Multi-Report

User Guide

v3.1

Updated 18 January 2025

READ ME NOW!

Multi-Report 3.1 no longer performs SMART tests by default, you must enable them. This is intentional due to if someone already has TrueNAS GUI performing SMART tests, it likely is not good slamming your drives with a lot of extra testing. SMART tests are now performed by the new script Drive-Selftest, please read the User Guide on how to set up the tests. You can use Multi-Report `-config` to setup the testing (keeping one config file common) and from the Main Menu, choose option 'D'. Just follow the instructions. Read that User Guide to understand how this new script works. It was designed to also run on its own.

INTRODUCTION

This user guide will provide an explanation of how to run and configure the Multi-Report script for your specific use. Please read this entire user guide before proceeding as there are many customizations for practically every situation.

The guide has a QUICK START section where you can utilize most of the default settings to get the script up and running fast, and customize it later as you learn what Multi-Report can do for you.

IF YOU HAVE A PROBLEM

Have a problem? First check the Common Problems and Solutions section of this user guide. It is not all inclusive however it does list the most common issues. You may also check the TrueNAS forums for additional information.

If you discover a drive that appears to be reporting in error, please run the script using the '-dump email' switches and enter a short message pointing out the problem when asked. An example is: "I have this big red alarm, what is it and how can I get rid of it?" or "Arg! I have ada2 errors and I don't think they are valid". This will send me an email from your TrueNAS system with SMART data from your drives, and a few other files which **will not** contain anything you would not want to share, except your personal email address. I should be able to analyze the issue and hopefully provide a suitable solution.

How fast will I respond? I still have a day job which means I will respond as soon as I check my emails after I get home from work. There are days I do not check my emails because I just do not feel like sitting in front of another computer that evening. However, I will respond to you once I receive the data and can analyze it. If you are just sending me drive data for collection purposes, please enter a message similar to "Hi Joe, here is some drive data for you. Dude this is such a great tool that I dropped $60 USD

into your go fund me account." LOL. While some people have offered me money, I don't do this for money and I will not take money as anyone can create this stuff. It is a learning experience for me.

NOTE: When you send me an email, I will know the address you sent it from. I will not share your email, go buy a new car, or sell it on the Dark Web (it is probably already there). I will use it to send you back a message if you reported a problem.

CHANGES V 3.1 (aka 3.0.8 Beta)

- Fix for some NVMe drives may report self-test results with leading white space.
- Fix for not checking if NVMe drives exist before attempting to run self-test.
- Fix for a drive serial number with white space.
- Added more data collection for NVMe drives (NVMe Self-Test Log and NVMe Error-Log).
- Added HDD/SSD Short/Long SMART Self-test feature that will spread out drive testing across up to 1 month without scheduling it in TrueNAS.
- Added Partition Backups generated and attached when TrueNAS Configuration is attached (by request).
- Cleaned up the Text Section and added a little more data.
- Added dumping of API drive data to aid in development efforts using the API.
- Added automatic update to statistical data file (reformatting the file to fix 30 day Total Data Read/Written issue).
- Updated SMR Drive Checking to report drives for 14 runs of the script.

CHANGES V 3.0.7

- Fixed for some NVMe drives may report self-test results with leading white space.
- Fixed to actually generate an alarm for Media Errors.
- Added Compensation (offset) for Media Errors.
- Added more data collection for NVMe drives (NVMe Self-Test Log and NVMe Error-Log).

CHANGES V 3.0.6

- Fix for Zpool gptid listing in text section (listing cache, log, meta, spare, and dedup).
- Added polling NVMe drives for self-test completion when 'waiting' for test complete. The default is now to wait for the test(s) to complete.

CHANGES V 3.0.5

- Fix for a significant error, any Errors in the Zpool Status would not be in alarm condition.
- Added SMR options to activate or deactivate alarm notifications.

CHANGES V 3.0.4

- Fix for abnormally high HE levels, if RAW Value is over 100, utilize Normalized Values.
- Fix for 'cache' not being displayed in Text Section.
- Fix for Spencer integration for Dragonfish (24.04.0).

- Added '-disable_smr' and '-enable_smr' switches to modify the config file.
- Added '-check_smr' switch for a One-Time Run to check SMR drives if normal SMR Checking has been disabled.
- Fix for Pool Names which contain space characters.

CHANGES V 3.0.3

- Fix for downloading SMR script.

CHANGES V 3.0.2

- Pools now provide Total Data Read and Total Data Written (up to 9.2 YB)
- Drives now provide Total Data Written either for the current month or for the past 30 days (must use statistical data file)
- Detect SMR drives and provide a Caution Message
- GPT Partition Checking
- Added option to disable the Multiple Instance Check
- Fixed a few minor errors

CHANGES V 3.0.1

- Fixed Execution Timer (dropped the full minutes).
- Fixed Temperature Reporting for ‘HPE’ SSD.
- Fixed NVMe Advanced Configuration Question for NVMe Self-test.
- Added SCSI to ATA Translation.
- Added new method to generate SCSI Power On Time value when the data does not exist in SMART.
- Added ability to display the Last Test Type “hours” when conducted.
- Added granularity to select which Text Output Section you want displayed, or not.

CHANGES V 3.0

- Multipath support
- More NVMe compatibility.
- Better SCSI support.
- 7zip no longer installed unless encryption is setup.
- And a lot of little things.

CHANGES V 2.5.4Beta

- Added custom wear level alarm value AFTER 'n' 'r' 'd' and 'i' for Ignore.

- Added Wait for SMART Short Self-test to complete before completing the report and added delay value.
- Added SMART Self-test Failure Recognition for NVMe.
- Added Email Report ONLY on Alert (any Error Message).
- Fixed checking NVMe drives for if they support Self-tests.
- Added NVME Short and Long Self-test for smartctl 7.3 and below.
- Updated CORE ability to capture NVMe Last Test Age.
- Adjusted script for multiple LBA reporting on Yucun SSDs.
- Updated script to work in a directory with a 'space character' in the path.

CHANGES V 2.5.1

- Changed exported configuration file to use .tar/.zip appropriately.
- Moved NVMe power state setting to end of script.

CHANGES V 2.5

- Added Custom Drive option to use 'Normalized' Wear Level.
- Added customization for Normal, Warning, and Critical Subject Lines.
- Added quick fix for odd reporting LITEON SSDs.
- Added NVMe power level reporting.
- Added setting NVMe lowest power level option.
- Updated to use smartmontools 7.4 or greater.
- Updated to use 'nvme' command in absence of smartmontools 7.4 or greater. (Last Test Age is not available in TrueNAS CORE).
- Added Last Test Type and Last Test Age columns for NVMe (when smartmontools 7.4 is incorporated into TrueNAS).
- Remove multipath drive data (duplicate drive serial numbers) from the report.
- Reduced normal drive data collection by 2/3's for troubleshooting/sending to Joe.
- Added '-dump emailextra' to send all (2/3's more) drive data files if required.
- Renamed drive dump files to be more user friendly.
- Added simulation enhancement (Developer tool)
- Added additional troubleshooting help for Script Running Error.
- Updated Multiple Instance Check to work properly. Slower processes would generate a false positive.
- Added '-ignore_lock' parameter to ignore Multiple Instance Check (should never be needed but it's included as an option).
- Updated reading temperature if value is zero or less to read ID 194.

CHANGES V 2.4.4

- Incorporated Spencer.py script by calling the external script.
- Changed TrueNAS Backup Configuration file name to include the TrueNAS version number.

- Fixed ability to edit/add Warranty Drive Data so it does not erase previously entered data.
- Fixed SSD/NVMe Capacity Title in chart.
- Fixed NVMe Media Errors column display, it now appears centered and has lines around it.
- Added more Wear Level & TBW compatibility. Hopefully I didn't break something in the process for someone.
- Updated -h and -help commands.
- Updated text section 'Drives for this pool' to list non-GPTID entries.

CHANGES V 2.4.3

- Minor Update to recognize more SCSI drive Offline Uncorrectable Errors and Total Data Written.
- Minor Update to recognize UDMA CRC Errors for some older Intel SSD's.

CHANGES V 2.4.2

- Bugfix to properly recognize Samsung HD103UJ HDD.
- Bugfix to properly recognize/display more than 26 drives in Scale.

CHANGES V 2.4.1

- Bugfix to allow script to run from any directory.
- Incorporated Fully Automatic Update feature.

CHANGES V 2.4

- Added common Problems and Solutions
- Updated Appendix A

CHANGES V 2.3

- The installation of version 2.2 were deemed too difficult for some people so the installation has been simplified. The running file is still 'multi_report.sh'. The Symlink has been removed. If you have version 2.2 installed, the '-update' feature will upgrade you to v2.3.
- Bugfix for Custom Drive List – Wear Level and Helium Level.

Table of Contents

What's New in version 3.1

- This release is a combination of several fixes from version 3.0.7 and 3.0.8 which were specific fixes.
- Added SMART Drive Testing for High Quantity of Drives.
- Updated zyx

What's New in version 3.0.8

This is a maintenance and added feature release.

- Fixed Total Data Read/Written calculations for 30 Day option.
    - This fix was in the statisticaldatafile.csv file, not to the actual calculations.
- Fixed zyx
- Added skdljd
- Added kjlsdf
- .

What's New in version 3.0.5

This is definitely a maintenance release only.

- The Zpool Status section would not report any errors it experienced. The cause was human error, mine specifically. While adjusting to accept pool names which have spaces, I added an extra set of parentheses which made the script look like it was going well, however no alarm for a real problem. It is amazing how a simple change can put a wrench into everything.
- Updated the SMR detection with the Drive ID no longer being red background for this error, rather it is now a nice easy yellow, which still catches the eye. The letters "SMR?" are also appended to the Drive ID to make it clear why the background is yellow. And added another variable to enable or disable the alarm notifications for SMR. The switches '-disable_smr_alarm' and '-enable_smr_alarm' will mitigate hiding any other alarm conditions.

What's New in version 3.0.4

This is a maintenance update.

- Fixed for some drives which report above 100 values for Helium level, automatically will utilize the 'Normalized' value.
- Fixed for the 'cache' drive (if it exists) not being displayed in the Text Section.
- Fixed for running Spencer under Dragonfish (24.04.0).
- Fixed for pool names which contain a space character.
- Added three new SMR command line switches:
    - -disable_smr This will update the multi_report_config.txt file to disable further checking for an SMR drive.
    - -enable_smr This will update the multi_report_config.txt file to enable further checking for an SMR drive.
    - -check_smr This will run the SMR check one time without modifying the multi_report_config.txt file. Useful if you have SMR checking disabled and then you replace/add a drive so you can test the one time.
- Added Total Reads to individual drives (uses Zpool setting).

What's New in version 3.0.3

This is a maintenance update.

- Fixed getting caught in a loop during the downloading of the SMR script.

What's New in version 3.0.2

While this is versioned to be a maintenance update, it also includes additional features I've been working on:

- Fixed the Automatic Update so it does not stop and issue an error message after the update.
- Fixed nvmecontrol operation for TrueNAS 13.3 Beta-1.
- Fixed MultiZone reporting Critical Error vice Warning Error.
- Fixed to ignore MultiZone errors for SSDs.
- SMR Drive Detection will check the drive model numbers against a list of known SMR drives and if a drive is recognized, the Drive ID with have a red background, a Critical message will state the SMR drive was detected, and of course the Subject line will state "CRITICAL ERROR". A big thanks goes out to Basil Hendroff for creating the smr-check.sh script for TrueNAS.
    - This by default will download the smr-check.sh script from Github and then run the script. You have the option to disable running the SMR drive checks. If you disable normal running of this feature, there is a new switch '-smr_check' which will run Multi-Report and run the SMR drive checks.
- Zpool Total Data Read / Total Data Written provides numbers to quantify your overall usage patterns and provides the data as a total of Data Read and Written for the life of the drives. This may be a useful tool when building your next TrueNAS project. Due to BASH limitations the maximum value is 9.2 YB. That is a big number for us home users, maybe not to a work environment.

- Drives Total Data Written by either Current Month or Past Rolling 30 Days. This is useful to identify individual drives possibly getting hit harder for write requests.

What's New in version 3.0.1

- Added SCSI to ATA translation: For ATA drives connected to a SCSI interface, this allows SMART to obtain the data required.
- Some drives will stop counting at 65535 hours, either Power On Time and/or Self-test hours.

  If the Self-test reaches 65535 and does not increment beyond, a yellow background and asterisk (*) will appear, and a message below the chart. This is to indicate the counter stopped and you will not know that a SMART test beyond that has occurred. The Last Test Age will also remain "0" value.

  For the issue where the drive Power On Time stops at 65535 hours, the background will be yellow and the number will reflect the last Self-test hour value.

  Should you have a drive where both counters stop at 65535, well you were dealt a bad hand, sorry. Keep running those SMART Self-tests.

- Text Section Output granularity was increased to allow a user to enable/disable the inclusion of the following text sections:

  Messages and Warnings/Cautions
  Zpool
  SMART Drive Data
  And as always - Disable the entire text section.

What's New in version 3.0?

NVMe enhancements are the biggest change.

With TrueNAS 13.0-U6.1, TrueNAS 13.3-Beta1, and TrueNAS 24.04, neither completely support NVMe testing. But to be fair, many older NVMe drives do not support SMART Self-tests either. The newer drives if they comply with NVMe standard 1.4 are fully supported (if they actually comply).

Support to run SMART self-tests on NVMe that do support self-testing.

Multipath support to remove duplicate drives from the script reporting while still providing failure data for each drive. The drive data will have the option to 1) Remove all duplicate Drive Idents based on serial number. 2) List all drives that have a unique gptid number. 3) List all Drive Idents but group by drive serial number. Each option has a specific benefit to the user.

Option to set the NVMe Power State to the Lowest Level in CORE only. SCALE already supports Autonomous Power State Transition (APST). After setting the lowest state, the NVMe drive will automatically change its power state to a higher level if required to support normal operations, however it will not automatically lower the power state in FreeBSD/TrueNAS CORE. This is not currently the best incorporation of this process and odds are the power level will return to the higher state shortly after. I'm

working on a standalone script but it will not be part of Multi-Report. I want to see what TrueNAS 13.3 does first.

Report Power State and Watts in the NVMe Chart.

Wear Level: User can now use Drive Customization to force use of the Normalized value (typically starts at 100 and decrements). This may help where other SMART values are invalid.

Customize Subject Line: The user can customize the Normal, Warning, and Critical subject line message in the generated email.

New command line switches and reduces data transmission:

-dump emailextra	In this version the normal '-dump email' option sends one third of the drive data previously transmitted. Should the full amount be requested the '-dump emailextra' switch will transmit the original full amount of data plus zpool/zfs report data.
-ignore_lock	This will ignore multiple instances of the script running. This is expected to be used on extremely slow machines.

Updated the exported configuration file to be .tar if not encrypted or .zip if encrypted, all in effort to make the .tar file directly importable. 7zip will not be installed on SCALE if a password is not established.

Updated Developer Simulation Tools: These are tools Joe uses to test your drive data against. These tools are not expected to be used by the end user.

What is Multi-Report?

Multi-Report is a joint effort to produce a simple script that will report key drive data points in order to predict drive failure and deliver that via email. Additionally multi-report has features to maintain statistical data in a Comma Separated Value (CSV) format compatible with any typical spreadsheet program, backup TrueNAS configuration files, perform other drive related checks such as SMR and Valid Partition checks.

This is a highly configurable program designed to allow the end user the ability to customize the script to the specific needs of the user. I will admit that there are a lot of customizations available and they can be confusing, hence in the future a GUI which I'm slowly working on should make configuration significantly easier. However, if you want the script to do something and you just can't figure out how to get there, toss me an email and ask me to help, there are very few drive related things that multi-report cannot do.

Versioning

Multi-Report versioning is controlled by the version number and the date. Example: "multi_report_v2.3_04_Apr_2023.txt" and Beta will be clearly identified. Small bug fixes are likely to have a third digit, for example: "multi_report_v2.3.1_12_Apr_2023.txt" The multi_report_config.txt is also recognized by versioning text in the first line of the file.

New Version Update Alert

The script will check the GitHub repository, and should an update be available, it will notify the user in the first few lines of the email report and those lines will be RED in color. In order to perform the software update, the user must run the script using the '-update' switch if using the default "Manual Update" option and follow the prompts. The script will exit after the update. Version 2.4.1 incorporates Automatic Updating. If the user has configured the script for "Automatic Update" the update will be applied without asking the user and then will execute the new script. Note that the default is Manual Updates, the user will need to intentionally enter the '-config' setup to select Automatic Update.

Messages from the Creator

Multi-Report v2.3 implements a message delivery system that will let users know of upcoming updates or problems and concerns about the product. These messages will appear just under the "Execution Time:" information. I rarely use this feature but it is there should I need to use it.

What do I ask for in return?

I would like to create the best and most inclusive free script but to do that, whenever someone has a problem, or when someone installs a NEW model drive, I would appreciate a little data in return. By running the script using the '-dump email' switch you will be prompted to enter a simple short message and then an email will be generated to my personal email address (created just for this project) that will contain drive configuration data. Drive Model data I already have that was used to test this script is listed in Appendix A. Please note that all drives do not provide all the data we are trying to display, especially

SCSI drives (work in progress). With this in mind, some fields will either be empty or display the non-exist value which is "---" by default. The Quick Start Guide (below) explains these fields.

Multi-Report

Quick Start Guide

What is Multi-Report?

- Multi-Report was written a long time ago under a different name, with the purpose of augmenting FreeNAS 8.x (and beyond) for running SMART tests, monitoring for drive failures as FreeNAS was not very good at it reliably.
- To this day it is still augmenting for some shortcomings (scheduling NVMe drive SMART test), and to make people feel a little safer knowing the testing is going on and alarms will be generated if Multi-Report detects a problem. Just call it "Peace of Mind".
- SMART was designed with the intention to warn a user of pending Hard Drive doom within 0 to 24 hours of a failure. This is not fool proof, not a magic bullet. SMART is not perfect however if it does predict a failure and you are aware of it, you can fend off some danger. There are some failures that cannot be predicted and some failures happen very fast. All the data provided by this script will assist you moving forward once a failure or indication of a pending failure is identified.
- Additionally, I highly recommend running a SMART Short test once a day and running a SMART Long test once a week. If you have a lot of drives, only schedule a few drives a day (Monday), a few others (Wednesday), you get the point .
- As you look at the chart data, note that the column titles should be self -explanatory.

Quick Setup Information

Place script on your server (location is for example only)

- Create a new dataset titled ' scripts'. Path: / mnt/pool/scripts
  - Make the dataset:
    - Name: scripts
    - Share Type/Dataset Preset: SMB
    - SCALE: Create SMB Share checkbox
    - Submit/Save
- You should now have access to the SMB share you created.
- Copy the script to the 'scripts' dataset, rename the script to "multi_report.sh".

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Setting up the CRON JOB

- Tasks -> Cron Jobs -> ADD
- Description: multi_report
- Command (CORE): ./mnt/pool/scripts/multi_report.sh
- Command (SCALE): cd/ mnt/pool/scripts && ./multi_report.sh
- Run As User: root (or any privileged account)
- Schedule: Custom
  - Preset: Daily
  - Minutes: 0, Hours: 2, Days: *
  - Select DONE
- Hide Standard Output: Unchecked
- Hide Standard Error: Unchecked
- Enabled: Checked
- Save

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First and Second Run

- As a privileged user, open a shell/SSH window and change directory 'cd' to cd/mnt/pool/scripts
- First Run: Enter ./multi_report.sh -config
  - Follow the instructions to create a multi_report_config.txt (configuration file).
- Second Run: Enter ./multi_report.sh
  - The script should run without error.

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Notes:

- To customize Multi -Report run the script with the ' -config' switch and select Advanced Configuration. There are a large amount of things which can be customized for almost every situation.
- In order to run SMART Self -tests on NVMe drives, you must set NVM_Smartmontools_74_Override="enable". You can manually edit the multi_report_config.txt file or use the Advanced Configuration section.
- If you run into a real problem, search the TrueNAS forums first, and if you cannot figure it out, use the ' -dump email' switch to send me the required information I need to assist you. I will return an email to you once I have looked at it. I normally get back to people in less that 24 hours, keep in mind time zones, I'm in the USA, NY (ET).

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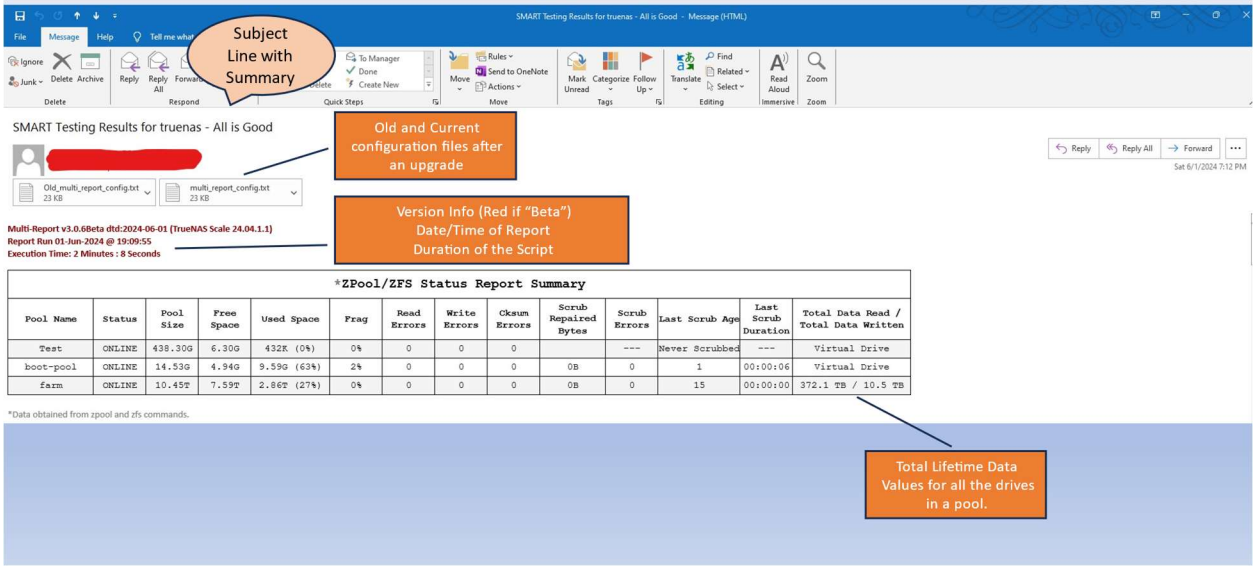
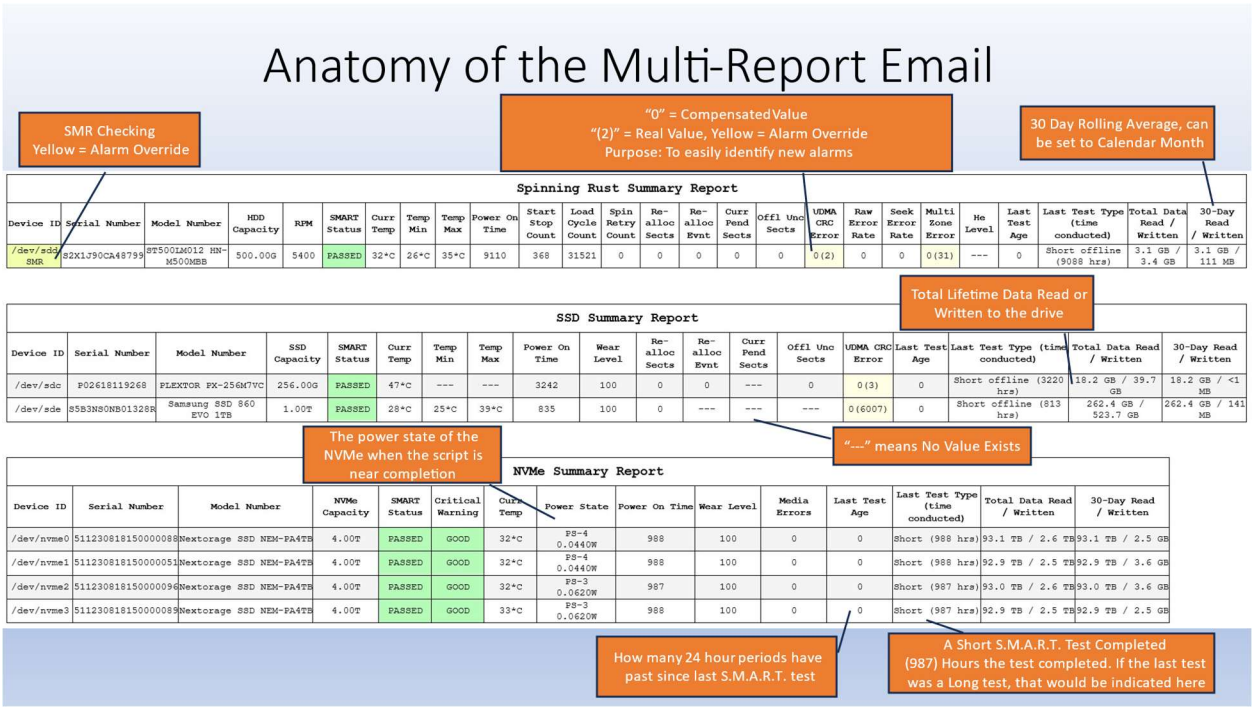
Anatomy of the Multi-Report Email





Spinning Rust Summary Report

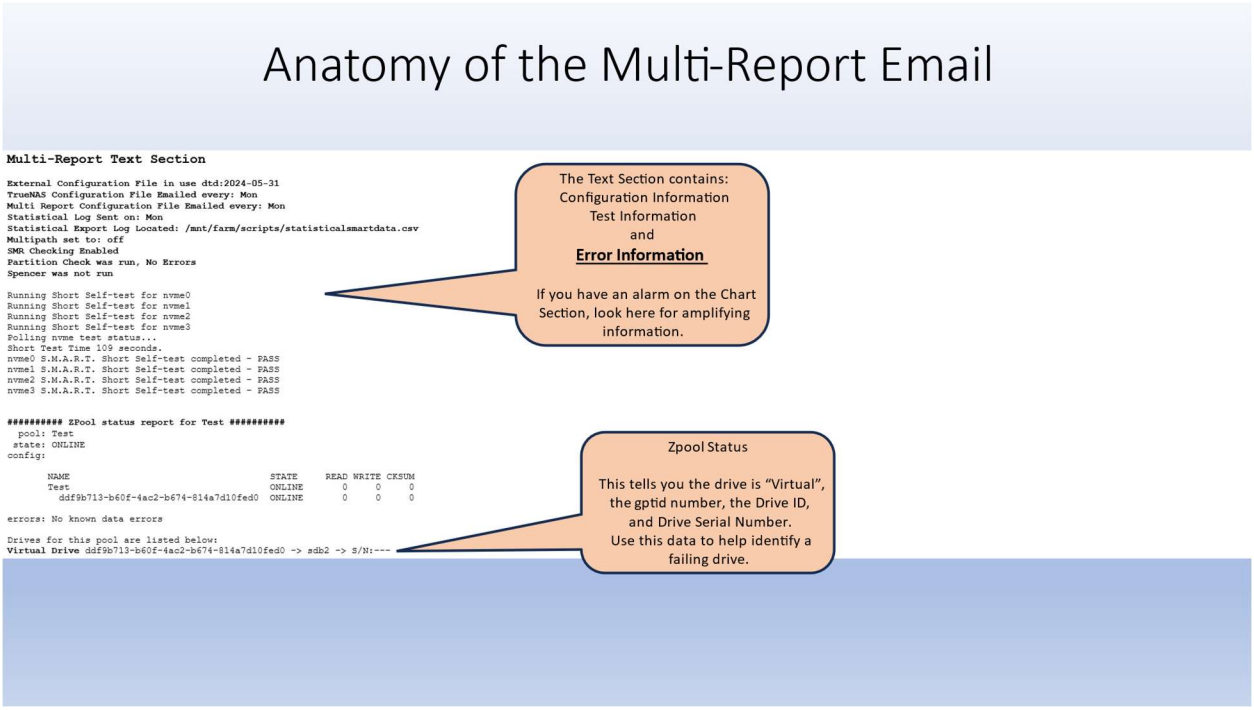
Device ID	Serial Number	Model Number	HDD Capacity	RPM	SMART Status	Curr Temp	Temp Min	Temp Max	Power On Time	Start Stop Count	Load Cycle Count	Spin Retry Count	Re-alloc Sects	Re-alloc Evnt	Curr Pend Sects	Offl Unc Sects	UDMA CRC Error	Raw Error Rate	Seek Error Rate	Multi Zone Error	He Level	Last Test Age	Last Test Type (time conducted)	Total Data Read / Written	30-Day Read / Written
/dev/sdd SMR	S2X1J90CA48799	ST500LM012 HN-M500MBB	500.00G	5400	PASSED	32*C	26*C	35*C	9110	368	31521	0	0	0	0	0	0(2)	0	0	0(31)	---	0	Short offline (9088 hrs)	3.1 GB / 3.4 GB	3.1 GB / 111 MB

SSD Summary Report

Device ID	Serial Number	Model Number	SSD Capacity	SMART Status	Curr Temp	Temp Min	Temp Max	Power On Time	Wear Level	Re-alloc Sects	Re-alloc Evnt	Curr Pend Sects	Offl Unc Sects	UDMA CRC Error	Last Test Age	Last Test Type (time conducted)	Total Data Read / Written	30-Day Read / Written
/dev/sdc	P02618119268	PLEXTOR PX-256M7VC	256.00G	PASSED	47*C	---	---	3242	100	0	0	---	0	0(3)	0	Short offline (3220 hrs)	18.2 GB / 39.7 GB	18.2 GB / <1 MB
/dev/sde	S5B3NS0NB01328R	Samsung SSD 860 EVO 1TB	1.00T	PASSED	28*C	25*C	39*C	835	100	0	---	---	---	0(6007)	0	Short offline (813 hrs)	262.4 GB / 523.7 GB	262.4 GB / 141 MB

NVMe Summary Report

Device ID	Serial Number	Model Number	NVMe Capacity	SMART Status	Critical Warning	Curr Temp	Power State	Power On Time	Wear Level	Media Errors	Last Test Age	Last Test Type (time conducted)	Total Data Read / Written	30-Day Read / Written
/dev/nvme0	511230818150000088	Nextorage SSD NEM-PA4TB	4.00T	PASSED	GOOD	32*C	PS-4 0.0440W	988	100	0	0	Short (988 hrs)	93.1 TB / 2.6 TB	93.1 TB / 2.5 GB
/dev/nvme1	511230818150000051	Nextorage SSD NEM-PA4TB	4.00T	PASSED	GOOD	32*C	PS-4 0.0440W	988	100	0	0	Short (988 hrs)	92.9 TB / 2.5 TB	92.9 TB / 3.6 GB
/dev/nvme2	511230818150000096	Nextorage SSD NEM-PA4TB	4.00T	PASSED	GOOD	32*C	PS-3 0.0620W	987	100	0	0	Short (987 hrs)	93.0 TB / 2.6 TB	93.0 TB / 3.6 GB
/dev/nvme3	511230818150000089	Nextorage SSD NEM-PA4TB	4.00T	PASSED	GOOD	33*C	PS-3 0.0620W	988	100	0	0	Short (987 hrs)	92.9 TB / 2.5 TB	92.9 TB / 2.5 GB



Multi-Report Text Section

```
External Configuration File in use dtd:2024-05-31
TrueNAS Configuration File Emailed every: Mon
Multi Report Configuration File Emailed every: Mon
Statistical Log Sent on: Mon
Statistical Export Log Located: /mnt/farm/scripts/statisticalsmartdata.csv
Multipath set to: off
SMR Checking Enabled
Partition Check was run, No Errors
Spencer was not run

Running Short Self-test for nvme0
Running Short Self-test for nvme1
Running Short Self-test for nvme2
Running Short Self-test for nvme3
Polling nvme test status...
Short Test Time 109 seconds.
nvme0 S.M.A.R.T. Short Self-test completed - PASS
nvme1 S.M.A.R.T. Short Self-test completed - PASS
nvme2 S.M.A.R.T. Short Self-test completed - PASS
nvme3 S.M.A.R.T. Short Self-test completed - PASS


########## ZPool status report for Test ##########
  pool: Test
 state: ONLINE
config:

        NAME                                    STATE     READ WRITE CKSUM
        Test                                    ONLINE       0     0     0
          ddf9b713-b60f-4ac2-b674-814a7d10fed0  ONLINE       0     0     0

errors: No known data errors

Drives for this pool are listed below:
Virtual Drive ddf9b713-b60f-4ac2-b674-814a7d10fed0 -> sdb2 -> S/N:---
```

Anatomy of the Multi-Report Email

```
########## ZPool status report for boot-pool ##########
  pool: boot-pool
 state: ONLINE
  scan: scrub repaired 0B in 00:00:06 with 0 errors on Sat Jun  1 03:45:07 2024
config:

        NAME        STATE     READ WRITE CKSUM
        boot-pool   ONLINE       0     0     0
          sda3      ONLINE       0     0     0

errors: No known data errors

Drives for this pool are listed below:
Virtual Drive 783941e5-a2e7-4666-ae07-77082b9d58cf -> sda3 -> S/N:---


########## ZPool status report for farm ##########
  pool: farm
 state: ONLINE
status: Some supported and requested features are not enabled on the pool.
        The pool can still be used, but some features are unavailable.
action: Enable all features using 'zpool upgrade'. Once this is done,
        the pool may no longer be accessible by software that does not support
        the features. See zpool-features(7) for details.
  scan: scrub repaired 0B in 00:00:00 with 0 errors on Fri May 17 23:47:32 2024
config:

        NAME            STATE     READ WRITE CKSUM
        farm            ONLINE       0     0     0
          raidz1-0      ONLINE       0     0     0
            nvme0n1p2   ONLINE       0     0     0
            nvme1n1p2   ONLINE       0     0     0
            nvme2n1p2   ONLINE       0     0     0
            nvme3n1p2   ONLINE       0     0     0

errors: No known data errors

Drives for this pool are listed below:
e2b38f27-14c4-11ef-8817-000c29c58878 -> nvme0n1p2 -> S/N:511230818150000088
e2b76c23-14c4-11ef-8817-000c29c58878 -> nvme3n1p2 -> S/N:511230818150000089
e2b4c540-14c4-11ef-8817-000c29c58878 -> nvme1n1p2 -> S/N:511230818150000051
e2b260d1-14c4-11ef-8817-000c29c58878 -> nvme2n1p2 -> S/N:511230818150000096
```

All drives for the "farm" pool are listed and identified by three things:
gptid -> Drive ID -> Drive Serial Number

This makes it significantly easier to identify which driveactually failedby serial number.

Anatomy of the Multi-Report Email

```
########## SMART status report for sdd drive (ST500LM012 HN-M500MBB : S2X1J90CA48799) ##########

SMART overall-health self-assessment test result: PASSED

ID# ATTRIBUTE_NAME          FLAG     VALUE WORST THRESH TYPE      UPDATED  WHEN_FAILED RAW_VALUE
  1 Raw_Read_Error_Rate     0x002f   100   100   051    Pre-fail  Always       -       0
  2 Throughput_Performance  0x0026   056   054   000    Old_age   Always       -       6116
  3 Spin_Up_Time            0x0023   091   091   025    Pre-fail  Always       -       2868
  4 Start_Stop_Count        0x0032   100   100   000    Old_age   Always       -       368
  5 Reallocated_Sector_Ct   0x0033   252   252   010    Pre-fail  Always       -       0
  7 Seek_Error_Rate         0x002e   252   252   051    Old_age   Always       -       0
  8 Seek_Time_Performance   0x0024   252   252   015    Old_age   Offline      -       0
  9 Power_On_Hours          0x0032   100   100   000    Old_age   Always       -       9110
 10 Spin_Retry_Count        0x0032   252   252   051    Old_age   Always       -       0
 11 Calibration_Retry_Count 0x0032   100   100   000    Old_age   Always       -       132
 12 Power_Cycle_Count       0x0032   100   100   000    Old_age   Always       -       361
 13 Read_Soft_Error_Rate    0x003a   100   100   000    Old_age   Always       -       0
181 Program_Fail_Cnt_Total  0x0022   096   096   000    Old_age   Always       -       91972053
191 G-Sense_Error_Rate      0x0022   100   100   000    Old_age   Always       -       9
192 Power-Off_Retract_Count 0x0022   252   252   000    Old_age   Always       -       0
193 Load_Cycle_Count        0x0032   097   097   000    Old_age   Always       -       31523
194 Temperature_Celsius     0x0002   064   059   000    Old_age   Always       -       32 (Min/Max 17/41)
195 Hardware_ECC_Recovered  0x003a   100   100   000    Old_age   Always       -       0
196 Reallocated_Event_Count 0x0032   252   252   000    Old_age   Always       -       0
197 Current_Pending_Sector  0x0032   252   252   000    Old_age   Always       -       0
198 Offline_Uncorrectable   0x0030   252   252   000    Old_age   Offline      -       0
199 UDMA_CRC_Error_Count    0x0036   100   100   000    Old_age   Always       -       2
200 Multi_Zone_Error_Rate   0x002a   100   100   000    Old_age   Always       -       31
240 Head_Flying_Hours       0x0032   100   100   000    Old_age   Always       -       7528
241 Total_LBAs_Written      0x0032   095   094   000    Old_age   Always       -       6812280
242 Total_LBAs_Read         0x0032   096   094   000    Old_age   Always       -       6144661
254 Free_Fall_Sensor        0x0032   252   252   000    Old_age   Always       -       0

No Errors Logged

Most recent Short & Extended Tests - Listed by test number
# 1 Short offline Completed without error 00% 9088 -
# 4 Extended offline Interrupted (host reset) 70% 9075 -


SCT Error Recovery Control:  Read: Disabled Write: Disabled
```

Header to identify the report is for Drive ID 'sdd' and lists the Model Number and Serial Number

Lastly we have the OUTPUT of "smartctl –a"

Why did I include this in the report you ask?
Because the more information we have to analyze, the better our decision is on what actions, if any, are required.

The Last SMART Short and Long Tests with the results.

TLDR Can also be set by the script, the default is 70 (7.0 seconds) when enabled. It is Disabled in this example.

Closing Notes

Always backup your important data.
Always use an Uninterruptable Power Supply (UPS).
Read the User Guide (I need to update it again).

If you find something wrong with the script or these instructions, please reach out to joeschmuck2023@hotmail.com with the issue, or run the script using the '-dump email' switch to send me data to analyze and include a little message as well. Believe it or not, I appreciate the feedback, good or not so good.

Initial Setup

The basic setup for Multi-Report is to install the script into a Dataset within your pool, and preferably a dataset that has an accessible share such as SMB. This will make everything easier to manipulate. For this example, the script is renamed from the original .txt file to "multi_report.sh" and the dataset is located at '/mnt/mypool/scripts'. I encourage you to rename the script to either 'multi_report.sh' or something you like that has no version numbers as this file will be replaced during an update. If you are not using the 'root' user to setup this script, you must use an administrator account you created and precede the commands with 'sudo' (in general). I prefer to use 'root' but that is just me and I know TrueNAS has plans to restrict/remove 'root' from the application. I'm against that as a home user however for a corporate user, it makes sense.

I have been told by several users that they prefer to place this script in the '/root' folder as it simplifies any permissions issues. I personally use a dataset but '/root' does work.

Prerequisites:

1. TrueNAS Core/Scale must be installed and operating normal.
2. TrueNAS must have the email account setup already. If you cannot send yourself an email, it is not setup properly.
3. If you have a previous version of 'multi_report.sh', you must remove or rename it. You should retain the 'multi_report_config.txt' file and it will be upgraded automatically.
4. I highly recommend that you place any scripts in its own directory as depicted below.

Installation of Script File

Steps to establish a basic setup: (Do not enter the single quotes)

In the examples below the dataset location will be '/mnt/my_pool/scripts' and the Multi-Report script will retain its original name. Ex: 'multi_report_v2.2_2023_04_08.txt'

1. Copy the script to a Dataset. NOTE: The dataset path cannot have any spaces in the path.
   Incorrect Example: '/mnt/my pool/scripts'
   Correct Example: 'mnt/my_pool/scripts'
2. Open an SSH terminal window, or Shell and log in (you will need elevated privileges).
3. Type 'cd /mnt/my_pool/scripts'
4. Ensure that there is no file called "multi_report.sh" in the directory. See prerequisites.
5. Copy the script 'multi_report_v2.2_2023_04_08.txt' into your script running directory.
6. Rename the script to 'multi_report.sh'.
7. Make the file executable 'chmod +x multi_report.sh'

First Time Installation (No External Configuration File)

1. If this is not your first time using multi_report and you have an external configuration file, proceed to step 8, otherwise let's create an external configuration file.
2. Run the script './multi_report.sh -config'
   NOTE: If you run the script without a configuration file, the script will display an error message and direct you to create a configuration file.
3. Press the 'n' key to create a New configuration file.

4. Read the questions and enter the answers (Email Address, EmailAlert Address, and From Address). If you would like to send to more than one email address, use a comma to separate the emails addresses.
   Example of multiple emails: 'joe@aol.com,joe@work.com'
5. The Automatic Drive Compensation is good to use if you have any drives which have UDMA_CRC_ERRORS or bad sectors errors. This will offset the value and bring it back to a zero value. Should other issues occur, the value will increment. This is useful to identify drives which increment slowly so you do not have to remember what the value was previously.
6. The script will create an external configuration file called 'multi_report_config.txt' where the user "could" edit this file with a simple text editor, however it's strongly advised against due to the tight formatting restrictions. If you venture out to manually edit the configuration file and it starts working incorrectly, recreate a new configuration file using the steps above.

Previous Installations (With External Configuration File)

7. Run the script './multi_report.sh'. This will run the script normally and upgrade the External Configuration File if required.
8. Let's run the script again but this time without any CLI switches './multi_report.sh'.
9. If all goes well you will receive an email that contains a chart and text section.
10. Examine the email, look for errors. The drive may be reporting a failure when you may feel the report is in error. If this is what you feel, please forward me your script data using the '-dump email' switch. I can confirm what the drive is reporting and if the script is in error.

Unfortunately, because manufacturers do not have a standard to live by, it's almost impossible to take into account every drive configuration and the end user will need to do some customizations. They are easy to perform.

If you have any drive errors such as a Sector Error or the Wear Level is incorrect, then you will need to customize some of the settings.

NOTE: ADVANCED INFORMATION - If you do not want to run the script using the file name "multi_report.sh" then you must change the variable in the script under the "Auto-generated Parameters" called "runfilename" to the filename you desire. By default, it is set to "multi_report.sh".

The Multi-Report External Configuration File

The external configuration file is a file created to limit the needless reconfiguring of the parameters when upgrading the script to newer versions. The script will generate the configuration file and update the configuration file with the upgrades. The configuration file by default will create itself in the same directory as the script is located and the name of the file is 'multi_report_config.txt'.

This configuration file is normally edited from within the script using the '-config' switch but may be edited using a simple text editor.

Prior to exiting the configuration tool ensure you WRITE the changes to your configuration file or the changes will be lost.

External Configuration File Update

Multi-Report is controlled by a configuration file called "multi_report_config.txt" and this configuration file is adjusted to control the operations Multi-Report performs. Most of these adjustments can and should be made from running the '-config' switch (see below). When the script is run it will check the version of the configuration file. Should the configuration file be out of date it will create a copy of the configuration file and then create an updated version of the configuration file. Both files will be sent to the user within the emailed report. This allows a user the ability to revert easily to the previous version should they desire. Additionally, when a software update occurs, a backup of the configuration file is made on the system so you may use that file as well to revert back to the original.

Explanation of the Email

Header information

The email generated contains the following information:
Program Version, Operating System Version
Report Run Date and Time
How long it took to execute the script.
If the backup configuration file is encrypted, a message will indicate this.

Zpool/ZFS Status Report Summary

Pool Name, Status, Capacity, Fragmentation, Errors, Last Scrub Age, Scrub Duration

Hard Drive Summary Report / SSD Summary Report / NVMe Summary Report

Device ID, Drive Identification, Capacity, SMART Status, Temperature, Power On Hours, Drive Errors Last Test Age, Last Test Type

These are the core identifiers used in this script and will lead any user to easily identify a problem. Any errors have the background color changed making it obvious.

Wear Level

Wear Level is based on 100% being new and 1% being almost dead.

CRITICAL/WARNING Log

This will list any issue which caused an error.

Attachments

There are several possible attachments depending on the configuration of Multi-Report.

- statisticaldata.csv: A copy of the statistical data file is available.
- multi_report_config.txt: Automatically sent each Monday by default, user selectable.
- Old_multi_report_config.txt: Sent when multi_report_config.txt is automatically updated.
- TrueNAS Config file: Automatically sent each Monday by default, user selectable.
- Various 'dump' files: Generated when using the '-dump' options (drive statistics).
- spencer.txt: If Spencer script is available, this will include any present alarm indications.

Encrypted TrueNAS_Config in Email

If you desire the TrueNAS_Config.tar file to be encrypted then you MUST manually edit the 5th line of the script and enter a password, this will export a .zip file since .tar files cannot be encrypted. Why encrypt this data? While the data "should" be perfectly safe since the password file is encrypted, some people prefer a little extra security. Windows Explorer will not open the encrypted attachment, you must use a third-party application. I recommend 7-Zip which is a free community-based program. Additionally, if a password is established, and you are running SCALE, then 7-zip will be installed by the script autmatically. By default 7-zip will not be installed.

Reference: https://www.7-zip.org/download.html

To add encryption, you are looking at line #5 of the script, **not the multi_report_config.txt file** and then looking for line #5 (see below).

TrueNASConfigEmailEncryption="" # Set this to "" for no encryption or enter some text as your passphrase.

By default, there is no encryption, additionally some email providers will block certain encrypted content.

An example of a password might be:

TrueNASConfigEmailEncryption="ThisIsMyPassword3#2@1!"

There are two files in the .zip file:

freenas-v1.db – Main Configuration File

pwenc_secret – All the passwords are in an encrypted format already.

When you restore 'freenas-v1.db' the other file will automatically be restored.

Setting up a Dedicated Script Directory

There are two ways I will show you how to install the script, one is to simply install the script into the root directory, the other is to create a dataset (if you don't already have one) that can run the script.

Instructions will be for both CORE and SCALE, any differences between the two will be clearly identified. If you see something incorrect in the instructions, please notify me so I can update the document.

PLACE SCRIPT IN ROOT DIRECTORY:

Example dataset location: The pool name is 'farm' and the dataset is named 'backups'. The full path to this location is '/mnt/farm/backups'

1. Log in as 'root' or a privileged user.
2. Rename the script file to 'multi_report.sh' on your desktop system before copying to the TrueNAS server.
3. In order to do this, you need to place a copy of the script on to a dataset, you should have some share which can support this. In my example I have a dataset called "backups" that has an SMB share so I can drop a copy of the script there. Ensure the script name is "multi_report.sh" when you drop it on the system.
4. Next in the TrueNAS GUI select Shell (CORE - Left side of GUI, SCALE - System Settings -> Shell).
5. Let's change to the root directory by entering 'cd /root' and press Enter.
6. Time to copy the script to the root directory by entering 'cp /mnt/farm/backups/multi_report.sh .' and pressing Enter. The file should be copied.
7. Let's test, while still in the Shell, enter './multi_report.sh' and press Enter. The script should run and give you an error message stating a configuration file does not exist and to run the script using the '-config' switch. This means the script is installed in the '/root' directory.
8. If the script fails to run, type 'chmod 755 multi_report.sh' and the file should now be executable. Repeat step 7.

NOTE: When you run using the '-config' switch you are able to significantly customize Multi-Report, however do not be tempted right now, you can revisit this once Multi-Report has successfully generated and emailed a report.

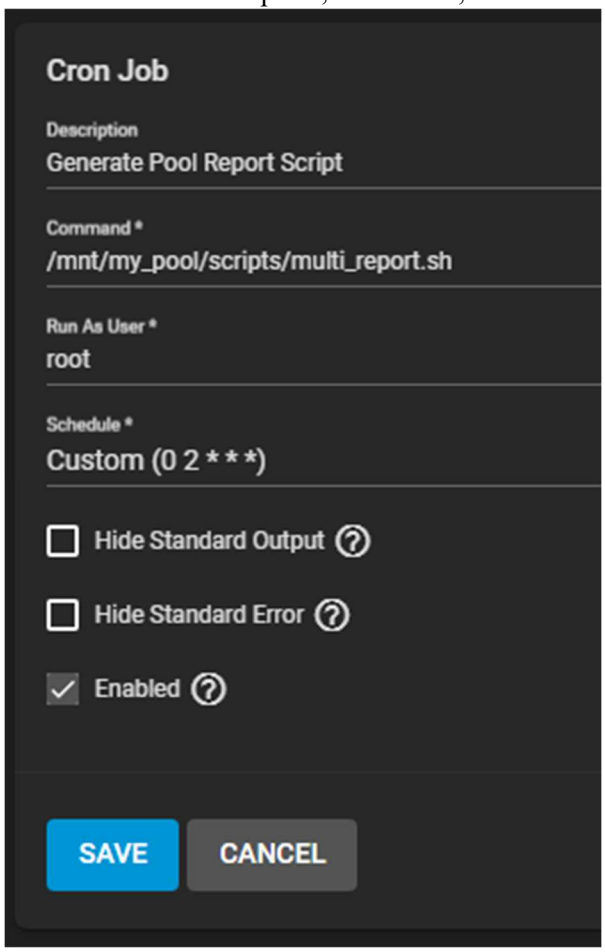
9. If you have never run multi_report before then you will need to run it one time to create the external configuration file. If you already have a configuration file, skip this step. Type './multi_report.sh -config' and answer the questions to create a NEW configuration file. During this process you will be asked to perform Automatic Compensation and you should select 'y' for yes.
10. TEST: Now test to see if Multi-Report actually works. Type './multi_report.sh' again, this time you should not have an error message (if all works well) and an email should be generated.
11. Cleanup time: Delete the 'multi_report.sh' file you placed in your dataset share (from step 3).

Setting Up a CRON Job

Typically, this type of script is designed to be automated to run periodically. In order to run this script, we will setup a CRON job.

TrueNAS CORE:

1. Log into the TrueNAS GUI.
2. Click on Tasks -> Cron Jobs.
3. On the right screen click ADD.
4. Next fill in the Description, Command, Run As User, Schedule, and Enabled. (See image below)



5. We identified a job Description called “Generate Pool Report Script”.
6. We identified the command to run this script as “/mnt/my_pool/scripts/multi_report.sh”.

   Note: The full path to the location of the script is required.

7. Run as is set to “root”, but this could be any user with privileges.
8. Schedule is Custom (0 2 * * *) which means 0 minutes, 2 hours, All Days/Months/Years, or in other words, 2AM every day the script will run.
9. Hide Standard Output is unchecked. (Note: Check this box if you would not like to see any CRON messages in an email when the script runs.)

10. Hide Standard Error in Unchecked.
11. Enabled is Checked.
12. Now click SAVE.
13. Test the CRON Job by selecting the RUN button. You should get two emails if you have everything setup correctly. One for running the CRON job, and the actual Multi-Report output.

TrueNAS SCALE is similar to setup.

1. System Setting.
2. Advanced.
3. At CRON Jobs, click Add.
4. Jump to TrueNAS CORE step 4 above and follow the instructions.

Running the Script

The script can be normally executed by simply entering the program name "./multi_report.sh" the script will run normally. Below in this document are various command line options you may use with the script in order to configure, run, and troubleshoot. Read these options carefully.

Recommended Script and SMART Testing Schedule

The first thing you must know is that S.M.A.R.T. was designed to warn a user that a failure would occur in less than 24 hours, and that less than could be 10 minutes. That was the goal and to be honest, SMART can give a person notification well in advance of a common media failure problem, HOWEVER SMART is not very good at warning a person of a pending spindle motor electronics failure. So first understand that it's not perfect and it's an attempt to provide us some sort of notification in advance. It is not a genie in a bottle. Do not over-expect. With all that said, it is recommended (by me) to run a SMART Short Test once a day and run a SMART Long/Extended test once a week. These are both non-destructive read-only tests. The Short Test generally takes less than 2 minutes to complete, whilst the Long/Extended Test can take 5 hours, 10 hours, 18 hours, or longer. Your SMART data provides you the time in minutes that the Long/Extended Test will take. For this example, we will say you have a 14TB hard drive and it takes 19 hours to complete a Long/Extended Test. Below is an example of a schedule you could use based on the NAS being used during the Day Light Hours:

SMART TEST	Run Start	Runtime
SHORT	11:05 PM (All Days)	2 minutes
LONG/EXTENDED	11:10 PM (Friday)	19 Hours
multi_report.sh	6 AM (All Days)	21 seconds

The above schedule would first run a Short Test every day. Then it would run a Long/Extended Test only on Fridays just after the SMART Short Test completed. And you would get a status report from Multi-Report every morning at 6 AM. Concerns about running the SMART Long/Extended Test are amplified by the drive size and drive count. If you do have large hard drives, say 14TB, and you have 12 of said hard drives, you would not want to perform a SMART Long/Extended Test on all the

drives at the same time as this will affect performance when the NAS needs to be useful, create extra heat by the drives (not good for the drives flanked by other drives), and it pulls a lot of power. Instead perform a SMART Long/Extended Test on two drives a day. This will generally make your NAS more responsive and the huge power consumption would be reduced and spread out over time, thus easing the load on the poor power supply.

Backing up and Restoring the TrueNAS Password File

Multi-Report by default will attach the TrueNAS Password File on Mondays. This will be a .tar file (default) or a .zip file (encrypted). To change what day of the week to backup these files run '-config' and Select Advanced Configurations and then Config-Backup. Follow the prompts.

When restoring your password file, copy the .tar file or export the .zip file to a directory on your computer and then use the TrueNAS GUI to Restore the configuration file. In order to extract the .zip file you will need to use some ZIP supported software tool and it will ask you for your passphrase that is located in line 5 of the 'multi_report.sh' script.

- All user accounts
- Encrypted 'keys' for an encrypted disk/dataset areas. Note that I said Keys, not Passphrases.

I highly recommend that you export and save your Key files when you create your encrypted data pool and/or datasets.

This script **does not** backup GELI keys, which have now been depreciated in TrueNAS. If you have GELI keys, you are responsible to backup your keys.

NVMe Self-tests

TrueNAS 13.0-U6.1 uses smartmontools v7.2, TrueNAS 13.3-Beta used v7.4, and TrueNAS 23.10.2 and 24.04.0 uses smartmontool 7.4, however none can schedule a self-test on NVMe via the GUI. I'm certain this will change however until that happens, Multi-Report is user configurable to run SMART short and long tests when the script is executed.

If enabled, by default a SMART short self-test is run Monday through Saturday and a SMART long self-test is conducted on Sunday given that TrueNAS is not able to run the test yet. This of course can be easily changed. You also have the option to wait until the NVMe self-test completes before the script generates the report. The default is to wait 120 seconds (2 minutes) for a short self-test to complete and then generate the report. The long self-test will wait 1200 seconds (20 minutes) but you could configure it to wait as long or short as you desire. Remember, this is for NVMe, not HDD or SSD.

NVMe Power State Transitions

NVMe drives have multiple power states. State '0' is the maximum performance and maximum power use. As the power state number increases the lower the power usage because at the cost of waking up speed. There could be up to 32 power states, however most NVMe drives have about 4 power states.

Multi-Report, at the end of the script, will attempt to set the NVMe drives to the minimum state to reduce power consumption. Note that if the system needs a higher power state to read/write data to these drives, then the power state will automatically change. In TrueNAS CORE (FreeBSD) the NVMe drives would remain at the higher state while SCALE (Debian) supports **Autonomous Power State Transition (APST)** so SCALE will automatically lower the power state to conserve power.

HDD/SSD SMART Self-tests

In addition to NVMe self-tests are the added benefit of having the script run all the SMART self-tests. The main advantage to this is if you are a user with a lot of drives and need to spread out your self-tests, it can be a pain to due this via the TrueNAS GUI. For example, 1: You have 100 HDDs and you want to perform a SMART Long self-test on a few drives per day and spread that out over 4 weeks. The algorithm will spread this out for all the drives, 4 drives per day for 25 days. How is this done? Magic, Ha Ha. But seriously the drives are sorted by serial number or drive ID (sda, sdb), serial number is the default as it may add a random appearing factor but this is user selectable, and the drives are run through in order. You can also just go by the drive ID order. Example 2: You have 8 drives and want to spread this out over the month then the first 8 days of the month would have one drive tested. You also have the option to test all the drives daily or weekly. By default these option are disabled (Option 3). A recommendation is to run a Short self-test on all drives every day (Option 2), and run a weekly Long self-test on all the drives (Option 1). When you examine the options, you will understand better.

This feature was really created for the people with a huge amount of drives so they do not need to manually configure the Long SMART testing for each drive. And this feature is only for HDD and SSD, not NVMe drives. NVMe drives has it's own section.

Multipath

What is Multipath? Hard drive multipath refers to a technique used to manage storage devices, especially in SAN (Storage Area Network) environments. It allows for redundancy and load balancing by creating a single logical path from the host to the storage device, even when there are multiple physical paths (such as multiple cables or network connections) between them.

Here's how it works:

1. Multiple Paths: In a multipath configuration, a storage device (such as a hard drive) is accessible through multiple physical paths. These paths can be different cables, switches, or network interfaces.
2. Multipath Device: The operating system creates a multipath device that represents the logical combination of these multiple paths. This device appears as a single entity to the host system.
3. Benefits:

   - Redundancy: If one path fails (due to cable issues, switch failures, or other reasons), the system automatically switches to an alternate path without disrupting I/O operations.
   - Load Balancing: Multipath allows distributing I/O requests across all available paths, improving performance and preventing bottlenecks.
4. Configuration:
   - Software Solution: The operating system uses software-based multipathing solutions to manage the paths. Examples include DM Multipath on Linux and MPIO (Multipath I/O) on Windows.
   - Hardware Solution: Some storage arrays and SAN switches provide built-in hardware-based multipathing capabilities.
5. Use Cases:
   - High Availability: Multipath ensures continuous access to storage even if a path fails.
   - Performance Optimization: Load balancing helps distribute I/O across multiple paths, improving overall throughput.
6. Considerations:
   - Configuration: Properly configuring multipath involves setting up rules, policies, and path priorities.
   - Monitoring: Regularly monitor the health of all paths to detect failures promptly.
   - Failover Testing: Test failover scenarios periodically to ensure seamless transitions.

In summary, hard drive multipath enhances reliability, performance, and availability in storage systems by intelligently managing multiple paths between the host and storage devices.

How does Multipath affect Multi-Report? A single drive may report that it is in-fact multiple drives:

1. Single drive with two Drive Idents (ada0, ada1, or sda, sdb) but have the same serial number and access to the exact same data.
2. Single drive with two Drive Idents with the same serial number but access to two different isolated sections of data.
3. Single drive with two or more Drive Idents (as in NVMe namespaces) but still show the same serial number.

The Problem: We are reporting too much duplicated information. For example 1, we only need to report all the data for one of the drive idents, not both as one drive ident contains all the SMART data we need. Example 2, we need both drive idents to report because media data would be different between the two drive idents, temperature for example would be identical but UDMA CRC Errors could be very different. Example 3, same thing as example 2 for the most part.

Solution: I provide four options here:

'off' = No special handling of multipath data. This is the default setting.

'normal' = Automatically remove duplicate serial numbers from the report. In other words if two drive idents have the same SMART serial number data, the second drive ident will be dropped from the report.

'Exos2x' = Remove duplicate serial numbers ONLY IF the gptid matches. Why use the gptid? Because this is how we track if the area is a data area. If they match then it is the same area, if they differ then they are a separate data area and we want to retain it.

'serial' = This will retain all the drive idents and sort them all by serial number to display. The can be handy to group all these areas together. This may be more useful for NVMe namespaces. Also, if you just would like the chart to organize by serial number, this is an option.

Warranty Column

The Warranty column will not be present if there is no defined expiration date for at least one drive. The was done to assist users to not need to disable this column.

Command Line Switches

-check_smr
One time check of SMR drives.

-config
Configuration

The '-config' switch will present the user with highly configurable series of menus. Below is the first menu you will see when invoking this switch.

Multi-Report v3.0.1 dtd:2024-04-05 (TrueNAS SCALE 24.04)

Configuration File Management

*** WARNING - A CONFIGURATION CURRENTLY FILE EXISTS ***

N)ew configuration file (creates a new clean external configuration file)

A)dvanced configuration (must have a configuration file already present)

S)pencer Integration (configure Spencer add-on)

H)ow to use this configuration tool (general instructions)

X) Exit

NOTE: In using this configuration script when the value is:
Number or Text: The current value will be displayed. You have the option to just press Enter/Return to accept the current value or you may enter a different value.
True or False: The current value will be displayed. You have the option to press Enter/Return to accept the current value or you may press 't' for true or 'f' for false.

Make your selection:

New Configuration File – Will create a new external configuration file in the same directory in which the script resides.

Advanced Configuration – This option provides a step-by-step menu driven customization of the multi_report_config.txt file. See the Advanced Configuration section for details.

How to use this configuration tool – These are the basic instructions on how to answer questions. (See next page)

-delete
Delete Statistical Data File.

-disable_smr
Change the multi_report_config.txt file so SMR checks are not run.

-disable_smr_alarm
Change the multi_report_config.txt file so SMR alarm messages are no longer reported.

-dump [all] or [email] or [emailextra]
Dump drive data files and Multi-Report configuration data

The -dump will generate several files for each drive in the system and append these files and the multi_report_config.txt file to the generated email. This is useful when troubleshooting a drive problem. All options of the '-dump' command will generate an email and send it to you. Option 'all' which will include the Statistical Data File and the TrueNAS configuration file. Option 'email' or 'emailextra' will send the data generated by the '-dump' command to you as well as to joeschmuckatelli2023@hotmail.com which is a dedicated email to support this project. No personal information will be sent except your email address. Sorry, I can't get away from that but I will not share your information with anyone. Note: '-dump email' now sends significantly less data in v2.5 (the typical required data), whereas '-dump emailextra' will send all of the drive data files to assist in diagnosing a problem.

-enable_smr
Change the multi_report_config.txt file so SMR checks are run when the script is run.

-enable_smr_alarm
Change the multi_report_config.txt file to reenable SMR alarm messages.

-m [-s]
Monitor

The '-m' switch by itself will check for any Critical Alarms and any Warning Temperatures. If present a simple short email will be generated to the email(s) on file. No statistical data will be collected unless the '-s' switch is also specified.

-purge
Purge Test Data from Statistical Data File.

-s [-m]
Statistical Data Only

The '-s' switch will only record statistical data in the CSV file and no email will be sent out, unless used with the '-m' switch (see above). This is useful if you want to setup a CRON task to run periodically to collect temperature data over time for example. The statistical data file is a Comma Separated Value (CSV) format which can be opened in any spreadsheet program.

-ignore_lock
This parameter will ignore multiple instances of the script running. Very few people should have to disable the lock but it is there should it be required. This parameter should be at the end of the command

line. There is also a parameter within the script (v3.0.2) Disable_Ignore_Lock="disable" which when set to "enable", will operate the same as using the '-ignore_lock' switch.

-scsismart
This will override the Run_SMART_No_power_on_time value in the config file and allow running a SMART Short Self-test is required to obtain the current power_on_time (POH) from a SCSI drive using a CLI switch. This can be a useful option vice using this method of obtaining SCSI POH time. A 130 second delay will allow the test to complete, and the delay is definable using variable in the config file called Wait_For_SMART_Short_Duration.

-t [path] [-dump]
Used strictly for test files (.json format) for Joe's development. Use at your own risk and don't ask how it works.

-u7zip
Uninstall 7-zip on Scale systems. 7-zip it automatically installed if 7-zip is not present on Scale. This option allows the user an easy way to uninstall 7-zip.

-update
The '-update' switch will update your script with the version on the GitHub server and then exit.

-h
Command line help

This will provide a brief listing of the command line switches and a brief description.

-help
Help

This will provide detailed help information.

Multiple Instance Protection
This script will check to find out if another instance is running and if it does detect this, it will exit immediately. This is to prevent data of a same named file form having it changed by two running scripts at the same time. If you find the script exiting without explanation, try the '-ignore_lock' option and please report the incident to Joe.

How to use this configuration tool
This tool has many options and you should be able to perform a complete configuration using this tool.

In order to use the advanced options, you will need to have created an external configuration file then the tool will be able to read and write to this file.

Throughout this process you will be asked questions that will generally require four different responses:

1) String content: Where you will either enter a new string followed by the Enter/Return key, or just press Enter/Return to accept the current value.

2) Numeric content: Where you will either enter a new number followed by the Enter/Return key, or just press Enter/Return to accept the current value.

3) True/False content: Where you will either enter 't' or 'f' followed by the Enter/Return key, or just press Enter/Return to accept the current value.

4) Yes/No content: Where you will enter either ‘y’ or ‘n’ followed by the Enter/Return key, or just press the Enter/Return key to accept the current value.

5) Other possible options: 'd' = delete or default, 'r' = reverse, 'i' = ignore, 'n' = normalized, 'e' to edit.

Advance Configuration Settings

This is the main configuration if the defaults are not exactly what you desire.

Advanced Configuration Settings

A) Alarm Setpoints (Temp, Zpool, Media, Activate In/Out, Ignore)
B) Config-Backup (Edit Config-Backup & Multi-Report_Config Settings)
C) Email Address (Edit Email address and Encryption)
D) HDD Column Selection (Select columns to display/hide)
E) SSD Column Selection (Select columns to display/hide)
F) NVMe Column Selection (Select columns to display/hide)
G) Output Formats (Hours, Temp, Non-Existent, Pool Capacity)
H) Report Header Titles (Edit Header Titles, Add/Remove Text Section)
I) Statistical Data File Setup
J) TLER / SCT (Setup if TLER is active)
K) Drive Errors and Custom Builds (Ignore Drives, UDMA CRC, MultiZone, Reallocated Sectors, ATA Errors, Warranty Expiration)
L) Subject Line Custom Settings
M) Multipath Settings
O) SCSI Settings (Options for Power On Hours)
N) NVMe Custom Settings
S) Custom Drive Configuration
T) SMR Drive Settings
U) Update Script - Automatic or Manual Internet (Github) Updates
W) Write Configuration File (Save your changes)
X) Exit - Will not automatically save changes

Make your selection:

Alarm Configuration Settings

Temperature Settings (Global)

- ✓ HDD Warning Temperature (45)
  - This is the high temperature setpoint for a Warning message
- ✓ HDD Critical Temperature (50)
  - This is the high temperature setpoint for a Critical message
- ✓ HDD Max Temperature Override for power Cycle Enabled (true)
  - When 'true' this will not alarm on "Current Power Cycle Max Temperature Limit" and only use the "Current Drive Temp" value. Set to 'false' to latch in an alarm on any maximum temperature limit achieved. This is good for diagnosing periodic high drive temperatures. Use with Monitor Email Settings below.
- ✓ SSD Warning Temperature (45)
  - Same HDD as above
- ✓ SSD Critical Temperature (50)
  - Same HDD as above
- ✓ SSD Max Temperature Override for power Cycle Enabled (true)
  - Same HDD as above
- ✓ NVMe Warning Temperature (50)
  - Same HDD as above
- ✓ NVMe Critical Temperature (60)
  - Same HDD as above

Zpool Settings

- ✓ Pool Scrub Maximum Age (37) days
  - This is the maximum number of days before a Scrub warning message is generated.
- ✓ Pool Used Percentage (80)
  - This is the maximum capacity before a warning message is generated.
- ✓ Pool Fragmentation Percentage (80)
  - This is the maximum fragmentation before a warning message is generated.

Media Alarm Settings (Global)

- ✓ SSD/NVMe Wear Level Lower Limit (9)
  - This is the lowest allowed value before a warning is generated.
- ✓ Sector Errors Warning (0)
  - This is the maximum allowed sector errors before a warning is generated.
- ✓ Sector Errors Critical (9)
  - This is the maximum allowed sector errors before a critical alert is generated.
- ✓ Reallocated Sectors Warning (0)
  - This is the maximum allowed reallocated sectors before a warning is generated.
- ✓ Raw Read Errors Warning (5)
  - This is the maximum allowed Raw Read Errors before a waring is generated.
- ✓ Raw Read Errors Critical (100)
  - This is the maximum allowed Raw Read Errors before a critical alert is generated.
- ✓ Seek Errors Warning (5)
  - This is the maximum allowed Seek Errors before a warning is generated.
- ✓ Seek Errors Critical (100)
  - This is the maximum allowed Seek Errors before a critical alert is generated.

- ✓ MultiZone Errors Warning (0)
  - This is the maximum Multizone Errors allowed before a waring is generated.
- ✓ MultiZone Errors Critical (5)
  - This is the maximum Multizone Errors allowed before a critical alert is generated.
- ✓ Helium Minimum Level (100)
  - This is the minimum Helium value allowed before a warning is generated.
- ✓ Helium Critical Alert Message (true)
  - This set to 'true' will make the Helium a Critical Alert, 'false' will make the Helium a Warning.
- ✓ S.M.A.R.T. Test Age Warning (2) days
  - This is the number of days exceeded when a test Age Warning will be generated.
- ✓ NVMe Media Errors (1)
  - This is the number of NVMe media errors when a critical alert will be generated.
- ✓ Flag Device ID RED on Error (true)
  - This will mark the DRIVE ID column in 'red' for any alarm for the respective drive.

Activate Input/Output Settings

- ✓ Force non-SMART Devices to report (true)
  - A 'true' value will allow drives which do not support SMART.
- ✓ Remove non-SMART data from the emailed report (false)
  - A 'true' value will remove non-SMART drive data from the text report.

Ignore Alarms

- ✓ Ignore UDMA CRC Errors (false)
  - Allows the user to ignore ALL UDMA_CRC Errors.
- ✓ Ignore Raw Read Rate Errors (false)
  - Allows the user to ignore ALL Raw Rear Rate Errors.
- ✓ Ignore Seek Errors (false)
  - Allows the user to ignore ALL Seek Errors.
- ✓ Ignore MultiZone Errors (false)
  - Allows the user to ignore ALL Multizone Errors.
- ✓ Disable Warranty Email Header Warning (true)
  - Allows the user to disable the "Warranty Expired" message in the email header when the Warranty Dates are set. Great for knowing when a drive has fallen out of warranty.
- ✓ ATA Auto Enable (false)
  - When set to 'true' will update the ATA Log Error Count only when a new error occurs. Set to 'false' to display the ATA Log Errors normally. Use with ATA_Errors_List value to identify the specific offending drive.

Monitor Email Settings (only for the '-m' switch)

- ✓ Alert On Warning Temperature (true)
  - Set to 'true' will send a temperature warning message to the designated email address.
- ✓ Alert On Critical Error (true)
  - Set to 'true' will send a critical error message to the designated email address.

Config-Backup

- ✓ Configuration Backup Enabled (true)
  - Set to 'true' to enable backups.
- ✓ Save a local copy of the config-backup file (false)
  - Set to 'true' will create a copy of the TrueNAS configuration in the path identified below.
- ✓ Day of the week would you like the file attached? (Mon)
  - The day of the week to attach the TrueNAS backup file. Options are: Mon, Tue, Wed, Thu, Fri, Sat, Sun, All, or Month.
- ✓ Enable sending multi_report_config.txt file (true)
  - Attach multi_report_config.txt file to email if 'true'.
- ✓ What day of the week would you like the file attached? (Mon)
  - The day of the week to attach the TrueNAS backup file. Options are: Mon, Tue, Wed, Thu, Fri, Sat, Sun, All, or Month.
- ✓ Send email of multi_report_config.txt file for any change (true)
  - When 'true', if the multi_report_config.txt file is changed, the original and new multi_report_config.txt files are attached to the email.

Email Address

- ✓ Email Address
  - The email address you want to receive notifications.
- ✓ Monitoring Email Address
  - The email address you want to receive monitor emails.
- ✓ From Email Address (TrueNAS@local.com)
  - The email address 'from'. Note gmail must use your gmail account.
- ✓ TrueNAS Configuration Backup Encryption Passphrase
  - The passphrase used to encrypt the TrueNAS Configuration file.

Output Formats

- ✓ Power On Hours Time Format (h)
  - The format of the drive power on hours. Possible options are "ymdh", "ymd", "ym", "y", or "h" (year month day hour).
- ✓ Temperature Display (*C)
  - The character(s) after a Temperature value.
- ✓ Non-Existent Value (---)
  - The character(s) to represent no data available. Popular are: "N/A", " ", or "---".
- ✓ Pool Size and Free Space (zfs)
  - The method to determine the Pool Size and FreeSpace. Options are: "zfs" or "zpool". "zfs" is considered the most accurate for RAIDZ, MIRRORs will not yield great results so try "zpool".
- ✓ Last Test - Power On Hours (true)
  - List the power on hours from the Last Test Type in this column.
- ✓ Last Test - Power On Hours - Units (hrs)
  - The unit value (word) after the POH digits. Example: (47234 hrs)

Statistical Data File Setup

- ✓ Statistical File Location (default to script location)
  - The location the statistical data file will be located.
- ✓ Statistical Data Recording Enabled (true)
  - When 'true' the statistical data file will record the unaltered drive data to a Comma Separated Value file.
- ✓ Statistical Data Email Enabled (true)
  - When 'true' will allow the statistical data file to be attached to the email generated.
- ✓ Statistical Data Purge Days (730)
  - This value in days will cause a purge of any data older than this value.
- ✓ Day of week email attach Statistical Data (Mon)
  - The day of the week to attach the Statistical Data File. Options are: Mon, Tue, Wed, Thu, Fri, Sat, Sun, All, or Month.

TLER / SCT

- ✓ Activate TLER (false)
  - Set to 'true' to enable TLER.
- ✓ TLER Warning Level (TLER_No_Msg)
  - Set to 'TLER_No_Msg" will only report drives which support TLER.
  - Set to 'TLER' will report all drives that support TLER.
  - Set to 'all' will report all TLER errors regardless if the drive(s) support TLER or not.
- ✓ SCT Read Timeout Setting (70)
  - Read threshold in 10'ths of seconds. 70 = 7.0 seconds.
- ✓ SCT Write timeout Setting (70)
  - Write threshold in 10'ths of seconds. 70 = 7.0 seconds.

Update Script (Automatic or Manual Operation)

- This option will set the script to either automatically update itself when a new update is available or to use the default manual update option.

Drive Errors

- ✓ Ignore Drives List (none)
  - This is a list of drives to be ignored from this script.
- ✓ Automatic Drive Compensation 'y/n'
  - This will scan the drives for three types of errors, UDMA CRC, Multizone, and Sector Errors. This will effectively zero out the values for display, unless a new error is generated. This feature is useful in tracking new errors.
- ✓ Automatic ATA Error Count Updates (false)
  - Set to 'true' will automatically update the ATA Error count after sending out an error message. This too is a troubleshooting aid.
- ✓ ATA Error Count (none)
  - This is a list of drives and a threshold to ignore ATA Errors.
- ✓ Drive Warranty Expiration Date Warning (none or blank)
  - List of drives with an expiration date. This is good if you typically want a warning message that your drives are falling out of the warranty period.
- ✓ Drive Warranty Expiration Chart Box Pixel Color (#000000)
  - Enter the HEX color code for the font color when a drive expires.
- ✓ Drive Warranty Expiration Chart Box Background Color (#f1ffad)
  - Enter a HEX color code for the box background when a drive expires.

Custom Drive Configuration Mode

This feature allows you the user to customize the script to properly handle drives which may not conform to normal settings. This consists of the following:

- Temperature Warning, Temperature Critical
- Sectors Warning, Sectors Critical, Reallocated Sectors Warning
- MultiZone Warning, MultiZone Critical
- Raw Read Error Rate Warning, Raw Rear Error Rate Critical
- Seek Error Rate Warning, Seek Error Rate Critical
- Test Age, Ignore Test Age
- Helium Minimum Level. Wear Level Adjustment

Why would you need such customizations? Well, that is a good question and the simple answer is, because manufacturers do not have a common SMART definition and they provide the data they desire.

When would I use this feature?

Example: You have a drive that always reports the Test Age is a high value such as 437 days. You know that you ran a SMART test and it passed however the drive data does not relate it properly to the power on hours value. In this situation you can just Ignore Test Age and you will not generate an alarm condition.

Example: You have a single drive with a Helium value of 97%. Under normal conditions this is an alarm issue. But you do not want to lower the warning setting for all the drives from 100 to 96% so you can use this feature to adjust the alarm setpoint to 96% just for the one drive.

If you choose to customize a drive you will be presented with the Drive ID, Drive Serial Number, and the "system default" setting.

Press Return to accept the "system default" value. If you change the system value, this setpoint will be used and this value will be coded for this one drive.

SCSI Drive Settings

This section provides the option to either generate POH from running a SMART Short Self-test or by using the Last Test Type POH value, ONLY if “power_on_time” is not in the SCSI SMART data.

Spencer Integration

NOTE: In Multi-Report v3.0.4, Spencer will run via CRON JOB in TrueNAS Dragonfish (24.04.0), thanks to @STUK for solving the running issue.

Spencer is a script designed by NickF to scan the /var/log/messages file for additional drive related errors which Multi-Report does not check for. These errors are as of this writing:

- CAM STATUS
- CTL_DATAMOVE ABORT
- CDB
- iSCSI Timeout

Spencer is an independent piece of software and the author may change it to incorporate additional error conditions. If 'spencer.py' is available, Multi-Report will run the script by default and:

- Generate an email attachment if there are any detected error messages in the messages log file.
- The email subject line will display 'Good', 'Warning', or 'Critical' (multi_report errors will also factor into these messages):
    - The default is 'Warning' for Only New Errors and 'Good' for Previous Errors. Each value is independently selectable. This can also be configured to 'Critical'.

Spencer Configuration:

You may establish if Multi-Report should run (enable) spencer which is enabled by default.

You can define the location (path) where spencer.py is located and even the name, but this entry must be the "FULL PATH" to the script if not using the default location which is with the multi_report.sh script.

You can set the Subject Line message (indicated above).

When Spencer is run by Multi-Report, spencer will not generate any emails. The data will be included in the multi-report email, thus you do not need to enter your email address into the spencer.py script.

Anatomy of the multi_report_config.txt file.

Below is a listing of the configuration file variables and a detailed explanation of what each performs.

Email=”YourEmail@Address.com”

This is the email address you desire your normal Multi-Report to be sent to.

From="TrueNAS@local.com"

The From address and the default works for most people however your email server may need this value to be set to your email account.

AlertEmail="YourAlertEmail@Address.com"

Alert email address used with the '-m' switch.

AlertOnWarningTemp="true"

Send alert on Warning Temp. Default="true"

AlertOnCriticalError="true"

Send alert on Critical Error. Default="true"

Email_On_Alarm_Only="false"

When true, an email will only be sent if an alarm condition exists. Default = 'false'

Email_On_Alarm_Only_And_Attachments="true"

When true, email attachments will be sent even when no alarm condition exists. Default = 'true'

Variables In The Script

TrueNASConfigEmailEncryption=""

Set this to "" for no encryption, THIS MUST REMAIN ON LINE 5 OF THE SCRIPT!

Ignore_Lock="disable"

Ignore_Lock when set to "enable" will ignore checking for multiple instances of multi_report.sh running.

Common Problems and Solutions

Below is a list of the most common problems I answer.

1. Q: When my Cron Job runs I receive a message stating some command cannot be found (usually like fdisk). What is going on?
   A: the most obvious issue here is the Cron Job is not running using a privileged account. Root is generally what I recommend for a home system not 'open' to the internet.

2. Q: My Last Test Age is giving me an alarm; how do I clear it?
   A: By default, the script expects the user to run a SMART Short or Long test once every 48 hours (2 days) or more frequently, but if you are a person who sleeps the drives for long periods of time, 2 days would not be reasonable for you. If you are testing less frequent then you can change this value by running the script in configuration mode "./multi_report.sh -config". Select 'Advanced Configuration' -> 'Alarm Setpoints' -> 'Media Alarm Settings' -> then press Return until you see "S.M.A.R.T. Test Age Warning (2)" and then enter a new number of days. For example, if you test once a week, make the value 7 or 8 days. Make sure you 'Write' the changes before exiting.

3. Q: If I hide a column, why do I still have an alarm?
   A: Hiding a column does not remove the data from being check for a problem condition. The problem condition should be addressed. There are however certain adjustments you can make if a single drive is alarming and you want to change the setpoint for that one drive. Example: Drive ada1 continues to exceed the high temperature setpoint and you need to raise this one drive from the default of 45C to 50C. You can make this adjustment for just this one drive using the Custom Drive Configuration in the -config Advanced Configuration section, option S.

4. Q: My Wear Level value is "0" and it should be "100". How can I fix this?
   A: First of all, this can be fixed using the Custom Drive Configuration in the Advanced Configuration menu. But also, please run the script using the '-dump email' and type me a short message pointing me to the problem. I'd like to update the script to properly recognize the drive if possible.

5. Q: I noticed my drive model is not listed in Appendix A. Does this mean my drive is not supported?
   A: Your drive is supported so long as "smartmontools" can read the drive data, even if the drive is not in the smartmontools database. However, if smartmontools or the drive manufacturer does not provide the data we are using, then there will be gaps. Appendix A is a list of drive data I have for simulation purposes because I cannot afford to purchase dozens of different drives to test this script on, and I thank those people who have sent me their data to help this effort.

6. Q: I want to change the names of the columns, for example I want to change "Spinning Rust Summary Report column "Curr Temp" to "Temp". Can I do that?

A: You can change practically any item in the report and requires you to edit the 'multi_report_config.txt' file. Open your favorite simple text editor and scroll down to the section titled "REPORT CHART CONFIGURATION". There you will find entries for every chart group and column titles. For the scenario above go to the line titled HDD_Drive_Temp_Title="Curr Temp" and change it to HDD_Drive_Temp_Title="Temp", then save the file. WARNING !!! This file is not forgiving if you add or delete a special character (comma, quotation, etc) then the script may fail. This is why the '-config' option is desired to be used, however the column titles are not built in to the '-config' option at this time.

7. Q: When I view my email using Gmail, the chart data appears out of place or not complete.
   A: Most email clients will display the HTML data correctly however the Gmail web-based email viewer may block the data from being presented properly. I suspect this is a security feature of Gmail. Your options are: 1) use another email client, 2) figure out how to make Gmail web-based email client work, then tell everyone how you did it, 3) live with the results.

8. Q: This seems like a nice tool but there are so many options and I'm confused. What can this script actually do for me?
   A: The main purpose of this script is to assist the user in diagnosing any drive related problems. For example, it monitors the SMART data so you can track changes and if the drive appears to be getting worse. It can track temperature related concerns using the '-m' switch and notify you when the temperature exceeds a certain threshold. This feature is great to identify when the temperature may be rising. The script also records data in a spreadsheet format for later trend analysis. What the script cannot do for you is tell you what you should be doing next. You can provide dump data to the TrueNAS forum and ask for advice, or you can send JoeSchmuck your dump data and ask for assistance. Please understand that JoeSchmuck has a day job and this is a hobby for him. He will return an answer when he can, typically in less than 24 hours. If there is something you want to do but can't figure it out, ask for help.

9. Q: My wear level appears to be wrong, what can I do?
   A: There are a lot of factors in calculating wear level and this is complicated by the manufacturer entering multiple values that determine wear level. Should the SMART data only present one wear level value then the data is easy to determine. It is when I get two or three values that contradict each other that the problem occurs. I have a priority of values to check, if there are multiple values, the first one that matches in the script is the value used. Is this accurate? Maybe not but there must be a judgement call at some point. The values are checked in a specific order based on my experience of which values have been most accurate over the span of all the data I have available. If you find that the wear level for one of your drives is in fact wrong, first try to use Custom Drive Configuration and if the wear level is the opposite, choose 'r', if the value is oddly wrong, choose 'n' for the normalized value. If none of these work, please send JoeSchmuck a email using '-dump email' so he can verify the problem and hopefully correct the issue.

Need Help?

If you need help you have a few options and you could do one, two, or all if desired.

1. Post a question in the TrueNAS forum Resources Discussion area for Multi-Report.
2. Post a Private Message to JoeSchmuck.
3. Send me an email to: joeschmuck2023@hotmail.com
4. Use the '-dump email' option and when asked to enter a message, type a short message pointing to the problem and if you have a preferred email address you want me to respond to. Joe Schmuck will respond to the email he received it from(ish) (whoever the email was addressed to) unless the message states otherwise. He will also likely send you a new version of the script with a fix for your problem to verify it works properly. Joe is always working on the next version, at least until it is as close to perfect as it can be.
5. If you have a suggestion to fix a possible problem, please send a message. I can use the advice.

Appendix A Drive Models Tested: (As of 30 March 2024)
If you have a drive model not listed below, please use '-dump email' to forward the data to Joe Schmuck.

HDD Model Number
HGST HTS725050A7E630
HGST HDN726060ALE614
HGST HUH721010AL5200 (SCSI)
HITACHI HUS72604CLAR4000
Samsung HD103UJ
SEAGATE OOS14000G (SCSI)
SEAGATE ST16000NM004J
ST12000NM001G-2MV103
ST12000NE0008-1ZF101
ST12000NM0008-2H3101
ST16000NM001G-2KK103
ST6000NM0115 00FN174 00FN177LEN
ST2000DL003-9VT166
ST2000DM001-1ER164
ST2000VN004-2E4164
ST8000VN004-3CP101
ST3000VN007-2AH16M
ST4000VN008-2DR166
ST6000VN001-2BB186
TOSHIBA DT01ABA300
TOSHIBA HDWG31G
TOSHIBA HDWG480
TOSHIBA MG04ACA600E
TOSHIBA MG07ACA14TE
TOSHIBA MG08ACA14TE
TOSHIBA MG08ACA16TE
TOSHIBA MG09ACA18TE
WDC WD10JFCX-68N6GN0
WDC WD140EDGZ-11B2DA2
WDC WD140EFGX-68B0GN0
WDC WD140PURZ-85GG1Y0
WDC WD2003FYYS-02W0B1
WDC WD20EARX-008FB0
WDC WD40EFPX-68C6CN0
WDC WD40EFRX-68WT0N0
WDC WD60EFZX-68B3FN0
WDC WD60EFRX-68MYMN1
WDC WD80EFBX-68AZZN0
WDC WD80EFZZ-68BTXN0
WDC WD80EFZX-68UW8N0
WDC WD100EFAX-68LHPN0
WDC WD100EMAZ-00WJTA0
WDC WD100EZAZ-11TDBA0

SSD Model Number
ADATA SU760
ADATA SU800
Crucial C300-CTFDDAC064MAG
Crucial_CT750MX300SSD1
FIKWOT FS810 128GB
GIGABYTE GP-GSM2NE3256GNTD
GIGABYTE GP-GSTFS31120GNTD
HGST HUSMM1680ASS200 (SCSI)
HITACHI HUSMM808 CLAR800 (SCSI)
HITACHI HUSSL401 CLAR100 (SCSI)
HPE VO000960JWTBK (SCSI)
IBM HUSML4040ASS600 (SCSI)
INTEL SSDSA2CT040G3
INTEL SSDSA2M040G2GC
INTEL SSDSC2BB080G4
INTEL SSDSC2BX016T4
INTEL SSDSC2BX800G4
INTENSO SSD (128 GB)
KINGSTON SA400S37120G
KINGSTON SA400S37960G
Lexar 240GB SSD
LITEON IT ECT-1920N9S
Patriot P220 128GB
PNY CS900 120GB SSD
Samsung SSD 840 EVO 120GB
Samsung SSD 850 EVO 1TB
Samsung SSD 850 PRO 256GB
Samsung SSD 860 EVO 250GB
Samsung SSD 870 QVO 8TB
SAMSUNG MZ7LM240HMHQ-00003
SanDisk SDSSDH3 512G
SanDisk SD6SB1M256G1022I
SanDisk SD8SBAT128G1122
SATADOM-MV 3ME
Seagate IronWolf ZA250NM10002-2ZG100
SPCC Solid State Disk
SuperMicro SSD
T-FORCE 512GB
T-FORCE 2TB
TOSHIBA PX05SMB160 (SCSI)
VK0120GEYJP
WD Blue SA510 2.5 500GB
WDC WDS500G1R0A-68A4W0
YUCUN SH00R060GB

NVMe Model Number
CL4-3D256-Q11 NVMe SSSTC 256GB
CT500P3SSD8
CT1000P3PSSD8
HP SSD EX900 Plus 1TB
HUSPR3238ADP301
INTEL SSDPEK1A118GA
INTEL SSDPE21D280GA
KINGSTON SA2000M8250G
KINGSTON SA400S37120G
KINGSTON SNV2S500G
Lexar SSD NM610PRO 2TB
Nextorage SSD NEM-PA4TB
Patriot M.2 P300 128GB
Patriot P210 512GB
PC SN740 NVMe WD 256GB
Samsung SSD 960 EVO 250GB
Samsung SSD 970 EVO Plus 250GB
Samsung SSD 980 PRO 1TB
Samsung SSD 980 1TB
Samsung SSD 980 PRO with Heatsink 2TB
SAMSUNG MZVL2512HCJQ-00BL7
SAMSUNG MZVL2256HCHQ-00B00
TS2TMTE220S
WD_BLACK SN770 250GB

Appendix B Changelog

Below is a copy of the changelog for the multi_report.sh script.

See Changelog file on github.com/JoeSchmuck

```
###### ZPool & SMART status report with FreeNAS/TrueNAS config backup
### Original script by joeschmuck
### Modified by Bidule0hm, melp, toomuchdata
### Thanks goes out to Basil Hendroff who created the SMR Drive Check script.
### Currently maintained by joeschmuck (joeschmuck2023@hotmail.com)

# V3.0.5 (25 May 2024)
#
#   -Fixed significant error to report Zpool errors.
#   -Added a few more SMR options '-enable_smr_alarm' and '-disable_smr_alarm'.
#

# V3.0.4 Beta (20 May 2024)
#
#   -Fix for abnormally high HE levels, if RAW Value is over 100, utilize Normalized Values.
#   -Fix for 'cache' not being displayed in Text Section.
#   -Fix for Spencer integration for Dragonfish (24.04.0).
#   -Added '-disable_smr' and '-enable_smr' switches to modify the config file.
#   -Added '-check_smr' switch for a One-Time Run to check SMR drives if normal SMR Checking has been disabled.
#   -Fix for Pool Names which contain space characters.
#

# V3.0.3 (13 May 2024)
#
#   -Fix for downloading SMR script.

### Changelog:
# V3.0.2 (11 May 2024)
#
#   -Fix for nvmecontrol for TrueNAS 13.3
#   -Added sgdisk and gdisk to validate partitions. (Note: For CORE, will copy the files from GitHub)
#   -Fixed NVMe simulation
#   -Fixed Automatic Update so it runs the script immediately after the update.
#   -Added Total Data Read/Total Data Written to Zpool Stats (supports up to 9.2 YB values)
#   -Added "Total Data" per drive for "Last 30 Days" or "Current Month Actuals" (Past 30 days is default).
#   -Added SMR Drive Detection, which can be disabled.
#   -Fixed MultiZone reporting Critical Error vice Warning Error.
#   -Fixed to Ignore MultiZone errors on SSDs.
```

```
#
# V3.0.1 (13 April 2024)
#   -Fixed NVMe Advanced Configuration question for NVMe Long Self-test.
#   -Fixed Temperature reporting for 'HPE' SSD.
#   -Added SCSI drive reporting when using SCSI to ATA Translation.
#   -Added SCSI new method to obtain Power On Hours for SCSI drives that do not expose this data. - Disabled by default, use '-scsismart' switch or new variable.
#   -Added LastTestType (hours) for drives that do not report correct Power On Hours but do report correct Self-test hours.
#   -Fixed Execution Timer (dropped off whole minutes).
#   -Added granularity to Text Output Section, can individually disable Warning/Caution, Zpool, or SMART Data output.
#   -Updated User Guide to support new features.
#
# V3.0 (30 March 2024)
# Notable issues:
# NVMe - Last SMART Short and Long tests not displaying in text area. It will be solved when Smartmontools 7.4 is installed.
#      -- This is not an issue in SCALE 23.10.2 as it has Smartmontools 7.4.
#
#   - Fixed checking NVMe drives for if they support Self-tests.
#   - Added NVME Short and Long Self-test for smartctl 7.3 and below.  Monday through Saturday a Short Test, Sunday a Long Test.
#   --- a Long Test, you may disable either or both options.  Once TrueNAS can run NVMe SMART Tests expect this option to go away.
#   - Updated to list Drive Idents for NVMe in the Text section.
#   - Added NVME Ignore "Invalid Field in Command", disabled by default.
#   - Added Wait for SMART Short/Long Self-test to complete before sending the report.
#   - Added SMART Self-test Failure Recognition for NVMe.
#   - Updated CORE ability to capture NVMe Last Test Age.
#   - Updated NVMe routines to ignore real data gathering while in test mode.
#   - Enhanced SCSI/SAS drive recognition and Power_On_Hours collection.
#   - Fixed Zpool Reporting of 'Resilvering xx days' incorrectly reporting in SCALE.
#   - Updated 7zip to only being installed if email is encrypted (See line 5 of this script).
#   - Updated script for SCALE Dragonfish for installing 7zip if required.
#   - Updated Configuration Questions to make configuration a little easier.
#   - Removed 'Mouseover' option and hardcoded it.
#   - Corrected 'Pool_Capacity_Type' variable missing in config file.
#   - Added checking for all software commands to respond (thanks dak180 for the idea).
#   - Added custom wear level alarm value 'i' to the group 'n' 'r' 'd'. 'i' = Ignore.  This makes wearLevel="", non-exist.
#   - Added Email Report ONLY on Alert (any Error Message).
#   - Updated to send attachments when Email_On_Alarm_Only="true" and Email_On_Alarm_Only_And_Attachments="true".
#   - Changed Non-Recognized drive power_on_hours from Warning to Caution.
#   - Adjusted script for multiple LBA reporting on Yucun SSDs.
#   - Updated script to work in a directory with a 'space character' in the path.
#   - Removed variables (IncluedSSD and IncludeNVM).
#
# V2.5.1 (3 December 2023)
#   - Changed exported configuration file to use .tar/.zip appropriately.
#   - Moved NVMe power state setting to end of script.
#
# V2.5 (25 November 2023)
```

```
#   - Added Custom Drive option to use 'Normalized' Wear Level.
#   - Added customization for Normal, Warning, and Critical Subject Lines.
#   - Added quick fix for odd reporting LITEON SSDs.
#   - Added nvme power level reporting.
#   - Added setting nvme lowest power level option.
#   - Updated to use smartmontools 7.4 or greater.
#   - Updated to use 'nvme' command in absence of smartmontools 7.4 or greater. (Last Test Age is not available in TrueNAS CORE).
#   - Added Last Test Type and Last Test Age columns for NVMe (when smartmontools 7.4 is incorporated into TrueNAS).
#   - Remove multipath drive data (duplicate drive serial numbers) from the report.
#   - Reduced normal drive data collection by 2/3's for troubleshooting/sending to Joe.
#   - Added '-dump emailextra' to send all (2/3's more) drive data files if required.
#   - Renamed drive dump files to be more user friendly.
#   - Added simulation enhancement (Developer tool)
#   - Added additional troubleshooting help for Script Running Error.
#   - Updated Multiple Instance Check to work properly. Slower processes would generate a false positive.
#   - Added '-ignore_lock' parameter to ignore Multiple Instance Check (should never be needed but it's included as an option).
#   - Updated reading temperature if value is zero or less to read ID 194.
#
# V2.4.4 (19 August 2023)
#   - Incorporated Spencer.py script by calling the external script.
#   - Changed TrueNAS Backup Configuration file name to include the TrueNAS version number.
#   - Fixed ability to edit/add Warranty Drive Data so it does not erase previously entered data.
#   - Fixed SSD/NVMe Capacity Title in chart.
#   - Fixed NVMe Media Errors column display, it now appears centered and has lines around it.
#   - Added more Wear Level & TBW compatibility.
#   - Updated -h and -help commands.
#   - Updated text section 'Drives for this pool' to list non-GPTID entries.
#
# V2.4.3 (16 June 2023)
#   - Minor Update to recognize more SCSI drive Offline Uncorrectable Errors and Total Data Written.
#   - Minor Update to recognize UDMA CRC Errors for some older Intel SSD's.
#
# V2.4.2 (19 May 2023)
#   - Bug Fix to properly recognize Samsung HD103UJ HDD.
#   - Bug fix to properly recognize/display more than 26 drives in Scale.
#
# V2.4.1 (29 April 2023)
#   - Bugfix to allow script to be run outside the script directory.
#   - Updated chmod 755 to the new script file.
#   - Updated cleanup routine for upgrade files left behind.
#   - Updated TrueNAS Config Backup name to reference the NAS name.
#   - Added Automatic Update Feature.
#   - Added Update Script File Checksum Check.
#
# V2.4 (21 April 2023)
#   - Added NVMe Media Errors
```

```
#   - Added Total Data Written for all drives that support it.
#   - Updated User Guide
#
# V2.3 (14 April 2023)
#   - Simplified User Installation
#   - Bugfix for Custom Drive Configuration - Wear Level, Helium Level.
#   - Updated User Guide
#
# V2.2 (10 April 2023)
#   - Bugfix for Test Age always being = "2".
#   - Bugfix for SSD Wear Level for certain drives.
#   - Bugfix for Scale, no TrueNAS Config Backup without 7-zip.
#   - Added Automatic Update Notification for newer version.
#   - Added Message from the Creator.
#   - Added Symlink - "multi_report.sh" is the file name to run from this point forward.  Read the User Guide for more details.
#   - Changed TrueNASConfig Backup to zip file type attachment.
#   - Adjusted for drive that passes SMART Test but reports the test hour as '0'.
#
# V2.1 (29 March 2023)
#   - Updated TrueNAS password backup to include encrypted password file, and enable encrypted Config File in email.
#   -- NOTE: The encrypted password is on line #5 of this script and must remain there.
#
#   - Updated script to use 'json' data.
#   - Fixed script to allow for a zero hour runtime on a drive.
#   - Renamed variables so they make more sence.
#   - More details when using a '-dump' switch.
#   - Added Runtime.
#   - New Wear Level & Helium Level formula.
#   - Added Backup of original multi_report_config.txt attachment along with the new configuration file.
#
#   The multi_report_config.txt file will automatically update previous versions to add new features
#   and will not be backwards compatible.
#
# V2.0.10 (6 March 2023)
#   - Fixed introduced error '-s' sending emails.
#
# V2.0.9 (5 March 2023)
#   - Only one running instance allowed.
#   - Minor updates to recognize SMART testing in progress for certain drives.
#
# V2.0.8 (23 February 2023)
#   - Added Email/Text Monitoring Feature for NugentS to try out.
#   - Edit multi_report_config.txt for additional email address.
#   - Use '-m' switch to invoke.  Statistical data is recorded each time the script is run.
#   - Added last two lines to display elapsed time of script running.
#
```

```
# V2.0.7 (7 February 2023)
#   - Bug Fix: Nuisance error message, did not impact operation but it doesn't look good.
#   -- "Cannot open input file /tmp/zpoollist.txt" and "/tmp/zpoolstatus.txt".  Only occurs in Core
#   -- during TrueNAS configuration file attachment operation (default is Monday).
# V2.0.6 (1 February 2023)
#   - Reduced drive data collection.  Added 'zpool' data collection.
#
# V2.0.5 (27 January 2023)
#   - Adjusted Zpool Status to allow 'resilvering' status message. (Line 1340)
#   - Updated '-dump email' command to allow user to enter comments to the author.
#
# V2.0.4 (26 January 2023)
#   - Fixed if Zpool does not provide a number for fragmentation, will now display non_exist_value string.
#
# V2.0.3 (24 January 2023)
#   - Hacked HDD SMART Testing in progress with "NOW" in the '# 1' line.  Will fix better later.
#
# V2.0.2 (24 January 2023)
#   - Fix Wear Level that may fail on some drives.
#
# v2.0.1 (21 January 2023)
#   - Fixed Zpool Fragmentation Warning for 9% and greater (Hex Math issue again).
#
# v2.0 (21 January 2023)
#   - Formatted all -config screens to fit into 80 column x 24 lines.
#   - Removed custom builds
#   - Fixed Custom Configuration Delete Function.
#   - Fixed Zpool Scrub Bytes for FreeNAS 11.x
#   - Fixed SMART Test to allow for 'Offline' value.
#   - Modified Wear Level script to account for 'Reverse' Adjustment.
#   - Added Wear Level Adjustment Reversing to the Custom Drive configuration.
#   - Added Output.html to -dump command.
#   - Added Mouseover and Alternate '()' to Mouseover for normalized values (Reallocated Sectors, Reallocated Sector Events, UDMA CRC, MultiZone).
#   - Updated Testing Code to accept both drive_a and drive_x files.
#   - Added Zpool Fragmentation value by request.
#   - Added '-dump email' parameter to send joeschmuck2023@hotmail.com an email with the drive data and the multi_report_config.txt file ONLY.
#   - Added Drive dump data in JSON format.  It looks like a better way to parse the drive data.  Still retaining the older file format for now.
#
#   The multi_report_config file will automatically update previous versions to add new features.
#
# v1.6f (27 December 2022)
#   - Added recognition for WDC SSD "230 Media_Wearout_Indicator".
#   - Adjusted the language to English for the Date calculations.
#   - Updated datestamp2 "date" command to be compatible with FreeBSD 11 and earlier.
#   - Updated Zpool Status Report to display Used Space Capacity when using the "zpool" reporting configuration.
#   - Added customizable alarm setpoints for up to 24 drives.
```

```
#   -- This feature allows for customizing drives which do not fit into the default parameters.
#   -- It is not intended to individualize each drive, but you could if you wanted.
#   -- This allows the option for removal of the three custom code options.
#   - The configuration file in the email will now change to FreeNAS or TrueNAS based
#   -- on the software running vice FreeNAS hard-coded.
#   - Corrected several spelling errors throughout script.
#
#   The multi_report_config file will automatically update previous versions to add new features.
#
#   - Future Plan: Remove custom code for snowlucas2022, diedrichg, and mistermanko in version 2.0.
#
# v1.6e (11 November 2022)
#   - Fixed gptid not showing in the text section for the cache drive (Scale only affected).
#   - Fixed Zpool "Pool Size" - Wasn't calculating correctly under certain circumstances.
#   - Added Toshiba MG07+ drive Helium value support.
#   - Added Alphabetizing Zpool Names and Device ID's.
#   - Added No HDD Chart Generation if no HDD's are identified (nice for SSD/NVMe Only Systems).
#   - Added Warranty Column to chart (by request and must have a value in the Drive_Warranty variable).
#   - Removed Update option in -config since the script will automatically update now.
#   - Updated instructions for multiple email addresses.
#   - Updated instructions for "from:" address, some email servers will not accept the default
#   -- value and must be changed to the email address of the account sending the email.
#   - Added the No Text Section Option (enable_text) to remove the Text Section from the email output
#   -- and display the chart only, if the value is not "true".
#   - Added Phison Driven SSD attribute for correct Wear Level value.
#
#   NOTES: If there is an error such as the host aborts a drive test and an error occurs, the script may
#   report a script failure.  I do not desire to account for every possible drive error message.
#   If you take a look at your drive data, you may notice a problem.  Fix the problem and the
#   script should work normally.  If it still does not, then reach out for assistance.
#
#   The multi_report_config file will automatically update previous versions to add new features.
#
# v1.6d-2 (09 October 2022)
#   - Bug fix for NVMe power on hours.
#   --- Unfortunately as the script gets more complex it's very easy to induce a problem.  And since I do not have
#   --- a lot of different hardware, I need the users to contact me and tell me there is an issue so I can fix it.
#   --- It's unfortunate that I've have two bug fixes already but them's the breaks.
#   - Updated to support more drives Min/Max temps and display the non-existent value if nothing is obtained vice "0".
#
#   The multi_report_config file is compatible with version back to v1.6d.
#
# v1.6d-1 (08 October 2022)
#   - Bug Fix for converting multiple numbers from Octal to Decimal.  The previous process worked "most" of the time
#   -- but we always aim for 100% working.
#
```

```
#   The multi_report_config file is compatible with version back to v1.6d.
#
# v1.6d (05 October 2022)
#   - Thanks goes out to ChrisRJ for offering some great suggestions to enhance and optimize the script.
#   - Updated gptid text and help text areas (clarifying information)
#   - Updated the -dump parameter to -dump [all] and included non-SMART attachments.
#   - Added Automatic UDMA_CRC, MultiZone, and Reallocated Sector Compensation to -config advanced option K.
#   - Fixed Warranty Date always showing as expired.
#   - Added Helium and Raw Read Error Rates to statistical data file.
#   - Added Raw Read Error Rates chart column.
#   - Added compensation for Seagate Seek Error Rates and Raw Read Error Rates.
#   - Added Automatic Configuration File Update feature.
#   - Added selection between ZFS Pool Size or Zpool Pool Size. ZFS is representative of the actual storage capacity
#   -- and updated the Pool Status Report Summary chart.
#   - Added ATA Error Log Silencing (by special request).
#   - Added 0.1 second delay after writing "$logfile" to eliminate intermittent file creation errors.
#   - Fixed Text Report -> Drive Model Number not showing up for some drives.
#   - Added option to email copy of multi_report_config.txt upon any automatic script modification and/or by day.
# v1.6c (28 August 2022)
#   - Supports external configuration file (but not required).
#   - Completely Configurable by running the script -config parameter (this took a lot of work).
#   - Added HDD/SSDmaxtempovrd variables to combat some bogus SSD values.
#   - Added TLER (SCT) support.
#   - Added support for drives which do not support recording over 65536 hours for SMART Tests and rolls over to start at zero again.
#   - Added -dump parameter to create and email all of the drives smartctl outputs as text file email attachments.
#   - Added support for Helium drives.
# v1.6: (05 August 2022)
#   Thanks to Jeff, Simon, and Sean for providing me more test data than I could shake a stick at and friendly constructive opinions/advice.
#   - Complete rewrite of the script.  More organized and easier for future updates.
#   - Almost completely got rid of using AWK, earlier versions had way too much programming within the AWK structure.
#   - Reads the drives much less often (3 times each I believe).
#   - Added test input file to parse txt files of smartctl -a output. This will allow for a single drive entry and ability
#   -- for myself or any script writer to identify additional parameters for unrecognized drives.
#   -- Usage: program_name.sh [HDD|SSD|NVM] [inputfile_a.txt] [inputfile_b.txt]
#   - Added better support for SAS drives.
#   - Fixed NVMe and SAS Power On Hours for statistical data recording, and other things.
#   - Added Critical and Warning Logs to email output with better descriptive data.
#   - Logs (stored in /tmp/) no longer deleted after execution to aid in troubleshooting, but deleted at the start of the script.
#   - Added HELP file, use program_name.sh [-h] [-help]
#   - Added SCT Error Recovery to the Text Report section.
#   - Added Zpool Size, Free Space, and Temp Min/Max.
#   - Added customizable temperature values and customizable Non-Value fields (use to be coded to "N/A").
#   - Added support for SandForce SSD.
# v1.5:
#   - Added NVMe support
#   - Added clearer error reporting for Warning and Critical errors.
```

```
#   - Known Problems: The NVMe Power On Time has a comma that I can't get rid of, yet. I want to remove the comma when the data is retrieved.
#   -- NVMe's are not all standardized so I expect tweaks as different drive data arrives.
#   -- onHours that includes a comma will not record correctly in the statistical data file.  This is related to the NVMe problem above.
#   -- Zpool Summary does not indicate Scrub Age warning, likely the entire summary has issues.
# v1.4d:
#   - Fixed Scrub In Progress nuisance error when a scrub is in progress.
#   - Added offsetting Reallocated Sectors for four drives.  This should be for testing only. Any drives
#   -- with a significant number of bad sectors should be replaced, just my opinion.
#   - Added Drive Warranty Expiration warning messages and ability to disable the Email Subject line warning.
#   -- NOT TESTED ON OTHER THAN U.S. FORMATTED DATE YYYY-MM-DD.
#   - Added HDD and SSD individual temperature settings.
#   - Changed order of polling Temperature data from HDD/SSD.
# v1.4c:
#   - Rewrite to create functions and enable easier editing.
#   - Added Custom Reports.
#   - Added disabling the RAW 'smartctl -a' data appended to the end of the email.
#   - Added sorting drives alphabetically vice the default the OS reports them.
#   - Added RED warning in Device for any single failure in the summary (deviceRedFlag switch controlled).
#   - Added some additional SSD definitions.
#   - Fixed sorting last two SMART Tests, now reports them in proper order.
#   - Fixed detecting "SMART Support is: Enabled", for white spaces.
#   - Changed IGNORE DRIVES to a String Format to clean up and simplify programming.
#   - Added MultiZone_Errors support for up to eight drives.
#   - Added sectorWarn variable to complement the sectorCrit variable.
#   - Added ignoreSeekError variable to ignore some of those wild Seek Error Rate values.
#   - Added ignoreUDMA CRC Errors due to the "Known Problem"
#   - Fixed md5/sha256 error on TrueNAS Scale (only used during config backups).
#   - Added selectable config backup periodicity by day vice every run.
#   - Added Exporting statistical data for trend analysis.
#   -- Can be setup to email statistics weekly, monthly, or not at all.
#   -- The -s switch will run Data Collection Only, no email generated.  Note: Do Not run two instances at once, the temp files do not survive.
#   - Fixed the Capacity to remove the brackets "[]", thanks Jeff Alperin.
#   - Fixed Scrub Age failure due to 1 day or longer repair time, now shows anything >24 hours.
#
#   - Known Problem: One user reported UDMA_CRC_Errors is not subtracting correctly, have not been able to personally replicate it.
#   -- This error seems to occur around line #1027
# v1.4b:
#   - Added SMART test remaining percentage if Last Test has a SMART Test is in progress.
#   - Fix for empty SMART fields, typically for unsupported SSD's.
#   - Added IGNORE SMART Drive so you can ignore specific drives that may cause you weird readings.
#   --- Updated so blank SSD table header is removed when you ignore all the drives (just crazy talk).
# v1.4a:
#   - Fixed report errors for if a SCRUB is in progress, now shows estimated completion time.
#   - Fixed report error for a Canceled SCRUB.
#   - Fixed FreeBSD/Linux use for SCRUB report (minor oversight).
# v1.4:
```

```
#   - Run on CRON JOB using /path/multi_report_v1.4.sh
#   - Fixed for automatic running between FreeBSD and Linux Debian (aka SCALE) as of this date.
#   - All SMART Devices will report.
#   - Added conditional Subject Line (Good/Critical/Warning).
#   - Added Automatic SSD Support.
#   --- Some updates may need to be made to fit some of SSD's. Code in the area of about line 530 will
#   --- need to be adjusted to add new attributes for the desired SSD's fields.
#   - UDMA_CRC_ERROR Override because once a drive encounters this type of error, it cannot be cleared
#   --- so you can offset it now vice having an alarm condition for old UDMA_CRC_Errors.
#   - Added listing NON-SMART Supported Drives.  Use only if useful to you, some drives will
#   --- still output some relevant data, many will not.
# v1.3:
#   - Added scrub duration column
#   - Fixed for FreeNAS 11.1 (thanks reven!)
#   - Fixed fields parsed out of zpool status
#   - Buffered zpool status to reduce calls to script
# v1.2:
#   - Added switch for power-on time format
#   - Slimmed down table columns
#   - Fixed some shellcheck errors & other misc stuff
#   - Added .tar.gz to backup file attached to email
#   - (Still coming) Better SSD SMART support
# v1.1:
#   - Config backup now attached to report email
#   - Added option to turn off config backup
#   - Added option to save backup configs in a specified directory
#   - Power-on hours in SMART summary table now listed as YY-MM-DD-HH
#   - Changed filename of config backup to exclude timestamp (just uses datestamp now)
#   - Config backup and checksum files now zipped (was just .tar before; now .tar.gz)
#   - Fixed degrees symbol in SMART table (rendered weird for a lot of people); replaced with a *
#   - Added switch to enable or disable SSDs in SMART table (SSD reporting still needs work)
#   - Added most recent Extended & Short SMART tests in drive details section (only listed one before, whichever was more recent)
#   - Reformatted user-definable parameters section
#   - Added more general comments to code
# v1.0:
#   - Initial release
```