not affected by the clear operation.
```
C:\>wdcfg -q d
LSI Windows Host Driver Configuration Utility (WDCFG)
Version 0.1, Built Sep 23 2009 16:47:01


======================================================
Active Driver Configuration
Target Driver = LSI_SAS2
======================================================

PlaceHolder = 0
```

***Activate the current snapshot settings by copying them to the driver level. The driver will not pick
them up until it is restarted.***
```
C:\>wdcfg -a
LSI Windows Host Driver Configuration Utility (WDCFG)
Version 0.1, Built Sep 23 2009 16:47:01

DRIVER HAS NOT BEEN RESTARTED.  RESTART DRIVER TO MAKE CHANGES ACTIVE.
Current snapshot activated to driver LSI_SAS2
```

The current snapshot is not affected by the activation.
```
C:\>wdcfg -q
LSI Windows Host Driver Configuration Utility (WDCFG)
Version 0.1, Built Sep 23 2009 16:47:01


======================================================
Snapshot Driver Configuration
Target Driver = LSI_SAS2
======================================================
```

```
MaximumTargetQueueDepth = 999
```

Driver level settings now match those in the snapshot due to the activation. The driver will not pick-up these settings until it is restarted.

```
C:\>wdcfg -q d
LSI Windows Host Driver Configuration Utility (WDCFG)
Version 0.1, Built Sep 23 2009 16:47:01


======================================================
Active Driver Configuration
Target Driver = LSI_SAS2
======================================================

MaximumTargetQueueDepth = 999
```

The history stack now contains 1 level due to the activation.

```
C:\>wdcfg -q h
LSI Windows Host Driver Configuration Utility (WDCFG)
Version 0.1, Built Sep 23 2009 16:47:01


======================================================
History Stack Contents
Target Driver = LSI_SAS2
======================================================


_____
History Stack Index: 0

PlaceHolder = 0
```

Revert driver level to settings form the history stack.

```
C:\>wdcfg -r
LSI Windows Host Driver Configuration Utility (WDCFG)
Version 0.1, Built Sep 23 2009 16:47:01

Driver config Reverted from history stack, Index = 0
```

The history stack is now empty.

```
C:\>wdcfg -q h
LSI Windows Host Driver Configuration Utility (WDCFG)
Version 0.1, Built Sep 23 2009 16:47:01


======================================================
History Stack Contents
Target Driver = LSI_SAS2
======================================================
```

The driver level settings have been reverted. These settings will be picked-up by the driver when it is restarted next time.

```
C:\>wdcfg -q d
LSI Windows Host Driver Configuration Utility (WDCFG)
Version 0.1, Built Sep 23 2009 16:47:01


======================================================
Active Driver Configuration
Target Driver = LSI_SAS2
======================================================

PlaceHolder = 0


C:\>
```