Identifying Power On Hours for SSD Drives

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Background

"Power on hours" is an important metric for SSD lifespan determination. In order to identify the affected Solid State Drives(SSD), you will need to download 3rdparty utilities that will allow you to see the Power-On Hours(PoH)and in some cases the model#for the affected SSD. Below you will find the instructions on where to get the utilities and how to use them.

Where to get the utilities

There are4different utilities to choose from depending on your OS and needs. Please review the below table.

Tool	Applicable OS's	Tool Source
SmartMon Tools	Linux, Windows, VMware	https://sourceforge.net/projects/smartmontools/files/smartmontools
sg3_utils	Linux, Windows	http://sg.danny.cz/sg/sg3_utils.
SanDisk Tool	Linux, Windows	https://kb.sandisk.com/app/answers/detail/a_id/18565/~/lightning-g-ssd-drive-firmware
Storcli Utility	All OS's	https://docs.broadcom.com/doc/7.1410.0000.0000_Unified_Sto.zip

Steps on how to use each utility.

Each utility requires some knowledge on installing software in Linux, VMware and Windows. Be sure to read any readme files before installing.

SmartMonTools for Windows - JBOD mode

Note: If you are using a RAID controller, you cannot collect this data through Windows

1. **Installation:** Go the download link posted in the table above and download and install the smartmontools utilityGet the smartctl Windows setup file through above link.Execute the setup file:

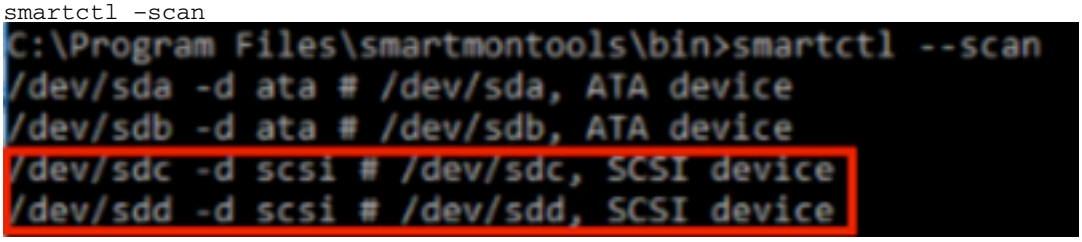
   ```
   smartmontools-7.1-1.win32-setup.exe
   ```

   Open the command promptGo to folder:

   ```
   C:\Program Files\smartmontools\bin
   ```

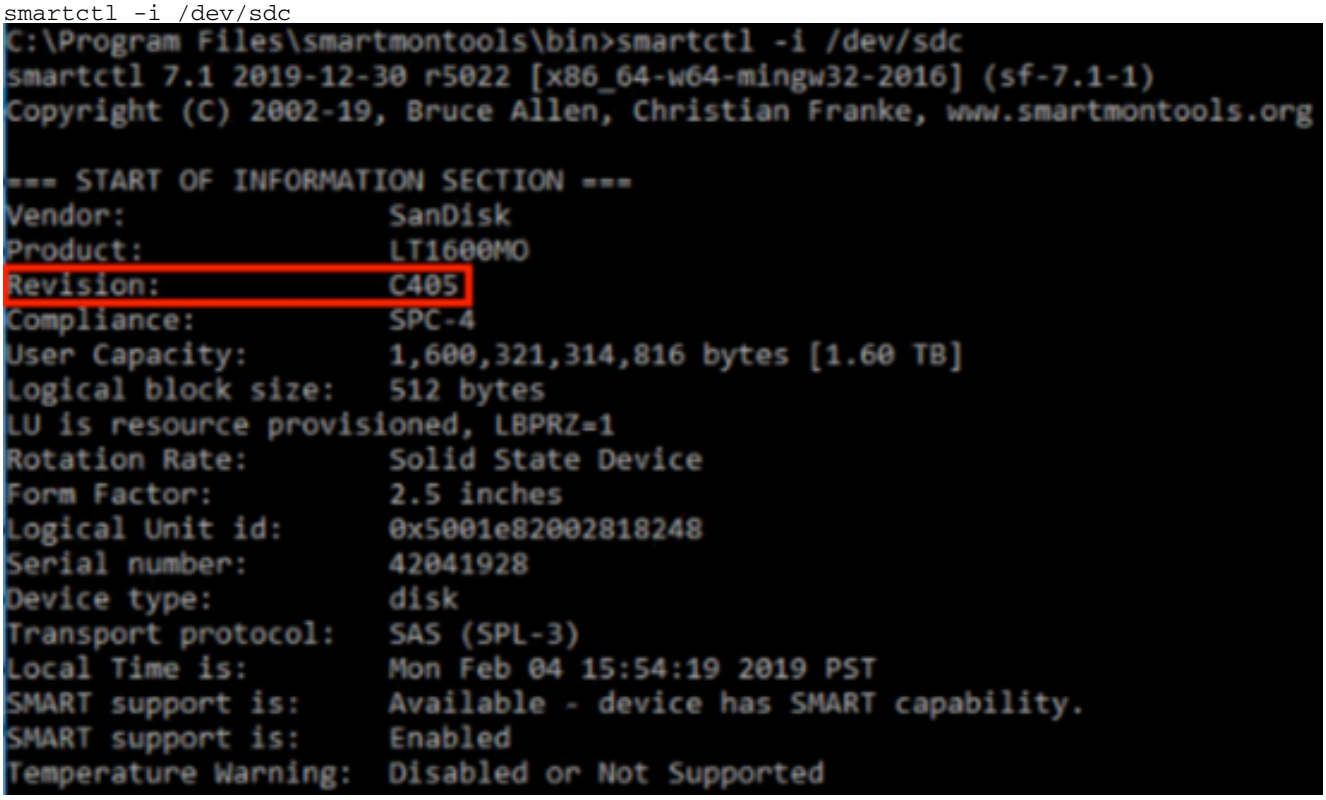
2. **Check Drive Firmware Version:** Run below command to get the device name of target drive.

   ```
   smartctl –scan
   ```

   [jbod windows smartmon fw 1]Read drive firmware version as below:

   ```
   smartctl -i /dev/sdc
   ```

   [jbod windows smartmon fw 2]

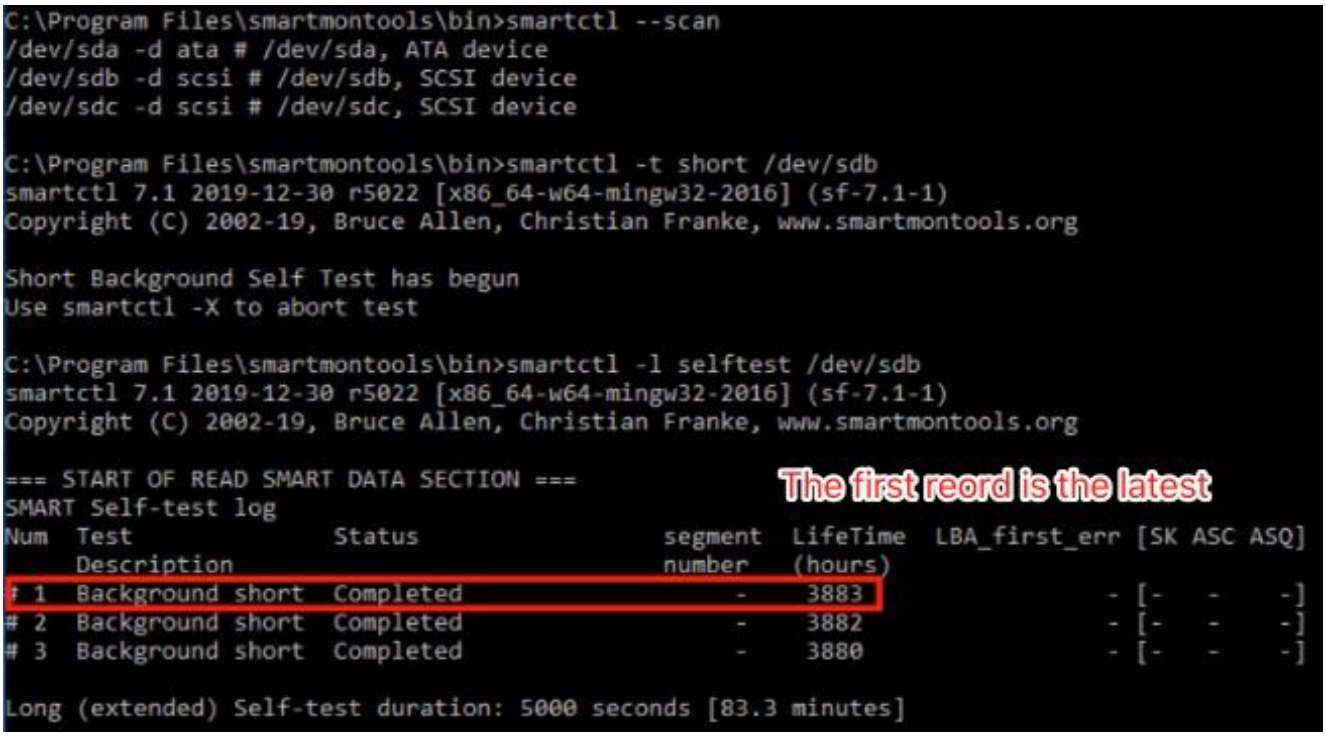
3. Check Power On Hours: Once installed, you will be using the ‘smartctl’ utility within the smartmontools package.Open up CMD, go to the smartmontools directory and find the list of SSDs by typing:

   ```
   smartctl.exe --scan
   ```

   Once you identify which SSD you want to check, you can then type the following two commands in order to get the output needed (where X is the drive letter you wish to check

```
smartctl -t short /dev/sdX – Wait 10 seconds before running the second command
smartctl -l selftest /dev/sdX
```

Look for the “Lifetime” hours from the 1st line. That will be the latest record of PoH.



[jbod windows smartmon]

SmartMonTools for Linux – JBOD Mode

1. Installation: Go the download link posted in the table above and download and install the smartmontools utility.Get the smartctl installation file Linux version through above link.Untar the installation file.

   ```
   tar -zxvf smartmontools-7.1.tar.gz
   ```

   Go to folder:

   ```
   smartmontools-7.1
   ```

   Run below commands in order.

   ```
   ./configure
   make
   make install
   ```

2. Check Drive Firmware Version: ‘sdb’ is the device name of target drive.

   ```
   smartctl -i /dev/sdb
   ```

```
[root@localhost ~]# smartctl -i /dev/sdb
smartctl 6.5 2016-05-07 r4318 [x86_64-linux-3.10.0-957.el7.x86_64] (local build)
Copyright (C) 2002-16, Bruce Allen, Christian Franke, www.smartmontools.org

=== START OF INFORMATION SECTION ===
Vendor:               SanDisk
Product:              LT1600MO
Revision:             C405
Compliance:           SPC-4
User Capacity:        1,600,321,314,816 bytes [1.60 TB]
Logical block size:   512 bytes
LU is resource provisioned, LBPRZ=1
Rotation Rate:        Solid State Device
Form Factor:          2.5 inches
Logical Unit id:      0x5001e82002818248
Serial number:        42041928
Device type:          disk
Transport protocol:   SAS (SPL-3)
Local Time is:        Mon Feb  4 19:38:03 2019 CST
SMART support is:     Available - device has SMART capability.
SMART support is:     Enabled
Temperature Warning:  Disabled or Not Supported
```

[jbod linux smartmon fw]

3. Check Power On Hours (POH) Go to the smartmontools directory and find the list of SSDs by typing:

```
esxcli storage core device list
```

Once you identify which SSD you want to check, you can thentype the following two commands in order to get the output needed (where X is the drive letter you wish to check

```
smartctl -t short /dev/sdX – Wait 10 seconds before running the second command
smartctl -l selftest /dev/sdX
```

Look for the “Lifetime” hours from the 1st line. That will be the latest record of PoH.

```
[root@localhost ~]# smartctl -t short /dev/sda
smartctl 7.0 2018-12-30 r4883 [x86_64-linux-3.10.0-957.el7.x86_64] (local build)
Copyright (C) 2002-18, Bruce Allen, Christian Franke, www.smartmontools.org

Short Background Self Test has begun
Use smartctl -X to abort test
[root@localhost ~]# smartctl -l selftest /dev/sda
smartctl 7.0 2018-12-30 r4883 [x86_64-linux-3.10.0-957.el7.x86_64] (local build)
Copyright (C) 2002-18, Bruce Allen, Christian Franke, www.smartmontools.org

=== START OF READ SMART DATA SECTION ===
SMART Self-test log
Num  Test              Status                 segment  LifeTime  LBA_first_err [SK ASC ASQ]
     Description                              number   (hours)
# 1  Background short  Completed                  -    6439                 - [-   -    -]
# 2  Background short  Completed                  -    6433                 - [-   -    -]
# 3  Background short  Completed                  -    6433                 - [-   -    -]
# 4  Reserved(7)       Aborted (device reset ?)   -     317                 - [-   -    -]

Long (extended) Self-test duration: 5000 seconds [83.3 minutes]

[root@localhost ~]#
```

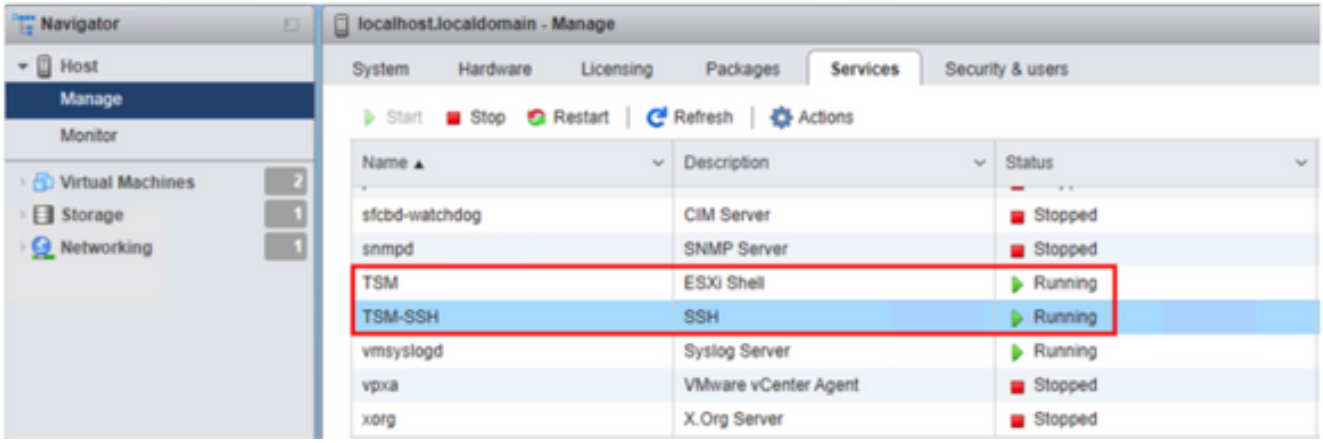
The first one is the latest record

[jbod linux smartmon]

SmartMonTools for ESXi – JBOD Mode

1. Installation: Go the download link posted in the table above and download and install

the smartmontools utility Get the smartctl ESXi installation file through above link.Enable shell and SSH on the ESXi host.



[jbod esxi smartmon install]

Upload file ‘smartctl-6.6-4321.x86_64.vib’ into ESXi host ‘tmp’ folder through ftp tool.SSH to the ESXi host.Set the ViB acceptance level to CommunitySupported.

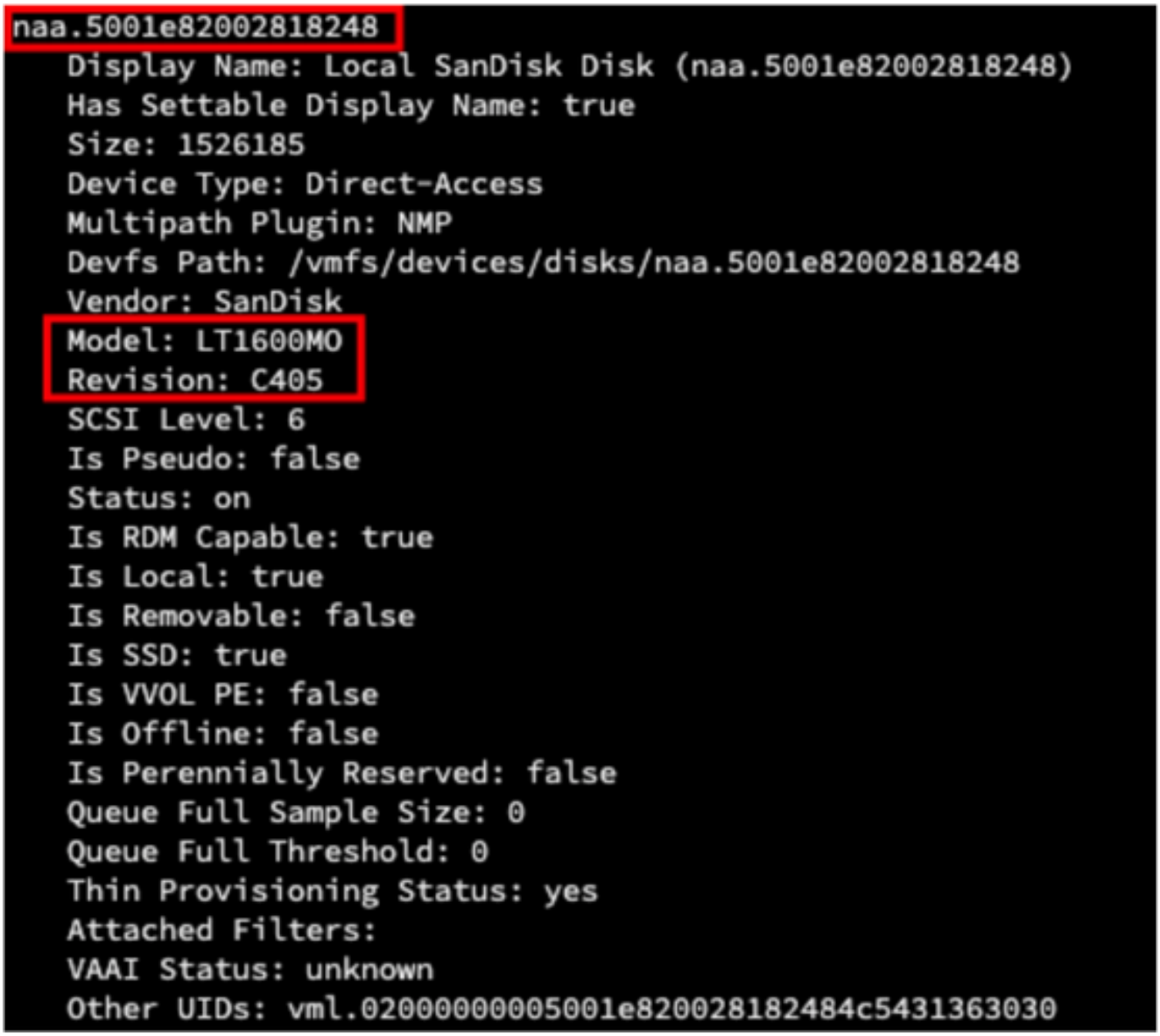
```
esxcli software acceptance set --level=CommunitySupported
```

Then install the package.

```
esxcli software vib install -v /tmp/smartctl-6.6-4321.x86_64.vib
```

2. Check the Drive Firmware Version SSH to the ESXi host. Then run below command to get the device name and firmware version of target drive.

```
esxcli storage core device list
```



[jbod esxi smartmon fw]

Check Power On Hours (POH) Go to the smartmontools directory and find the list of SSDs by typing

```
esxcli storage core device list
```

Once you identify which SSD you want to check, you can then type the following two commands in order to get the output needed (where naa.xxx is the drive letter you wish to check

```
/opt/smartmontools/smartctl -d scsi -t short /dev/disks/naa.xxx – Wait 10 seconds before running the second command
/opt/smartmontools/smartctl -d scsi -l selftest /dev/disks/naa.xxx
```

Look for the “Lifetime” hours from the 1st line. That will be the latest record of PoH.

```
[root@localhost:~] /opt/smartmontools/smartctl -d scsi -t short /dev/disks/naa.5001e82002818248
smartctl 6.6 2016-05-10 r4321 [x86_64-linux-6.5.0] (daily-20160510)
Copyright (C) 2002-16, Bruce Allen, Christian Franke, www.smartmontools.org

Short Background Self Test has begun
Use smartctl -X to abort test
[root@localhost:~] /opt/smartmontools/smartctl -d scsi -l selftest /dev/disks/naa.5001e82002818248
smartctl 6.6 2016-05-10 r4321 [x86_64-linux-6.5.0] (daily-20160510)
Copyright (C) 2002-16, Bruce Allen, Christian Franke, www.smartmontools.org

=== START OF READ SMART DATA SECTION ===
SMART Self-test log
Num  Test              Status                 segment  LifeTime  LBA_first_err [SK ASC ASQ]
     Description                              number   (hours)
# 1  Background short  Completed                  -    2505                 - [-   -    -]
# 2  Background short  Completed                  -    2409                 - [-   -    -]

Long (extended) Self Test duration: 29600 seconds [493.3 minutes]
```

[jbod esxi smartmon]

Sg3_utils for Windows - JBOD mode

1. Installation Go the download link posted in the table above and download and install the sg3_utils utilityGet the smartctl Windows setup file through above link.Execute the setup file:

   ```
   smartmontools-7.1-1.win32-setup.exe
   ```

   Open the command promptGo to folder:

   ```
   C:\Program Files\smartmontools\bin
   ```

2. Check the Drive Firmware Version: Run below command to get the device name of target drive.

   ```
   smartctl –scan
   ```

```
C:\Program Files\smartmontools\bin>smartctl --scan
/dev/sda -d ata # /dev/sda, ATA device
/dev/sdb -d ata # /dev/sdb, ATA device
/dev/sdc -d scsi # /dev/sdc, SCSI device
/dev/sdd -d scsi # /dev/sdd, SCSI device
```

[jbod windows sg3_utils fw 1]Read drive firmware version as below

```
smartctl –i /dev/sdc
```

```
C:\Program Files\smartmontools\bin>smartctl -i /dev/sdc
smartctl 7.1 2019-12-30 r5022 [x86_64-w64-mingw32-2016] (sf-7.1-1)
Copyright (C) 2002-19, Bruce Allen, Christian Franke, www.smartmontools.org

=== START OF INFORMATION SECTION ===
Vendor:               SanDisk
Product:              LT1600MO
Revision:             C405
Compliance:           SPC-4
User Capacity:        1,600,321,314,816 bytes [1.60 TB]
Logical block size:   512 bytes
LU is resource provisioned, LBPRZ=1
Rotation Rate:        Solid State Device
Form Factor:          2.5 inches
Logical Unit id:      0x5001e82002818248
Serial number:        42041928
Device type:          disk
Transport protocol:   SAS (SPL-3)
Local Time is:        Mon Feb 04 15:54:19 2019 PST
SMART support is:     Available - device has SMART capability.
SMART support is:     Enabled
Temperature Warning:  Disabled or Not Supported
```

[jbod windows sg3_utils fw 2]

3. Check Power On Hours: Go to the sg3_utils directory and find the list of SSDs by typing:

```
sg_scan
```

Once you identify which SSD you want to check, you can then type the following command(where X is the drive letter you wish to check):

```
sg_logs --page=0x15 pdX
```

Look for the “Accumulated power on minutes”.

```
C:\Users\Administrator\Downloads\sg3_utils-1.45mgw64>sg_scan
PD0     [C]     ST1000NX0423  CT05              S4702TL2
PD1             SanDisk   LT0400MO          C405  42211160
PD2             SanDisk   LT1600MO          C405  42041928

C:\Users\Administrator\Downloads\sg3_utils-1.45mgw64>sg_logs --page=0x15 pd2
    SanDisk   LT1600MO          C405
Background scan results page  [0x15]
  Status parameters:
    Accumulated power on minutes: 144762 [h:m  2412:42]
    Status: background medium scan is active
    Number of background scans performed: 36750
    Background medium scan progress: 1.13831 %
    Number of background medium scans performed: 36750
```

[jbod windows sg3_utils]

Sg3_utils for Linux - JBOD mode

1. Installation: Go the download link posted in the table above and download and install the sg3_utils utilityGet the sg3_utils installation file Linux version through above link.Untar the installation file.

```
tar -zxvf sg3_utils-1.45.tgz
```

Go to folder ‘sg3_utils-1.45’.Run below commands in order.

```
./configure
make
make install
```

2. Check Drive Firmware Version ‘sdb’ is the device name of target drive.

```
sg_logs --page=0x33 /dev/sdb
```

```
[root@localhost ~]# sg logs --page=0x33 /dev/sdb
    SanDisk   LT1600MO          C405
No ascii information for page = 0x33, here is hex:
 00     33 00 07 c8 00 00 03 08  56 55 5f 50 41 47 45 53
 10     00 01 03 08 01 02 03 04  05 06 07 08 00 02 03 08
 20     09 0a 0b 0c 0d 0e 0f 10  00 03 03 08 12 2f 00 00
 30     00 00 00 00 00 04 03 08  00 00 00 00 00 00 00 00
 .....  [truncated after 64 of 1996 bytes (use '-H' to see the rest)]
```

[jbod linux sg3_utils fw]

3. Check Power On Hours Once you identify which SSD you want to check, you can then type the following command(where X is the drive letter you wish to check):

```
sg_logs --page=0x15 /dev/sdX
```

Look for the “Accumulated power on minutes”.

```
[root@localhost ~]# sg_logs --page=0x15 /dev/sdb
    SanDisk   LT1600MO          C405
Background scan results page  [0x15]
  Status parameters:
    Accumulated power on minutes: 372254 [h:m  6204:14]
    Status: background medium scan is active
    Number of background scans performed: 3321
    Background medium scan progress: 3.52 %
    Number of background medium scans performed: 3321
```

[jbod linux sg3_utils.jpg]

Sandisk Tool for Windows - JBOD mode

1. Installation: Go the download link posted in the table above and download and install the sg3_utils utilityGet the smartctl Windows setup file through above link.Execute the setup file

```
smartmontools-7.1-1.win32-setup.exe
```

Open a command promptGo to folder:

```
C:\Program Files\smartmontools\bin
```

2. Check Drive Firmware Version Run below command to get the device name of target drive.

```
smartctl -scan
```

```
C:\Program Files\smartmontools\bin>smartctl --scan
/dev/sda -d ata # /dev/sda, ATA device
/dev/sdb -d ata # /dev/sdb, ATA device
/dev/sdc -d scsi # /dev/sdc, SCSI device
/dev/sdd -d scsi # /dev/sdd, SCSI device
```

[jbod windows sandisk fw]

3. Check Power On Hours To identify the drive you want to check, type the command:

```
scli show all
```

Once you identify which SSD you want to check, you can then type the

following command(where X is the drive letter you wish to check):

```
scli show diskX -S
```

Look for “Total Power on Hours”.

```
C:\Program Files\SanDisk\scli\bin64>scli show all
SanDisk scli version 1.8.0.12
Copyright (C) 2014 SanDisk
01/30/2019  18:30:57

Device            Port Capacity  State   Boot DeviceSerial#        Model
----------------- ---- --------- ------- ---- ---------------- ----------------
DISK0             SATA 1.00 TB   Unknown Yes  S4702TL2         ST1000NX0423
DISK1             SAS  400.09 GB Good    No   42211160         LT0400MO
DISK2             SAS  1.60 TB   Good    No   42041928         LT1600MO

Command Executed Successfully.

C:\Program Files\SanDisk\scli\bin64>scli show disk2 -S
SanDisk scli version 1.8.0.12
Copyright (C) 2014 SanDisk
01/30/2019  18:55:39


Statistics Information for disk2
--------------------------------
Life Used                 : 1 %
Temperature               : 39 Celsius
Total Read                : 164.96 TB
Total Write               : 275.10 TB
Total Read Commands       : 12052397070
Total Write Commands      : 18756685157
Read Errors               : 1
Program Events            : 0
Background Read Events    : 0
GList Count               : 1
Lifetime Max Temperature  : 73 Celsius
Total Power on Hours      : 2409

Command Executed Successfully.
```

[jbod windows sandisk]

Sandisk Tool for Linux - JBOD mode

1. Installation Go the download link posted in the table above and download and install the sg3_utils utilityGet the scli installation file Linux version through above link.Unzip the installation file.Go to folder:

   ```
   Linux_1.8.0.12/generic/x86_64
   ```

   Run below command to let ‘scli’ be executable.

   ```
   chmod +x scli
   ```

2. Check Drive Firmware Version ‘sdb’ is the device name of target drive.

   ```
   ./scli show /dev/sdb -a
   ```

```
[root@localhost x86_64]# ./scli show /dev/sdb -a
SanDisk scli version 1.8.0.12
Copyright (C) 2014 SanDisk
07/15/2020  15:41:10

Asset Information for /dev/sdb
------------------------------
Vendor          : SanDisk
Product ID      : LT1600M0
Revision Level  : C405
Serial No       : 42062372
Part Number     : 193a
WWN LUN         : 5001e8200281d224
WWN Target      : 5001e8200281d225

Command Executed Successfully.
```

[jbod linux sandisk fw]

3. Check Power On Hours Once you identify which SSD you want to check, you can then type the following command(where X is the drive letter you wish to check):

```
./scli show /dev/sdX -S
```

Look for “Total Power on Hours”.

```
[root@localhost x86_64]# ./scli show /dev/sda -S
SanDisk scli version 1.8.0.12
Copyright (C) 2014 SanDisk
07/10/2020  19:53:30


Statistics Information for /dev/sda
-----------------------------------
Life Used                 : 6 %
Temperature               : 41 Celsius
Total Read                : 275.83 TB
Total Write               : 580.95 TB
Total Read Commands       : 23791125744
Total Write Commands      : 29664369071
Read Errors               : 0
Program Events            : 0
Background Read Events    : 0
GList Count               : 1
Lifetime Max Temperature  : 71 Celsius
Total Power on Hours      : 6436

Command Executed Successfully.
```

[jbod linux sandisk]

SmartMonTools for Linux - RAID mode

1. Installation You will need to install both smartmontools and storcli utility to collect the data.Go the download link posted in the table above and download and install the smartmontools utility Get the smartctl installation file Linux version through above

link.Untar the installation file.

```
tar -zxvf smartmontools-7.1.tar.gz
```

Go to folder:

```
smartmontools-7.1
```

Run below commands in order.

```
./configure
make
make install
```

Now go to the download link posted in the table above and download and install the storcli utility.To identify the drive you want to check, go to the storcli directory and type the command:

```
storcli /c0/eall/sall show
```

Look for the Device ID(DID). The Device ID will be needed in the future steps.

```
[root@localhost smartctl]# storcli /c0/eall/sall show
CLI Version = 007.0913.0000.0000 Jan 11, 2019
Operating system = Linux 3.10.0-957.el7.x86_64
Controller = 0
Status = Success
Description = Show Drive Information Succeeded.


Drive Information :
==================

-----------------------------------------------------------------------------------------
EID:Slt DID State DG       Size Intf Med SED PI SeSz Model                          Sp Type
-----------------------------------------------------------------------------------------
252:1    69 Onln   0 222.585 GB SATA SSD N   N  512B SAMSUNG MZ7LM240HMHQ-00005 U  -
252:4    91 JBOD   - 372.611 GB SAS  SSD N   N  512B LT0400MO                   U  -
252:5    88 JBOD   -   1.455 TB SAS  SSD N   N  512B LT1600MO                   U  -
-----------------------------------------------------------------------------------------
```

[raid linux smartmon fw 1]

2. Check Drive Firmware Version ‘148’ in below command is the device ID (DID) of target drive. And ‘sdc’ is its device name.

```
smartctl -d megaraid,148 -i /dev/sdc
[root@localhost ~]# smartctl -d megaraid,148 -i /dev/sdc
smartctl 6.5 2016-05-07 r4318 [x86_64-linux-3.10.0-957.el7.x86_64] (local build)
Copyright (C) 2002-16, Bruce Allen, Christian Franke, www.smartmontools.org

=== START OF INFORMATION SECTION ===
Vendor:               SanDisk
Product:              LT0400MO
Revision:             C405
Compliance:           SPC-4
User Capacity:        400,088,457,216 bytes [400 GB]
Logical block size:   512 bytes
LU is resource provisioned, LBPRZ=1
Rotation Rate:        Solid State Device
Form Factor:          2.5 inches
Logical Unit id:      0x5001e82002841758
Serial number:        42211160
Device type:          disk
Transport protocol:   SAS (SPL-3)
Local Time is:        Mon Feb  4 23:08:06 2019 CST
SMART support is:     Available - device has SMART capability.
SMART support is:     Enabled
Temperature Warning:  Disabled or Not Supported
```

[raid linux smartmon fw 2]

3. Check Power On Hours Once you identify which SSD you want to check, you can then type the following two commands in order to get the output needed (where X is the Device ID you

got from step 4

Note: In order for this to work, you need to make sure and use the '**megaraid**'switch in the command when using a RAID set. Otherwise it won't work.

```
smartctl -d megaraid,N -t short /dev/sdX – Wait 10 seconds before running the second command
smartctl -d megaraid,N -l selftest /dev/sdX
```

Look for the "Lifetime" hours from the 1st line. That will be the latest record of PoH.

```
-----------------------------------------------------------------------------------------
EID:Slt DID State DG       Size Intf Med SED PI SeSz Model                          Sp Type
-----------------------------------------------------------------------------------------
252:1    69 Onln   0 222.585 GB SATA SSD N   N  512B SAMSUNG MZ7LM240HMHQ-00005 U  -
252:4    91 JBOD   - 372.611 GB SAS  SSD N   N  512B LT0400MO                  U  -
252:5    88 JBOD   -   1.455 TB SAS  SSD N   N  512B LT1600MO                  U  -
-----------------------------------------------------------------------------------------

EID=Enclosure Device ID|Slt=Slot No.|DID=Device ID DG=DriveGroup
DHS=Dedicated Hot Spare|UGood=Unconfigured Good|GHS=Global Hotspare
UBad=Unconfigured Bad|Onln=Online|Offln=Offline|Intf=Interface
Med=Media Type|SED=Self Encryptive Drive|PI=Protection Info
SeSz=Sector Size|Sp=Spun|U=Up|D=Down|T=Transition|F=Foreign
UGUnsp=Unsupported|UGShld=UnConfigured shielded|HSPShld=Hotspare shielded
CFShld=Configured shielded|Cpybck=CopyBack|CBShld=Copyback Shielded



[root@localhost ~]# smartctl -d megaraid,88 -t short /dev/sdb
smartctl 7.0 2018-12-30 r4883 [x86_64-linux-3.10.0-957.el7.x86_64] (local build)
Copyright (C) 2002-18, Bruce Allen, Christian Franke, www.smartmontools.org

Short Background Self Test has begun
Use smartctl -X to abort test
[root@localhost ~]# smartctl -d megaraid,88 -l selftest /dev/sdb
smartctl 7.0 2018-12-30 r4883 [x86_64-linux-3.10.0-957.el7.x86_64] (local build)
Copyright (C) 2002-18, Bruce Allen, Christian Franke, www.smartmontools.org

=== START OF READ SMART DATA SECTION ===
SMART Self-test log
Num  Test              Status                 segment  LifeTime  LBA_first_err [SK ASC ASQ]
     Description                              number   (hours)
# 1  Background short  Completed                  -    6204                 - [-   -    -]
# 2  Background short  Completed                  -    6203                 - [-   -    -]
# 3  Background short  Completed                  -    6198                 - [-   -    -]
# 4  Background short  Completed                  -    6198                 - [-   -    -]
# 5  Background short  Completed                  -    6198                 - [-   -    -]

Long (extended) Self-test duration: 29600 seconds [493.3 minutes]
```

[raid linux smartmon]

Note: SmartMonTools does not work in RAID for ESXi. sg3_utils and Sandisk Tool do not work in RAID for all OSes.