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## Preventive measures against hard disk failures with smartd / Installing smartmontools on Linux

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Many admins might not know about **smartmontools** Linux package. It provides two useful tools **smartctl** and **smartd** which use (*Self Monitoring and Reporting Technology system*) often abbreviated as **S.M.A.R.T.**. SMART support is nowadays available across any modern ATA, SATA and SCSI hard disks. smartmontools package is installable via default package repositories on virtually all different Linux distributions. Having *smartmontools* installed on all critical productive server is a must for the reason it serves as early notification system in case if hard disk is on the down-verge of break-up (i.e. physical media of hard disk storage starts getting damaged). Through the last 14 years I worked as Linux sysadmin. I've used *smartmontools* on hundreds of servers and on many times it save companies hundreds of dollars by simply reporting a system hdd is dying and by replacing the server or hard disk with identifiably configured ones. smartmontools supports monitoring of single hard disks as well as ones configured on a hardware level to work in some RAID array. As of time of writing you can check list of [smartmontools supported hardware RAID-Controllers here](#).

### 1. Installing smartmontools

a) *To install smartmontools on Debian and Ubuntu and other .deb based servers:*

```
debian:~# apt-get install --yes smartmontools
```

.....

b) *On CentOS, Fedora, RHEL and other RPM based install with:*

```
[root@centos ~]# yum --yes install smartmontools
```

.....

### 2. Configuring and Enabling smartd hard disk health monitoring

a) *on Debian and derivatives*

Edit `/etc/default/smartmontools`:

```
debian:~# vim /etc/default/smartmontools
```

By default file looks smth. like;

```
# Defaults for smartmontools initscript (/etc/init.d/smartmontools)
```

```
# This is a POSIX shell fragment

# List of devices you want to explicitly enable S.M.A.R.T. for
# Not needed (and not recommended) if the device is monitored by smartd
#enable_smart="/dev/hda /dev/hdb"
#enable_smart="/dev/hda"
# uncomment to start smartd on system startup
#start_smartd=yes

# uncomment to pass additional options to smartd on startup
#smartd_opts="--interval=1800"
```

Config file should look something like;

```
# Defaults for smartmontools initscript (/etc/init.d/smartmontools)
# This is a POSIX shell fragment

# List of devices you want to explicitly enable S.M.A.R.T. for
# Not needed (and not recommended) if the device is monitored by smartd
#enable_smart="/dev/hda /dev/hdb"
enable_smart="/dev/sda"
# uncomment to start smartd on system startup
start_smartd=yes

# uncomment to pass additional options to smartd on startup
#smartd_opts="--interval=1800"
```

*b) on CentOS, RHEL, Fedora for smartd options*

By default on RPM based distros there is no need for special configuration. However for some custom cases edit **/etc/sysconfig/smartmontools** and **/etc/smartd.conf**

*c) Enabling smartmontools*

```
[root@centos default]# /etc/init.d/smartd start
Starting smartd:      [ OK ]
```

### 3. Checking hard disk failure status with smartctl

Checking whether a SMART hard disk consistency check Passes is done simplest with:

```
debian:~# /usr/sbin/smartctl -H /dev/sda
```

```
smartctl 5.40 2010-07-12 r3124 [x86_64-unknown-linux-gnu] (local build)
Copyright (C) 2002-10 by Bruce Allen, http://smartmontools.sourceforge.net
```

```
SMART Health Status: OK
```

```
debian:~# /usr/sbin/smartctl -i /dev/sda1
```

```
smartctl version 5.38 [i686-redhat-linux-gnu] Copyright (C) 2002-8 Bruce Allen
Home page is http://smartmontools.sourceforge.net/
```

```
==== START OF INFORMATION SECTION ====
```

```
Model Family:   Seagate Barracuda 7200.7 and 7200.7 Plus family
Device Model:   ST340014AS
Serial Number:  4MQ0LV3B
Firmware Version: 3.43
User Capacity:  40,020,664,320 bytes
Device is:      In smartctl database [for details use: -P show]
ATA Version is: 6
ATA Standard is: ATA/ATAPI-6 T13 1410D revision 2
Local Time is:  Fri Mar 15 15:27:12 2013 EET
SMART support is: Available - device has SMART capability.
SMART support is: Enabled
```

*To print as much information as possible for hard disk health status;*

```
[root@centos default]# /usr/sbin/smartctl -a /dev/sda1
```

```
smartctl version 5.38 [i686-redhat-linux-gnu] Copyright (C) 2002-8 Bruce Allen
Home page is http://smartmontools.sourceforge.net/
```

```
==== START OF INFORMATION SECTION ====
```

```
Model Family:   Seagate Barracuda 7200.7 and 7200.7 Plus family
```

Device Model: ST340014AS  
Serial Number: 4MQ0LV3B  
Firmware Version: 3.43  
User Capacity: 40,020,664,320 bytes  
Device is: In smartctl database [for details use: -P show]  
ATA Version is: 6  
ATA Standard is: ATA/ATAPI-6 T13 1410D revision 2  
Local Time is: Fri Mar 15 15:14:53 2013 EET  
SMART support is: Available - device has SMART capability.  
SMART support is: Enabled

=== START OF READ SMART DATA SECTION ===  
SMART overall-health self-assessment test result: PASSED

### General SMART Values:

Offline data collection status: (0x82) Offline data collection activity was completed without error.  
Auto Offline Data Collection: Enabled.

Self-test execution status: ( 0) The previous self-test routine completed without error or no self-test has ever been run.

Total time to complete Offline data collection: ( 423) seconds.

Offline data collection capabilities: (0x5b) SMART execute Offline immediate.  
Auto Offline data collection on/off support.  
Suspend Offline collection upon new command.  
Offline surface scan supported.  
Self-test supported.  
No Conveyance Self-test supported.  
Selective Self-test supported.

SMART capabilities: (0x0003) Saves SMART data before entering power-saving mode.  
Supports SMART auto save timer.

Error logging capability: (0x01) Error logging supported.  
General Purpose Logging supported.

Short self-test routine recommended polling time: ( 1) minutes.

Extended self-test routine recommended polling time: ( 19) minutes.

SMART Attributes Data Structure revision number: 10

Vendor Specific SMART Attributes with Thresholds:

ID#	ATTRIBUTE_NAME	FLAG	VALUE	WORST	THRESH	TYPE	UPDATED
	WHEN_FAILED		RAW_VALUE				

```
1 Raw_Read_Error_Rate    0x000f 052 045 006 Pre-fail Always - 172137473
3 Spin_Up_Time           0x0002 098 098 000 Old_age Always - 0
4 Start_Stop_Count       0x0033 096 096 020 Pre-fail Always - 4198
5 Reallocated_Sector_Ct  0x0033 100 100 036 Pre-fail Always - 0
7 Seek_Error_Rate        0x000f 090 060 030 Pre-fail Always - 945095084
9 Power_On_Hours         0x0032 075 075 000 Old_age Always - 22769
10 Spin_Retry_Count      0x0013 100 100 097 Pre-fail Always - 0
12 Power_Cycle_Count     0x0033 099 099 020 Pre-fail Always - 1084
194 Temperature_Celsius  0x0022 038 046 000 Old_age Always - 38 (0 15 0 0)
195 Hardware_ECC_Recovered 0x001a 052 045 000 Old_age Always -
172137473
197 Current_Pending_Sector 0x0012 100 100 000 Old_age Always - 0
198 Offline_Uncorrectable 0x0010 100 100 000 Old_age Offline - 0
199 UDMA_CRC_Error_Count  0x003e 200 200 000 Old_age Always - 0
200 Multi_Zone_Error_Rate 0x0000 100 253 000 Old_age Offline - 0
202 TA_Increase_Count    0x0032 100 253 000 Old_age Always - 0
```

SMART Error Log Version: 1

ATA Error Count: 33 (device log contains only the most recent five errors)

CR = Command Register [HEX]

FR = Features Register [HEX]

SC = Sector Count Register [HEX]

SN = Sector Number Register [HEX]

CL = Cylinder Low Register [HEX]

CH = Cylinder High Register [HEX]

DH = Device/Head Register [HEX]

DC = Device Command Register [HEX]

ER = Error register [HEX]

ST = Status register [HEX]

Powered\_Up\_Time is measured from power on, and printed as DDd+hh:mm:SS.sss where DD=days, hh=hours, mm=minutes, SS=sec, and sss=millisec. It "wraps" after 49.710 days.

Error 33 occurred at disk power-on lifetime: 21588 hours (899 days + 12 hours)

When the command that caused the error occurred, the device was active or idle.

After command completion occurred, registers were:

ER ST SC SN CL CH DH

-----

40 51 00 77 c3 6a e0 Error: UNC at LBA = 0x006ac377 = 6996855

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 77 c3 6a e0 00 14:07:39.385 READ DMA

ec 00 00 00 00 00 a0 00 14:07:35.553 IDENTIFY DEVICE

```
ef 03 45 00 00 00 a0 00    14:07:35.550 SET FEATURES [Set transfer mode]
ec 00 00 00 00 00 a0 00    14:07:35.547 IDENTIFY DEVICE
c8 00 08 77 c3 6a e0 00    14:07:35.543 READ DMA
```

Error 32 occurred at disk power-on lifetime: 21588 hours (899 days + 12 hours)  
When the command that caused the error occurred, the device was active or idle.

After command completion occurred, registers were:

ER ST SC SN CL CH DH

-----

40 51 00 77 c3 6a e0 Error: UNC at LBA = 0x006ac377 = 6996855

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 77 c3 6a e0 00    14:07:23.940 READ DMA
ec 00 00 00 00 00 a0 00    14:07:35.553 IDENTIFY DEVICE
ef 03 45 00 00 00 a0 00    14:07:35.550 SET FEATURES [Set transfer mode]
ec 00 00 00 00 00 a0 00    14:07:35.547 IDENTIFY DEVICE
c8 00 08 77 c3 6a e0 00    14:07:35.543 READ DMA
```

Error 31 occurred at disk power-on lifetime: 21588 hours (899 days + 12 hours)  
When the command that caused the error occurred, the device was active or idle.

After command completion occurred, registers were:

ER ST SC SN CL CH DH

-----

40 51 00 77 c3 6a e0 Error: UNC at LBA = 0x006ac377 = 6996855

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 77 c3 6a e0 00    14:07:23.940 READ DMA
ec 00 00 00 00 00 a0 00    14:07:23.937 IDENTIFY DEVICE
ef 03 45 00 00 00 a0 00    14:07:20.071 SET FEATURES [Set transfer mode]
ec 00 00 00 00 00 a0 00    14:07:20.057 IDENTIFY DEVICE
c8 00 08 77 c3 6a e0 00    14:07:20.044 READ DMA
```

Error 30 occurred at disk power-on lifetime: 21588 hours (899 days + 12 hours)  
When the command that caused the error occurred, the device was active or idle.

After command completion occurred, registers were:

ER ST SC SN CL CH DH

-----

40 51 00 77 c3 6a e0 Error: UNC at LBA = 0x006ac377 = 6996855

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 77 c3 6a e0 00 14:07:23.940 READ DMA
ec 00 00 00 00 00 a0 00 14:07:23.937 IDENTIFY DEVICE
ef 03 45 00 00 00 a0 00 14:07:20.071 SET FEATURES [Set transfer mode]
ec 00 00 00 00 00 a0 00 14:07:20.057 IDENTIFY DEVICE
c8 00 08 77 c3 6a e0 00 14:07:20.044 READ DMA
```

Error 29 occurred at disk power-on lifetime: 21588 hours (899 days + 12 hours)  
When the command that caused the error occurred, the device was active or idle.

After command completion occurred, registers were:

```
ER ST SC SN CL CH DH
```

```
-----
```

```
40 51 00 77 c3 6a e0 Error: UNC at LBA = 0x006ac377 = 6996855
```

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 77 c3 6a e0 00 14:07:23.940 READ DMA
ec 00 00 00 00 00 a0 00 14:07:23.937 IDENTIFY DEVICE
ef 03 45 00 00 00 a0 00 14:07:20.071 SET FEATURES [Set transfer mode]
ec 00 00 00 00 00 a0 00 14:07:20.057 IDENTIFY DEVICE
c8 00 08 77 c3 6a e0 00 14:07:20.044 READ DMA
```

SMART Self-test log structure revision number 1

Num	Test_Description	Status	Remaining	LifeTime(hours)	LBA_of_first_error
# 1	Extended offline	Completed without error	00%	1	-

SMART Selective self-test log data structure revision number 1

SPAN	MIN_LBA	MAX_LBA	CURRENT_TEST_STATUS
1	0	0	Not_testing
2	0	0	Not_testing
3	0	0	Not_testing
4	0	0	Not_testing
5	0	0	Not_testing

Selective self-test flags (0x0):

After scanning selected spans, do NOT read-scan remainder of disk.

If Selective self-test is pending on power-up, resume after 0 minute delay.

#### 4. Visualizing smartd collected data in GUI with *gsmartcontrol*

For people who prefer to visualize things in Graphical environment smartd service hard disk health data can be viewed in nice graphical interface with *gsmartcontrol* tool. Most Linux servers don't have



graphical environment as having a X server with any graphics manager is a waste of system resources thus installing gsmartcontrol doesn't make much sense, however for monitoring and reporting for upcoming Hard Disk issues gsmartcontrol is a good one to have.

a) *To install gsmartcontrol on Debian and Ubuntu Linux;*

```
debian:~# apt-get install --yes gsmartcontrol
```

....

b) *Installing gsmartcontrol on CentOS, Fedora, RHEL and SuSE;*

gsmartcontrol has a binary package builds for all major Linux distributions, except Slackware Linux. For any of RPM based Linux distros. Go and [download required smartmontools distro version and type binary from here](#) then install the RPMs one by one with the usual:

```
[root@centos ~]# rpm -ivh glimm*
```

....

```
[root@centos ~]# rpm -ivh libgladem*
```

....

```
[root@centos ~]# rpm -ivh libsigc*
```

....

```
[root@centos ~]# rpm -ivh cairomm*
```

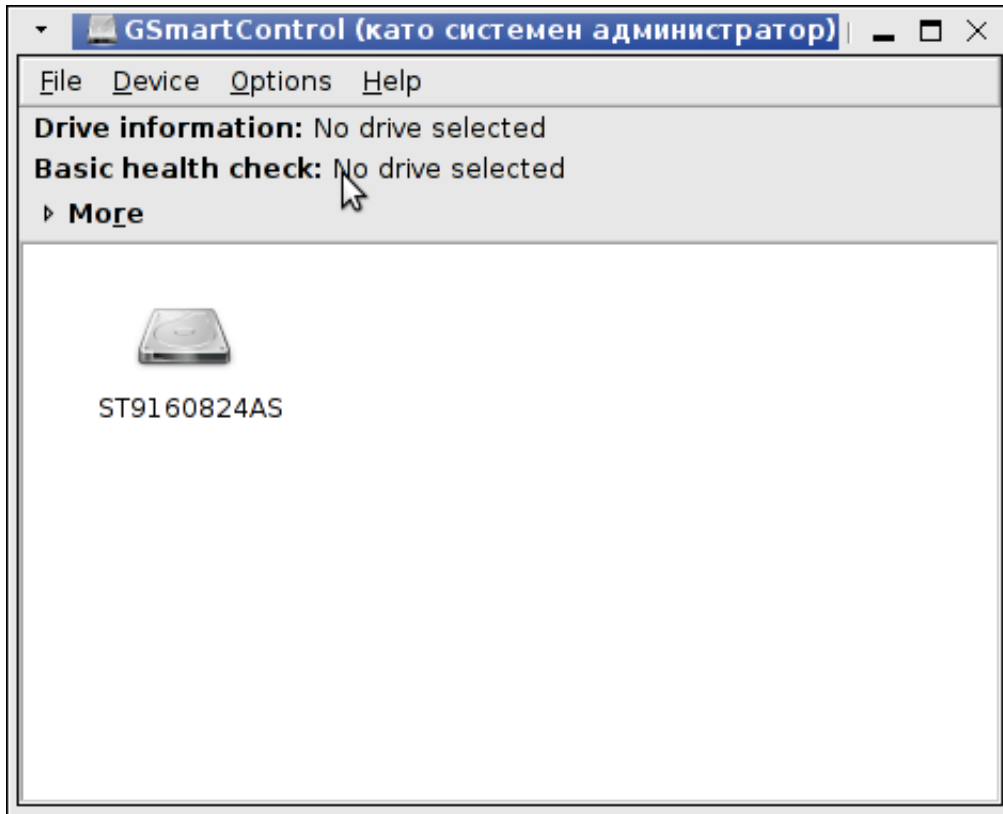
....

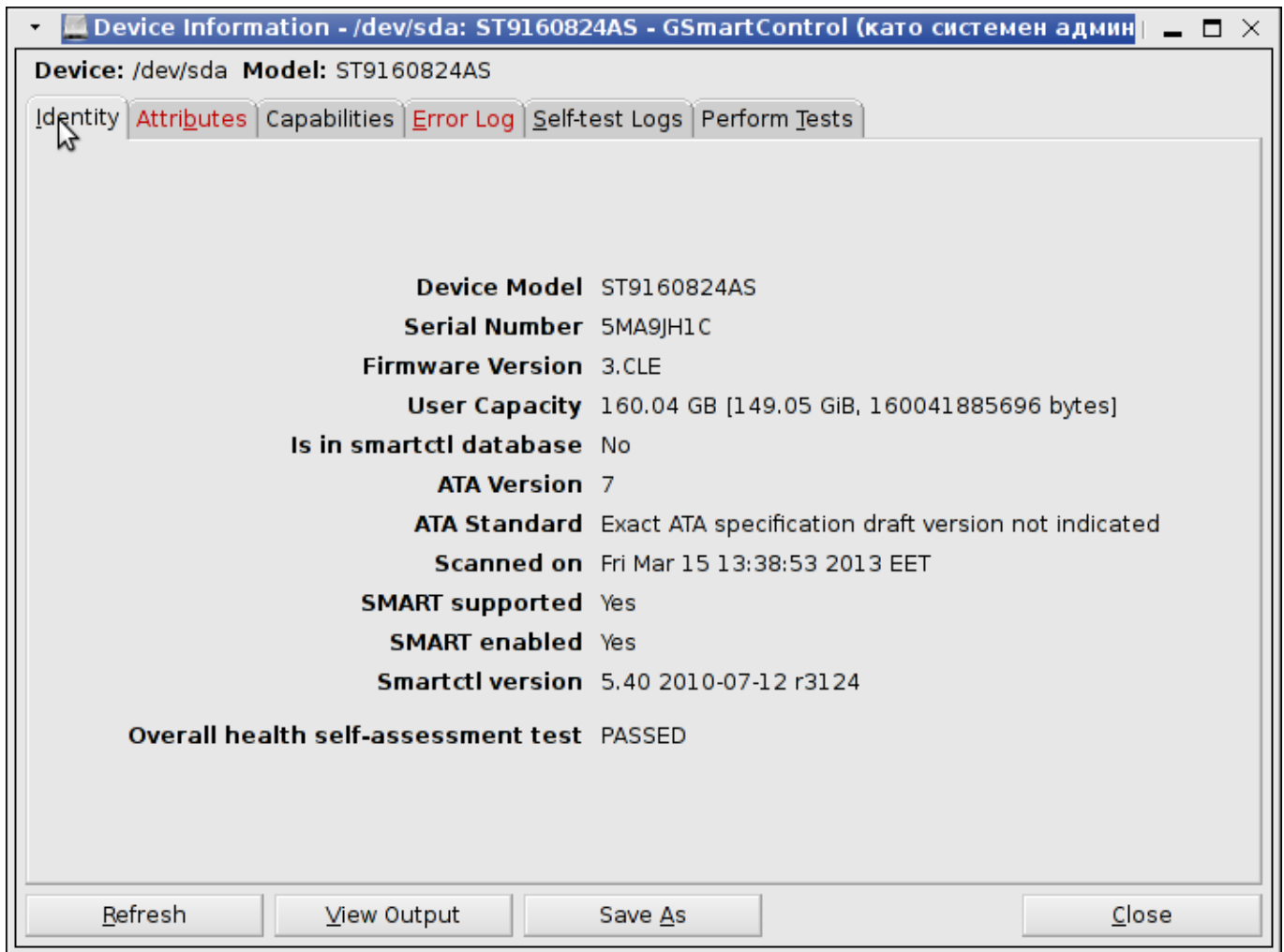
```
[root@centos ~]# rpm -ivh gsmartcontrol*
```

....

Below, are 2 screenshots of GSmartControl taken from my







If you get something different from **Overall health self-assessment test PASSED**, this means hard disk has a surface damage and needs to be replaced ASAP. If during hard disk normal operation HDD hits *I/O errors* and you can't afford to have a GUI environment just for *gsmartcontrol*, errors gets logged in *dmesg* hence *dmesg* could be useful to provide you with info of a failing hard drive.