# Linux: Disks diagnostic using smartctl

Article Number: 333 | Rating: Unrated | Last Updated: Wed, Jul 25, 2018 2:07 PM

Facing disk issues such as corruption or block defect is thankfully not happening frequently. However when it does, the diagnose may look sometimes like a real struggle. This is forgetting that disks integrate since years the S.M.A.R.T technology. Good point, it can easily be adressed in Linux command line through smartctl

## What is S.M.A.R.T. exactly?

S.M.A.R.T., which stands for Self-Monitoring, Analysis and Reporting Technology (also called SMART), is a monitoring system for and integrated in hard disks allowing to detect and report various indicators of reliability.

SMART is the successor of various previous disk monitoring solution such as PFA (IBM, 1992) or IntelliSafe (Compaq, 1995). The join-work between Compaq, IBM, Seagate, Quantum, Conner and Western Digital resulted in the standard SMART.

SMART is part of AT Attachment (ATA) standard since 2004 and provides several information about disk such as:

- Status
- Manufacter information (Brand, serial number...)
- Inability to read or Write data

In addition SMART collects data through an offline monitoring and use thresholds in order to warn about potential disk failures. Finally it allows to run different disk integraty tests.

More detailed information about the SMART standard can be found here:

### http://en.wikipedia.org/wiki/S.M.A.R.T

Getting information out of SMART under Linux is pretty easy, as the binary smartctl is available.

## **Basic operations**

Like for any tool under linux, you can get some help on the usage of smartctl.

1	srvoeltest1:~ # smartctlhelp
2	smartctl 5.39 2008-10-24 22:33 [x86_64-suse-linux-
3	gnu] (openSUSE RPM)
4	Copyright (C) 2002-8 by Bruce Allen, <a href="&lt;/td&gt;&lt;/tr&gt;&lt;tr&gt;&lt;th&gt;5&lt;/th&gt;&lt;td&gt;http://smartmo&lt;/td&gt;&lt;/tr&gt;&lt;tr&gt;&lt;th&gt;&lt;/th&gt;&lt;td&gt;ntools.sourcelorge.net"></a>
6	http://smartmontools.sourceforge.net
7	
8	Usage: smartctl [options] device
9	
10	======= SHOW INFORMATION OPTIONS
11	=====
12	
13	-h,help,usage
14	Display this help and exit
15	

16	-V,version,copyright,license
17	Print license, copyright, and version information and exit
18	
19	-i,info
20	Show identity information for device
21	
22	-a,all
23	Show all SMART information for device
24	
25	
26	SMARTCTL RUN-TIME BEHAVIOR OPTIONS
27	
	-q TYPE,quietmode=TYPE (ATA)
	Set smartctl quiet mode to one of: errorsonly, silent, noserial

A good idea is also to take a look on the man page of smartctl:

http://smartmontools.sourceforge.net/man/smartctl.8.html

Then the first basic operation is to get the basic information about a disk. To do so run: **smartctl -i** /dev/<disk>

1	
2	srvoeltest1:~ # smartctl -i /dev/sda
2	smartctl 5 39 2008-10-24 22:33 [x86_64-suse-linux-
3	gnu] (openSUSE RPM)
4	Copyright (C) 2002-8 by Bruce Allen, <a< th=""></a<>
-	href="
5	http://smartmo
	https://www.sturceforge.net >
0	http://smartmontoois.sourcerorge.net
7	
8	=== START OF INFORMATION SECTION ===
9	Device Model: GB1000EAMYC
10	
10	Serial Number: WMA1 V9306345
11	Firmware Version: HPG3
12	User Capacity: 1,000,204,886,016 bytes
13	Device is: Not in smartctl database [for details use:
	-P showall]
14	
15	AIA Version is: /
1.5	ATA Standard is: ATA/ATAPL7 T13 1532D
	revision 4a
	Local Time is: Wed Sep 5 13:24:31 2012 CEST

SMART support is: Available - device has SMART capability.

SMART support is: Enabled

We can see, using the -i option, information such as the model, S/N, capacity and more interresting we can check if SMART is available and activated for the disk.

If it is not activated yet, you can do it with command: smartctl -s on /dev/<disk>

## **Check disks health**

Now that we have the base information about the disks we may want to check their state. So let's check first if we simply still see them and can access then. This is done using the command: **smartctl -H** /dev/<disk>

1	
	srvoeltest1:~ # smartctl -H /dev/sda
2	smartet 5 30 2008 10 24 22:33 [v86, 64 suse linux
3	gnu] (openSUSE RPM)
4	Copyright (C) 2002-8 by Bruce Allen, <a href="&lt;/td&gt;&lt;/tr&gt;&lt;tr&gt;&lt;td&gt;5&lt;/td&gt;&lt;td&gt;http://smartmo&lt;/td&gt;&lt;/tr&gt;&lt;tr&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;ntools.sourceforge.net"></a>
6	http://smartmontools.sourceforge.net
7	
8	=== START OF READ SMART DATA
	SECTION ===
0	



Remember that this check is a simple test of the disk availability. A PASSED result doesn't mean that the disk is healthy. On the other hand any other result than PASSED let you know to that you should replace it.

As second step, you may want to check the disk capabilities using: smartctl -c /dev/<disk>

2

srvoeltest1:~ # smartctl -c /dev/sda smartctl 5.39 2008-10-24 22:33 [x86\_64-suse-linuxgnu] (openSUSE RPM) Copyright (C) 2002-8 by Bruce Allen, <a href=" http://smartmo

6	ntools.sourceforge.net">
	http://smartmontools.sourceforge.net
7	
8	
0	=== SIARI OF READ SMARI DAIA
9	SECTION ===
10	General SMART Values
10	General Stander Values.
11	Offline data collection status: (0x84) Offline data
	collection activity
12	-
	was suspended by an interrupting command from
13	host
14	Auto Offline Data Collection: Enabled.
15	Self-test execution status: (0) The previous self-test
16	routine complete
10	without error or no self test has ever
17	without error of no sen-test has ever
- /	been run.
18	
	Total time to complete Offline
19	
	data collection: (18000) seconds.
20	
	Offline data collection
21	
22	capabilities: (0x/b) SMART execute Offline
23	Auto Offline data collection on/off support
	Auto offinie data concerton on off support.
24	Suspend Offline collection upon new

25	command.
26	Offline surface scan supported.
27	Self-test supported.
28	Conveyance Self-test supported.
29	Selective Self-test supported.
30	SMART capabilities: (0x0003) Saves SMART data before entering
31	power-saving mode.
32	Supports SMART auto save timer.
33 34	Error logging capability: (0x01) Error logging supported.
35	General Purpose Logging supported.
36	Short self-test routine
37	recommended polling time: (2) minutes.
	Extended self-test routine
	recommended polling time: (208) minutes.
	Conveyance self-test routine
	recommended polling time: (5) minutes.
	SCT capabilities: (0x303f) SCT Status supported.
	SCT Feature Control supported.

#### SCT Data Table supported.

Capabilities let us know different information:

- Offline data collection status
- Last self-test status
- Type of test available and their duration In my example above, for instance, a short self-test would take approximately 2 minutes.

Going deeper in scope of the disk health check, drives us then to check out the so called disk attributes. These are metrics collected for the disk with their current value, the vendor warning value and threshold. They include counters helping to detect/prevent potential failures like:

- Raw Read Error Rate
- Reallocated sector Ct
- Seek Error Rate
- Reallocated Event Count

The current state of the attributes can be get using the command: smartctl -A /dev/<disk>

1	srvoeltest1:~ # smartctl -A /dev/sdb
2 3	smartctl 5.39 2008-10-24 22:33 [x86_64-suse-linux- gnu] (openSUSE RPM)
4	Copyright (C) 2002-8 by Bruce Allen, <a< th=""></a<>
5	hret=" http://smartmo ntools.sourceforge.net">
6	http://smartmontools.sourceforge.net

7	
8	=== START OF READ SMART DATA SECTION ===
9	
10	SMART Attributes Data Structure revision number: 10
11	Vendor Specific SMART Attributes with Thresholds:
12	ID# ATTDIDUTE NAME VALUE WODST
13	THRESH TYPE UPDATED RAW_VALUE
14	1 Raw_Read_Error_Rate 080 063 044 Pre-fail Always 115187504
15	
16	3 Spin_Up_Time 093 093 000 Pre-fail Always 0
17	4 Start_Stop_Count 100 100 020 Old_age Always 26
18	5 Reallocated_Sector_Ct 100 100 036 Pre-fail Always 1
19	
20	7 Seek_Error_Rate 087 060 030 Pre-fail Always 534389509
21	9 Power_On_Hours 087 087 000 Old_age Always 12084
22	
23	10 Spin_Retry_Count 100 100 097 Pre-fail Always 0
24	12 Power_Cycle_Count 100 100 020 Old_age Always 26
25	
	180 Unknown_Attribute 100 100 000 Pre-fail

26	Always 1535031962
27	184 Unknown_Attribute 100 100 003 Old_age Always 0
28	
29	187 Reported_Uncorrect 100 100 000 Old_age Always 0
30	188 Unknown_Attribute 100 100 000 Old_age Always 0
31	
	189 High_Fly_Writes 100 100 000 Old_age Always 0
	190 Airflow_Temp_Cel 073 065 045 Old_age Always 27
	191 G-Sense_Error_Rate 100 100 000 Old_age Always 0
	192 Power-Off_Retract_Ct 100 100 000 Old_age Always 22
	193 Load_Cycle_Count 100 100 000 Old_age Always 26
	194 Temperature_Celsius 027 040 000 Old_age Always 27
	195 Hardware_ECC_Reco 034 025 000 Old_age Always 115187504
	196 Reallocated_Event_Ct 100 100 036 Pre-fail Always 1
	197 Curr_Pending_Sector 100 100 000 Old_age Always 0

198 Offline\_Uncorrectable 100 100 000 Old\_age Offline 0

199 UDMA\_CRC\_Error\_Count 200 200 000 Old\_age Always 0

According the attributes provided by SMART, this disk doesn't look in good shape. So why not looking to its SMART error log? Let's run **smartctl -l error /dev/<disk>** 

1	
	srvoeltest1:~ # smartctl -l error /dev/sdc
2	
	smartctl 5.39 2008-10-24 22:33 [x86_64-suse-linux-
3	gnu] (openSUSE RPM)
4	Commight (C) 2002 8 km Drugs Allen (c)
4	brof="
5	http://smartmo
	ntools sourceforge net">
6	http://smartmontools.sourceforge.net
7	
8	=== START OF READ SMART DATA
	SECTION ===
9	
10	SMART Error Log Version: 1
10	Error 14049 accurred at dick newson on lifetime.
11	5037 hours (200 days + 21 hours)
11	5057 nouis (209 days + 21 nouis)
12	When the command that caused the error occurred,
	the device was active or
13	

14	idle.
15	
16	After command completion occurred, registers were:
17	ER ST SC SN CL CH DH
18	
19	40 51 08 95 58 37 e2 Error: UNC 8 sectors at I BA
20	= 0x02375895 = 37181589
21	
22	Commands leading to the command that caused the error were:
23	CR FR SC SN CL CH DH DC Powered Up Time
24	Command/Feature_Name
25	
26	c8 00 08 8e 58 37 e2 08 3d+10:30:59.131 READ DMA
27	c8 00 08 86 58 37 e2 08 3d+10:30:59.042 READ
28	DMA
29	b0 d1 01 00 4f c2 00 08 3d+10:30:59.039 SMART READ ATTRIBUTE THRESHOLDS [OBS-4]
30	c8 00 08 7e 58 37 e2 08 3d+10:30:58.713 READ
31	DMA
32	ec 00 00 00 00 00 a0 08 3d+10:30:58.688 IDENTIFY DEVICE

34	Error 14046 occurred at disk power-on lifetime: 5037 hours (209 days + 21 hours)
35 36	When the command that caused the error occurred, the device was active or idle.
37	
38	After command completion occurred, registers were:
39 40	ER ST SC SN CL CH DH
	<u></u>
	40 51 08 7d 58 37 e2 Error: UNC 8 sectors at LBA = 0x0237587d = 37181565
	Commands leading to the command that caused the error were:
	CR FR SC SN CL CH DH DC Powered_Up_Time Command/Feature_Name
	c8 00 08 76 58 37 e2 08 3d+10:30:54.293 READ DMA
	ec 00 00 00 00 00 a0 08 3d+10:30:54.269 IDENTIFY DEVICE
	ef 03 46 00 00 00 a0 08 3d+10:30:54.262 SET FEATURES [Set transfer mode]

#### ec 00 00 00 00 00 a0 08 3d+10:30:54.253 IDENTIFY DEVICE

c8 00 08 76 58 37 e2 08 3d+10:30:52.335 READ DMA

## **Running selftest checks**

If you have issues with a disk a good idea is then to run a selftest. Different tpyes of test are available with SMART

- short Basic tests
- long Extended SMART tests. Runs usually tens of minutes
- conveyance

Test dedicated to detection of damage during transport

• select

Selective self-test to test a range of disk Logical Block Addresses (LBA)

Run the test with the command: smartctl -t <type> /dev/<disk>

1	srvoeltest1:~ # smartctl -t short /dev/sdc
2 3	smartctl 5.39 2008-10-24 22:33 [x86_64-suse-linux- gnu] (openSUSE RPM)
4	Copyright (C) 2002-8 by Bruce Allen, <a <="" href="" th=""></a>
5	http://smartmo
6	http://smartmontools.sourceforge.net

,	
8	=== START OF OFFLINE IMMEDIATE AND SELF-TEST SECTION ===
9 10	Sending command: "Execute SMART Short self- test routine immediately in off-line mode".
	Drive command "Execute SMART Short self-test routine immediately in off-line mode" successful.
	Testing has begun.
	Please wait 2 minutes for test to complete.
	Test will complete after Wed Sep 5 11:44:26 2012

Once started the test will run in background. To check its results, use the command

#### smartctl -l selftest /dev/<disk>

7

1	srvoeltest1:~ # smartctl -l selftest /dev/sdc
3	smartctl 5.39 2008-10-24 22:33 [x86_64-suse-linux- gnu] (openSUSE RPM)
4	Copyright (C) 2002-8 by Bruce Allen, <a href="&lt;/th&gt;&lt;/tr&gt;&lt;tr&gt;&lt;th&gt;5&lt;/th&gt;&lt;td&gt;http://smartmo&lt;/td&gt;&lt;/tr&gt;&lt;tr&gt;&lt;th&gt;6&lt;/th&gt;&lt;th&gt;ntools.sourceforge.net"> http://smartmontools.sourceforge.net</a>
7	

=== START OF READ SMART DATA SECTION ===

SMART Self-test log structure revision number 1

Num Test\_Description Status Remaining LifeTime(hours) LBA\_of\_first\_error

# 1 Short offline Completed: read failure 90%6091 356245779

In the example above, we can see that the test failed after 10% on the Logical Block Address 356245779.

Last trick, the command to get the test output doesn't refresh itself automatically. Therefore you may have to run it several time until the test finished. A easy workaround is to run it as following: watch smartctl -l selftest /dev/<disk>

This will provide you an every 2 seconds refresh of the output. I hope that this smartctl overview will help.

Posted - Wed, Jul 25, 2018 2:07 PM. This article has been viewed 15284 times.

Online URL: http://kb.ictbanking.net/article.php?id=333