Multi-Report

User Guide

Updated 19 August 2023

Multi-Report User Guide (Version 2.2 to 2.4)

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

IF YOU HAVE A PROBLEM

Have a problem? First check the Common Problems and Solutions section of this user guide. If you discover a drive that does not appear to be addressed, please run the script using the '-dump email' 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 fix it?" or "Arg! I have ada2 errors and I don't think they are valid". This will send me an email with all your dump data and I will be able to look into the issue and address it. 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."

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 with it, or sell it to the Mafia. I may use it to send you back a message if you reported a problem.

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.

Contents

What is Multi-Report?

Multi-Report is a joint effort to produce a simple script that would report key drive data points in order to predict drive failure and deliver that via email. Additionally multi-report can maintain statistical data in a Comma Separated Value (CSV) format compatible with any typical spreadsheet program.

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.

Versioning

Multi-Report versioning is controlled by the version number and the date. Example: "multi_report_v2.2_04_Apr_2023.txt" and Beta will be clearly identified. Small bug fixes are likely to have a third digit, for example: "multi_report_v2.2.1_02_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" 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 v2.2 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.

What do I ask for in return?

I would like to create the best and most inclusive free product 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 and was used to test this script is listed in Appendix A. Please note that all drives do not present all the data we are trying to display, especially SCSI drives.

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 in the

future. For this example, the script is named "multi_report.sh" and the dataset is located at '/mnt/mypool/scripts'. If you are not using the 'root' user to setup this script, you must use an administrator account you create and precede the commands with 'sudo'. I prefer to use 'root' but that is just me.

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.

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

NOTE: V2.2 or V2.3 steps only apply to the respective installation you are performing.

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. V2.3 Rename the script to 'multi_report.sh'.
7. V2.3 Make the file executable 'chmod +x multi_report.sh'
8. V2.2 Give the file some execute permissions 'chmod 777 multi_report_v2.2_2023_04_08.txt'
9. V2.2 Make the file executable 'chmod +x multi_report_v2.2_2023_04_08.txt'

First Time Installation (No External Configuration File)

10. If this is not your first time using multi_report and you have an external configuration file, proceed to step 17.
11. V2.3 Run the script './multi_report.sh -config'
12. V2.2 Run the script './multi_report_v2.2_2023_04_08.txt -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.
13. Press the 'n' key to create a New configuration file.
14. 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'
15. 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.

16. 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 it 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)

17. V2.3 Run the script './multi_report.sh'. This will run the script normally and upgrade the External Configuration File if required.
18. V2.2 Run the script './multi_report_v2.2_2023_04_08.txt'. This will perform a few things:
    a. Create a symbolic link to 'multi_report.sh'
    b. Upgrade the External Configuration File
19. V2.2 Let's run the script again but this time without any CLI switches './multi_report.sh'.
20. If all goes well you will receive an email that contains a chart and text section.
21. 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.

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 configuration of Multi-Report. 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 with 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.

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.

- Statustical_Data.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.
- 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.zip file to be encrypted then you MUST manually edit the 5th line of the script and enter a password. Why encrypt this data? While the data “should” be perfectly safe since the password file is encrypted, some of us prefer a little extra security. Additionally, normally 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.

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.

And example of a password might be:

TrueNASConfigEmailEncryption="ThisIsMyPassword#3#2@1!"

There are two files in the .zip file:

freenas-v1.db – Main Configuration File

pwenc_secret – All the passwords in an encrypted format.

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

Setting up a Dedicate Script Directory

NOTE: ACL's will be the death of me. In order to run the script correctly for use with the Update feature, you must create a proper dataset in which you can execute the commands in the script, of which 'chmod' is the largest offender. Below is a set of instructions for someone who has limited or no real knowledge of ACL's, like me. I did a lot of trial and error so if someone had a better way then please let me know and I will test it and update the instructions, especially for the ACL portion.

I will be honest here, I run the script as 'root' and I provide my script directory full permissions, as well as my script. But my TrueNAS server is behind a firewall and is not exposed to the internet so risk is extremely low to my system. I'm 100% certain there are smarter ways to do this but this works for me so I'll share it. Please know that I'm not a networking guru so if someone tells me there is a better way to do this, I'll be happy to test it out and then update the instructions.

If you are using Spencer, it is highly recommended to place the 'spencer.py' script in the same directory as the 'multi_report.sh' directory. This is the default configuration.

1. Create a new dataset and give it a simple name.
    a. Choose Share Type = Generic (need to have ACL Mode = Passthrough)
2. Create an SMB Share for ease of copying the script to the dataset.
    a. Use default share parameters.
    b. When asked to configure the ACL's, do it.
        i. Configure the ACL's as OPEN. (RESTRICTED worked for me as well)
        ii. Leave everything as default.
            1. User 'root'
            2. Group 'wheel'
    c. Save
3. If the SMB is not active, turn it on.
4. Now using your SMB share, drop the multi_report.sh file into the folder.

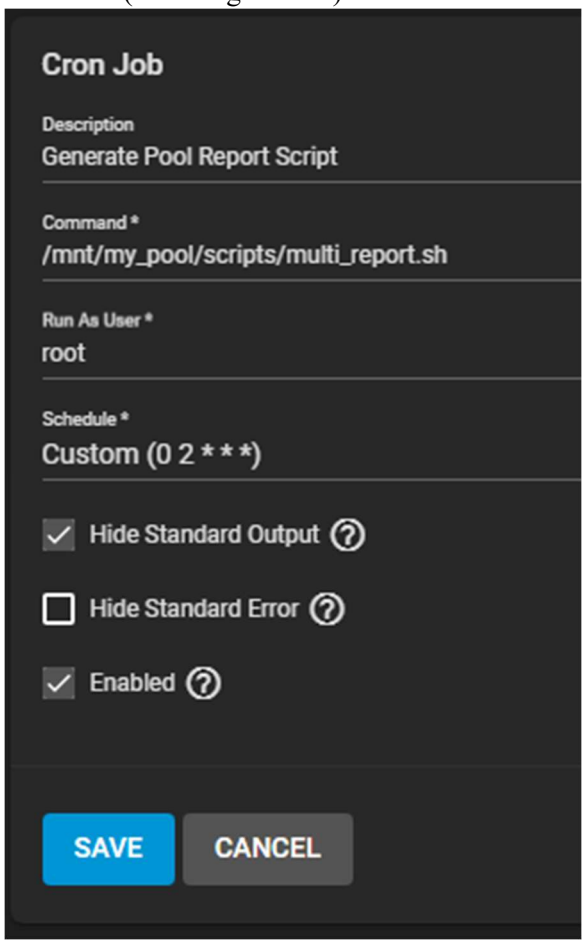
5. We must make the file executable now so in the TrueNAS GUI, go to Shell, cd to your dataset.
6. Type ‘ls’ and your file should be listed.
7. Type ‘chmod 755 multi_report.sh’ and the file will now be executable.
8. If you have never run multi_report before then you will need to run it one time to create the external configuration file. Type ‘./multi_report.sh -config’ and answer the questions. If you already have a configuration file, skip this step.
9. Time to create a CRON JOB (see instructions below)

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, Hide Standard Output, 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 Checked.

10. Hide Standard Error in Unchecked.
11. Enabled is Checked.
12. Now click SAVE.
13. Test the CRON Job by manually running it. You should get an email if you have everything setup correctly.

TrueNAS Scale is similar to setup.

Running the Script

The script can be normally executed by simply entering the program name "./multi_report.sh" the script will run normally. Below 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. 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 used 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)	2 minutes

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. 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.

Command Line Switches

-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 v2.4.4 dtd:2023-08-17 (TrueNAS Core 13.0-U5.3)

Configuration File Management

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

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

U)pdate configuration file (updates select static variables to default)

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.

Update Configuration File – This option will reset most of the static variable to factory defaults.

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)

-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.

-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.

-dump [all] or [email]
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. Option 'all' which will include the Statistical Data File and the TrueNAS configuration file. Option 'email' will send the data generated in the '-dump' command also 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.

-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.

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 require three 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) Some options will give you a choice of 'd' to delete the value and continue, or '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)

S) Custom Drive Configuration

U) Update Script (Automatic or Manual operation)

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

- ✓ Automatic SSD Detection (true)
  - A 'true' value will allow looking for SSD's.
- ✓ Automatic NVMe Detection (true)
  - A 'true' value will allow looking for NVMe drives.
- ✓ Force non-SMART Devices to report (true)
  - A 'true' value will report drives which do not support SMART.
- ✓ Remove non-SMART data from 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

- ✓ Save Local Copy of TrueNAS config-backup file (false)
  - Set to 'true' will create a copy of the TrueNAS configuration in the path identified below.
- ✓ TrueNAS Backup Location (/tmp/)
  - Path to save the above file if above is set to 'true'.
- ✓ TrueNAS Backup Email Enabled (true)
  - Attach TrueNAS configuration file to email when set 'true'.
- ✓ Day of the week to attach TrueNAS Backup file (Mon)
  - The day of the week to attach the TrueNAS backup file. Options are: Mon, Tue, Wed, Thu, Fri, Sat, Sun, All, or Month.
- ✓ Multi_Report_Config Email Enable (true)
  - Attach multi_report_config.txt file to email if 'true'.
- ✓ Day of the week to attach Multi_Report_Config (Mon)
  - The day of the week to attach the TrueNAS backup file. Options are: Mon, Tue, Wed, Thu, Fri, Sat, Sun, All, or Month.
- ✓ Attach Multi_Report_Config on any change (true)
  - When 'true', attach the multi_report_config.txt file if the file changes.

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.
- ✓ Mouseover (alt)
  - This will present the UDMA_CRC_Errors value if there are errors in three possible values:

- 'true' = Display a zero'd out value normally until mouseover then display the actual errors. This is not functional yet, unable to make this work in email, yet.
- 'false' = Disable the mouseover feature.
- 'alt' = Display both the zero'd out value and the actual value in parenthesis.

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 and Custom Builds

- ✓ 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 Thickness (1)
  - Values are 1, 2, or 3. This will place a box around the warranty box once the warranty has expired vice using a color.
- ✓ 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 drives expires.

Custom Drive Configuration (Drive Serial Number Specific)

This adjusts individual media alarms for individual drives. For example, if you have one drive that is giving you an alarm condition such as a Sector Alarm, you can change the alarm setpoint for this specific drive. By default, Sector Warning = 1, if you have 3 bad sectors already then you can use this custom configuration to set the Sector Warning value to 4, or any other number you desire. This is drive specific, based on the drive serial number.

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 (reverse value)

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.

Spencer Integration

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.

Common Problems and Solutions

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

1. 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.
2. 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.
3. 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.
4. 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.
5. 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.
6. 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.

7. 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.

8. 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, please send me a '-dump email' so I can verify the problem and maybe I can fix it without breaking something else.

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 an email address if you want me to respond. Joe Schmuck will respond to the email he received it from unless the message states otherwise.
5. If you have a suggestion to fix a possible problem, please send a message.

Appendix A Drive Models Tested: (As of 11 August 2023)
If you have a drive model not listed below, please use '-dump email' to forward the data to Joe Schmuck.

HDD Model Number
HGST HDN726060ALE614
HGST HUH721010AL5200 (SCSI)
HITACHI HUS72604CLAR4000
Samsung HD103UJ
SEAGATE OOS14000G (SCSI)
SEAGATE ST16000NM004J
ST12000NM001G-2MV103
ST12000NM0008-2H3101
ST16000NM001G-2KK103
ST6000NM0115 00FN174 00FN177LEN
ST2000VN004-2E4164
ST3000VN007-2AH16M
ST4000VN008-2DR166
ST6000VN001-2BB186
TOSHIBA HDWG480
TOSHIBA MG04ACA600E
TOSHIBA MG07ACA14TE
TOSHIBA MG08ACA14TE
TOSHIBA MG08ACA16TE
TOSHIBA MG09ACA18TE
WDC WD10JFCX-68N6GN0
WDC WD140EDGZ-11B2DA2
WDC WD40EFPX-68C6CN0
WDC WD40EFRX-68WT0N0
WDC WD60EFZX-68B3FN0
WDC WD60EFRX-68MYMN1
WDC WD80EFZZ-68BTXN0
WDC WD80EFZX-68UW8N0
WDC WD100EFAX-68LHPN0
WDC WD100EZAZ-11TDBA0

SSD Model Number
Crucial_CT750MX300SSD1
GIGABYTE GP-GSTFS31120GNTD
HITACHI HUSMM808 CLAR800 (SCSI)
HPE VO000960JWTBK (SCSI)
IBM HUSML4040ASS600 (SCSI)
INTEL SSDSA2CT040G3
INTEL SSDSA2M040G2GC
INTEL SSDSC2BB080G4
INTEL SSDSC2BX016T4
INTEL SSDSC2BX800G4
KINGSTON SA400S37120G
KINGSTON SA400S37960G
Lexar 240GB SSD
PNY CS900 120GB SSD
Samsung SSD 850 EVO 1TB
Samsung SSD 850 PRO 256GB
Samsung SSD 860 EVO 250GB
Samsung SSD 870 QVO 8TB
SanDisk SDSSDH3 512G
SAMSUNG MZ7LM240HMHQ-00003
SanDisk SD6SB1M256G1022I
SanDisk SD8SBAT128G1122
SATADOM-MV 3ME
Seagate IronWolf ZA250NM10002-2ZG100
SPCC Solid State Disk
SuperMicro SSD
VK0120GEYJP
WDC WDS500G1R0A-68A4W0

NVMe Model Number
CL4-3D256-Q11 NVMe SSSTC 256GB
CT500P3SSD8
CT1000P3PSSD8
INTEL SSDPEK1A118GA
INTEL SSDPE21D280GA
KINGSTON SA400S37120G
KINGSTON SNV2S500G
Patriot M.2 P300 128GB
PC SN740 NVMe WD 256GB
Samsung SSD 960 EVO 250GB
Samsung SSD 970 EVO Plus 250GB
Samsung SSD 980 PRO 1TB
SAMSUNG MZVL2512HCJQ-00BL7
SAMSUNG MZVL2256HCHQ-00B00
TS2TMTE220S

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 Bidelu0hm, then by melp (me)

### Version: v1.3 TrueNAS Scale (Jeff Alperin 12-6-21)

### Version v1.4 → v2.4 FreeNAS/TrueNAS (CORE & SCALE) (joeschmuck)

### Changelog:
# 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.
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#   - 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
```