ADVANCED USE CASE

Using nvmecmd to verify user features

www.epicutils.com

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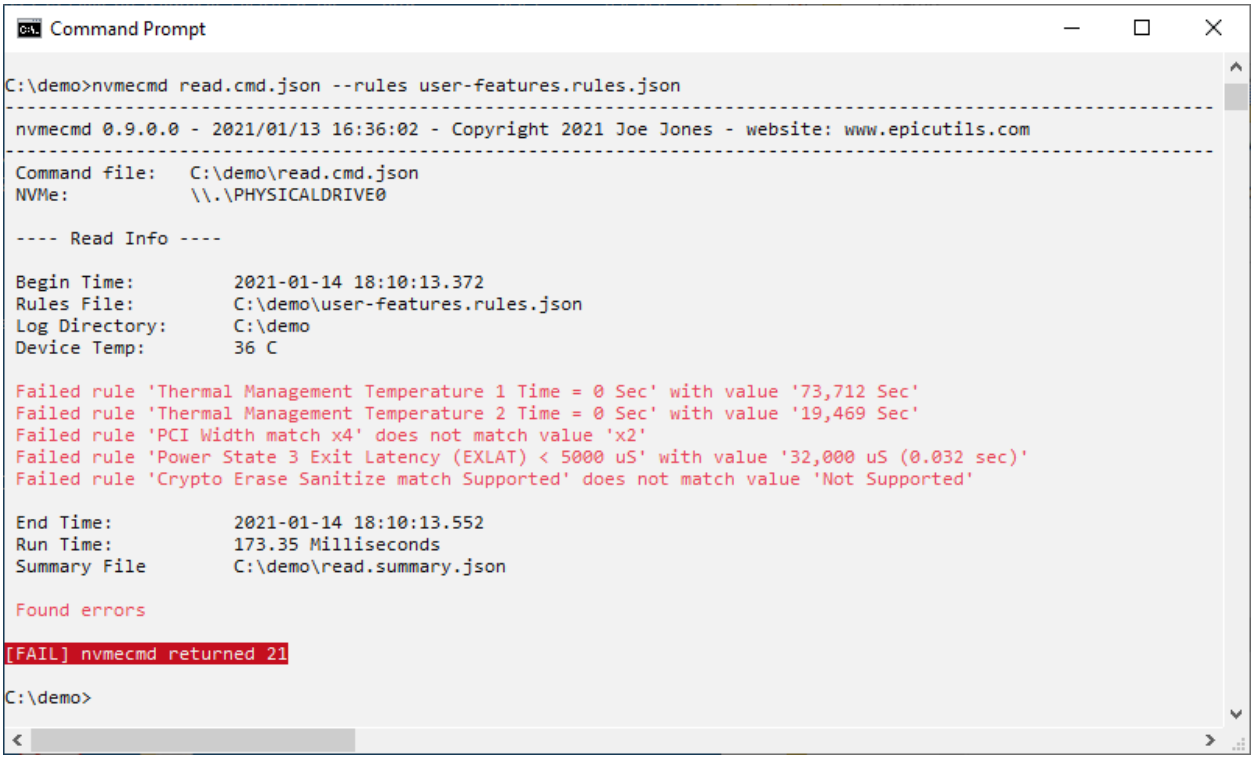
Overview

The nvmecmd command line utility can verify user specific features of an NVMe drive. The following command reads the drive information and verifies it against a set of rules for user defined features.

nvmecmd read.cmd.json --rules user-features.rules.json

This command returns 0 if all rules are met and non-zero if not.

The example output below shows a drive that does not meet the rules defined in user-features.rules.json. The output displays one line for each failed rule. The first two lines indicates the drive has spent time in the throttled state when the rules indicate no throttling is allowed.



User Specific Features and Rules

Users can define their own rules to verify drives meet their specific requirements. An example set of rules can be found in in the tables below. These rules can also be found in the file user-features.rules.json located in the \resources\nvmecmd subfolder of the NVMe Info installation.

These rules are provided as an example only and should be updated to meet user specific requirements.

TABLE 1: EXAMPLE RULES FOR ERROR CHECK

Example rules to verify the drive is not reporting any errors or throttling. These rules allow the user to determine if the drive is over-heating or reaching end of life.

Rule
Critical warnings match No
Media and Data Integrity Errors must be 0
Warning Composite Temp Time must be 0
Critical Composite Temp Time must 0
Total Time for TMT1 must be 0
Total Time for TMT2 must be 0
No Self-Test failures reported in Log Page 6

TABLE 2: EXAMPLE RULES FOR PCI CHECK

Example rules to verify drive is running at the correct PCIe width and speed for the current system and slot it is installed in. Drives not running at the correct speed and width could indicate a problem with the electrical connection to the drive.

Rule
PCI Width match x4
PCI Speed match Gen3 8.0GT/s

TABLE 3: EXAMPLE RULES FOR POWER STATE CHECK

Example rules to verify a subset of the power state parameters. Within a given system a user may require the drive to operate below a specific power limit. Rules can be created that check the reported maximum power for each state against a user specified limit.

Rule
Number of Power States Support (NPSS) = 5
Power State 0 Maximum Power (MP) < 10 Watts
Power State 1 Maximum Power (MP) < 9 Watts
Power State 2 Maximum Power (MP) < 8 Watts
Power State 3 Maximum Power (MP) < 0.1 Watts
Power State 4 Maximum Power (MP) < 0.05 Watts
Power State 0 Non-Operational State (NOPS) match False
Power State 1 Non-Operational State (NOPS) match False
Power State 2 Non-Operational State (NOPS) match False
Power State 3 Non-Operational State (NOPS) match True
Power State 4 Non-Operational State (NOPS) match True
Power State 3 Exit Latency (EXLAT) < 5000 uS
Power State 4 Exit Latency (EXLAT) < 50000 uS

TABLE 4: EXAMPLE RULES FOR FEATURES

Example rules to verify user specific features are supported or not supported.

Rule
Firmware Activation Without Reset match Supported

Autonomous Power State Transition match Supported
Extended Device Self-test Time (EDSTT) > 0 Min
Crypto Erase Sanitize match Supported

TABLE 5: EXAMPLE RULES FOR RUN TIME D3

Example rules to verify the entry and exit times for run time D3.

Rule
RTD3 Entry Latency (RTD3E) < 10000000 uS
RTD3 Resume Latency (RTD3R) < 1000000 uS

Rules File (user-features.rules.json)

The rules above can be found in the user-features.rules.json rules file from the \resources\nvmecmd subfolder of the NVMeInfo installation folder. This file consists of a simple JSON array of strings where each string is a rule. This file is shown below. Additional details on how to create or modify rules file can be found in the nvmecmd User Guide.

```
{
  "rules": [
    "'Critical Warnings' match No",
    "'Media and Data Integrity Errors' = 0",
    "'Warning Composite Temperature Time' = 0 Min",
    "'Critical Composite Temperature Time' = 0 Min",
    "'Thermal Management Temperature 1 Time' = 0 Sec",
    "'Thermal Management Temperature 2 Time' = 0 Sec",
    "'Number Of Failed Self-Tests' = 0",

    "'PCI Width' match x4",
    "'PCI Speed' match Gen3 8.0GT/s",

    "'Number of Power States Support (NPSS)' = 5",
    "'Power State 0 Maximum Power (MP)' < 10 Watts",
    "'Power State 1 Maximum Power (MP)' < 9 Watts",
    "'Power State 2 Maximum Power (MP)' < 8 Watts",
    "'Power State 3 Maximum Power (MP)' < 0.1 Watts",
    "'Power State 4 Maximum Power (MP)' < 0.05 Watts",
    "'Power State 0 Non-Operational State (NOPS)' match False",
    "'Power State 1 Non-Operational State (NOPS)' match False",
    "'Power State 2 Non-Operational State (NOPS)' match False",
    "'Power State 3 Non-Operational State (NOPS)' match True",
    "'Power State 3 Exit Latency (EXLAT)' < 5000 uS",
    "'Power State 4 Exit Latency (EXLAT)' < 50000 uS",

    "'Firmware Activation Without Reset' match Supported",
    "'Autonomous Power State Transition' match Supported",
    "'Extended Device Self-test Time (EDSTT)' > 0 Min",
    "'Crypto Erase Sanitize' match Supported",

    "'RTD3 Entry Latency (RTD3E)'  < 10000000 uS",
    "'RTD3 Resume Latency (RTD3R)' < 1000000 uS"
  ]
}
```

References

NVMe specification https://nvmexpress.org/developers/nvme-specification/

Nvmecmd User Guide http://www.epicutils.com

User Guide provided with NVME Info application located in the Documentation folder of the install path for NVMe Info.