



Client SSD ~~Traps and Pitfalls~~

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PyNVMe3 Introduction

test suite:

customized

conformance

performance

library:

power

ZNS

TCG

MI

**Python
scripts**

API:

controller

namespace

qpair

pcie

buffer

SPDK: nvme driver

cmdlog

checksum

ioworker

**user
space
driver**

Test Phases

- Phase I
 - NVMe conformance
 - TCG
 - Performance
 - Latency
 - Power consumption
 - Low power mode transtion
 - Poweron time
 - Wear leveling
 - ...
- Phase II
 - Consume PE 300
 - Performance
 - Consume PE 600
 - Performance
 - 1-week IO stress
 - Consume PE 900
 - Performance
 - Consume PE 1200
 - Performance
 - Data retention after 2-month

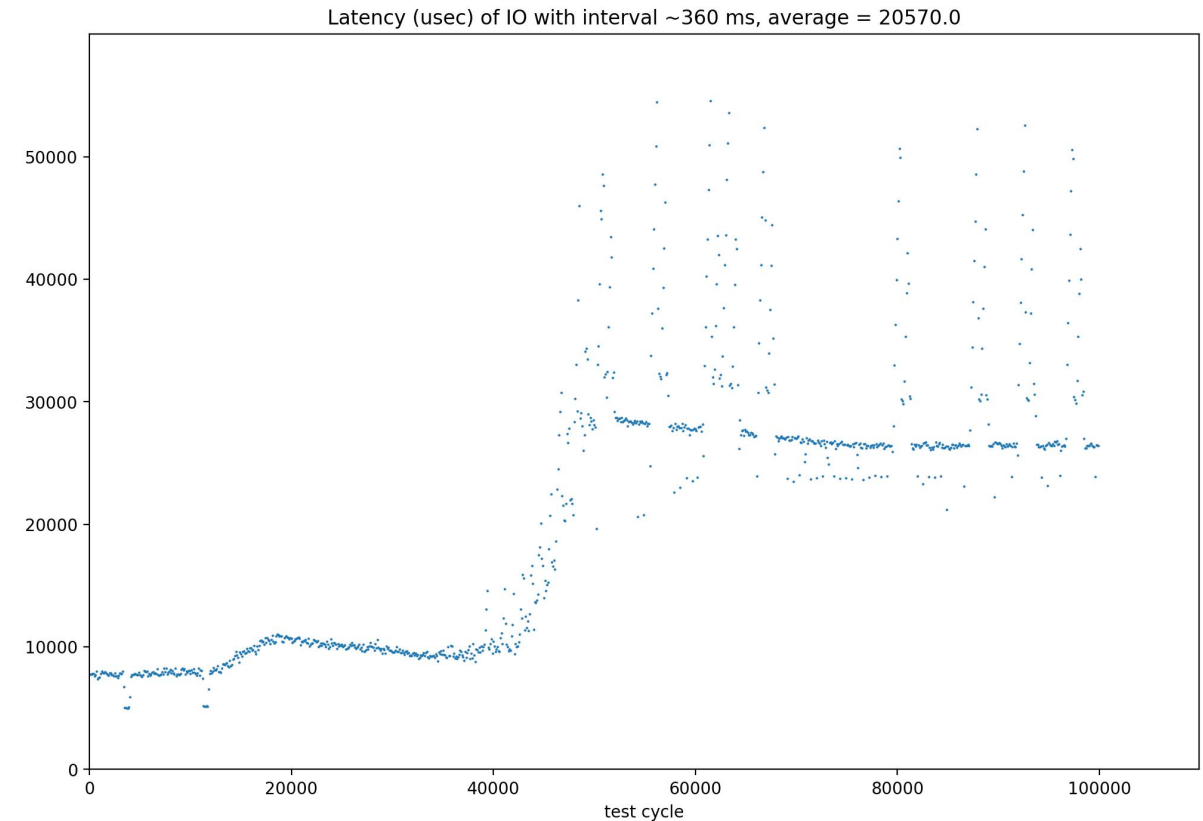
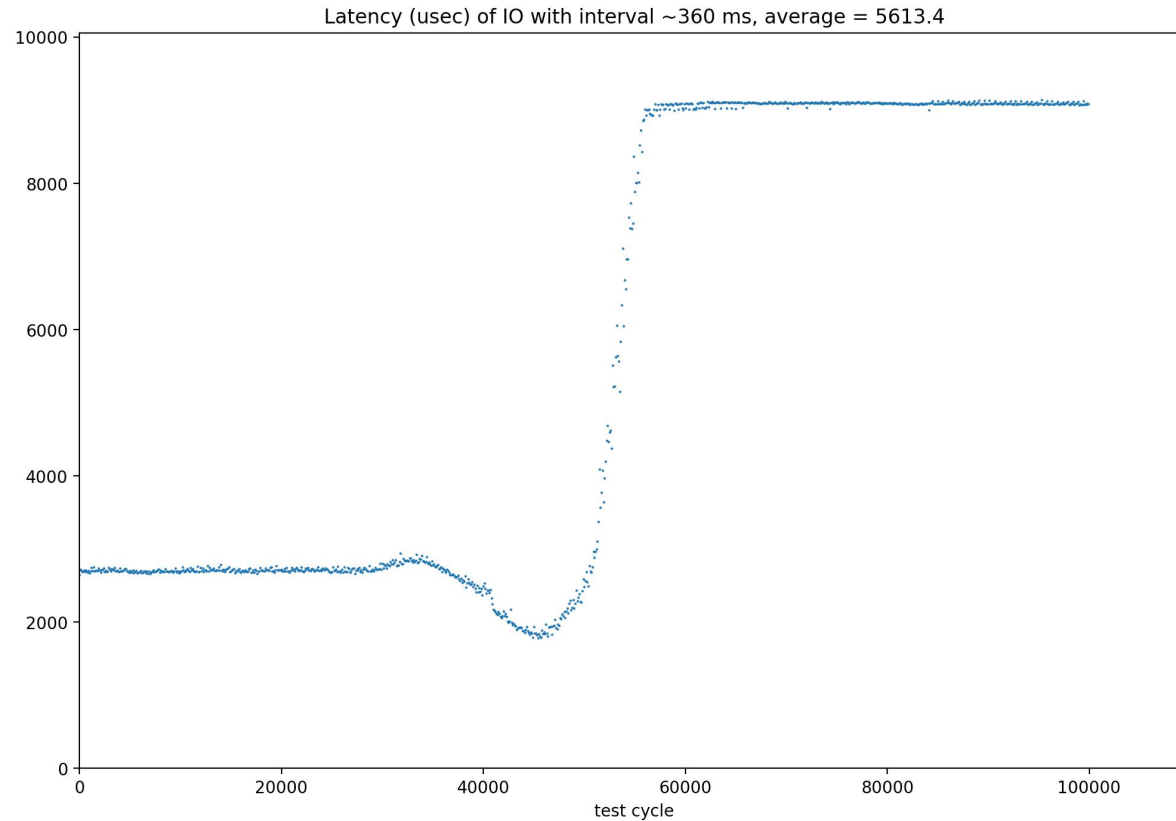


Classes of Client SSD

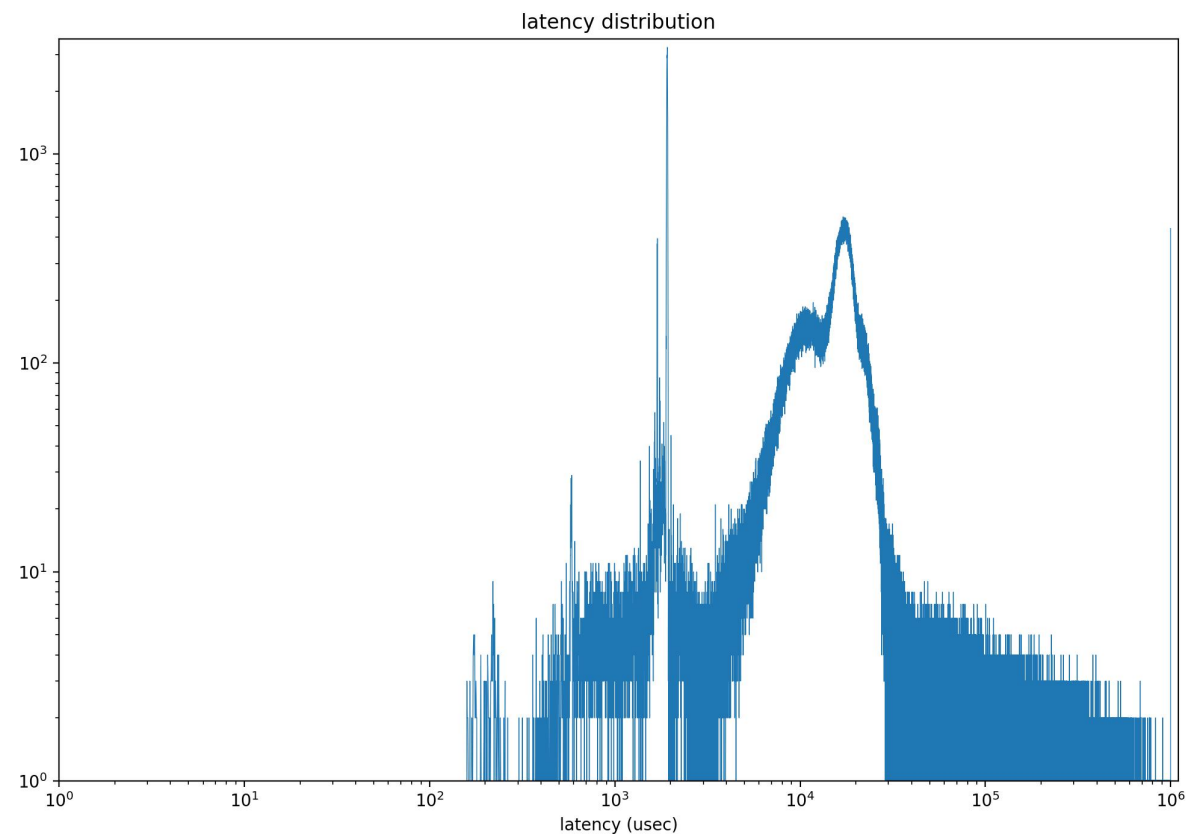
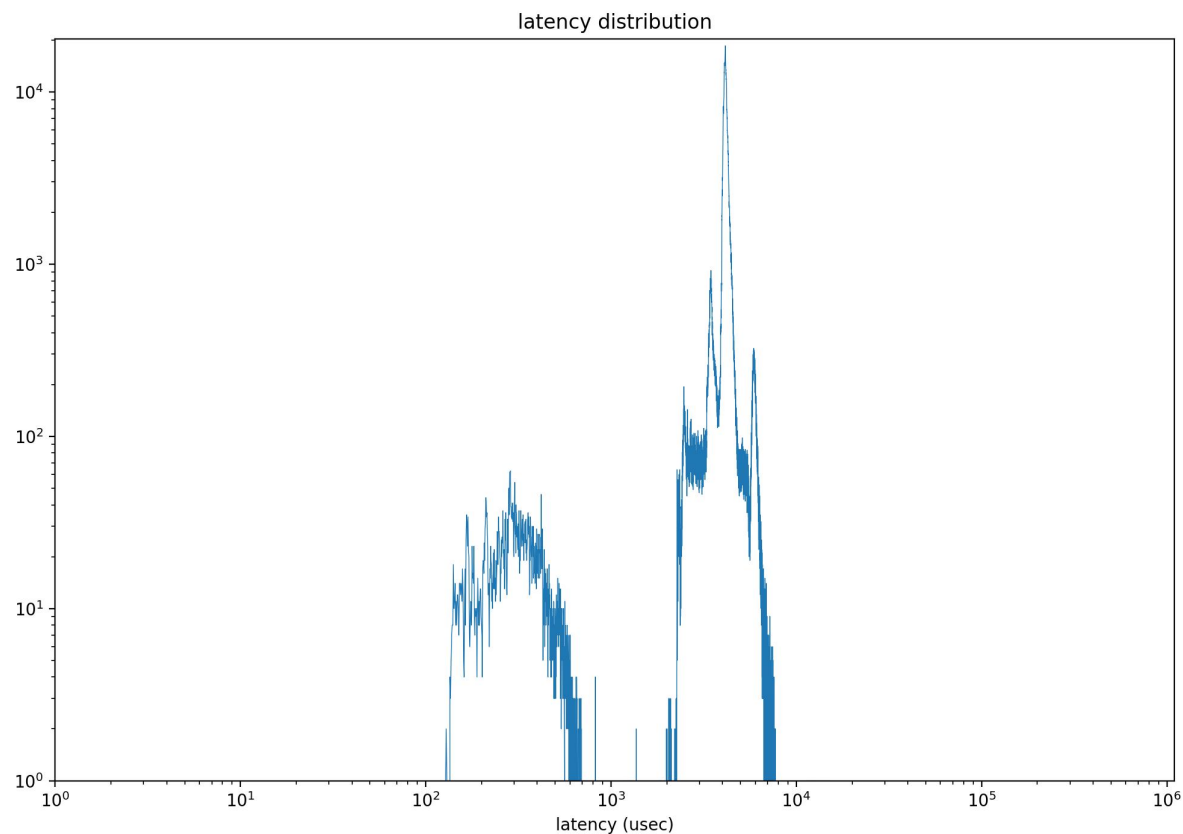
- performance
- cost



TP1: PS4 Exit Latency



TP2: Data Retention



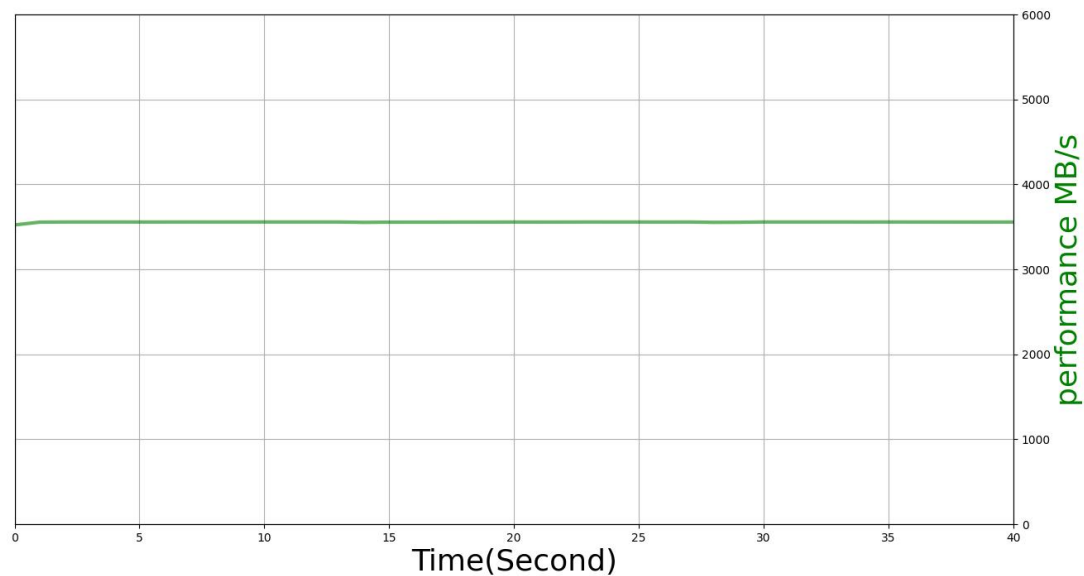
TP3: Low-Loading Performance

Latency (ms)	10 IOPS randread 99%	4K 1QD randread 99.9%	512 1QD randread max
S50Pro	1.824	0.122	8.968
SN770	102.830	0.179	140.470
NM710	>999.999	0.142	6.137

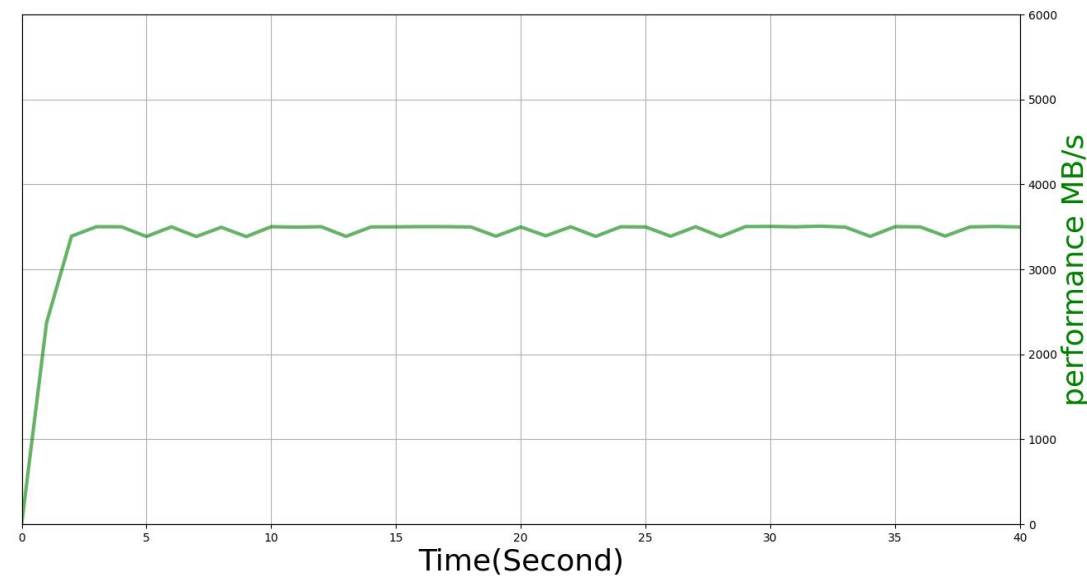


TP4: Time-0 Performance

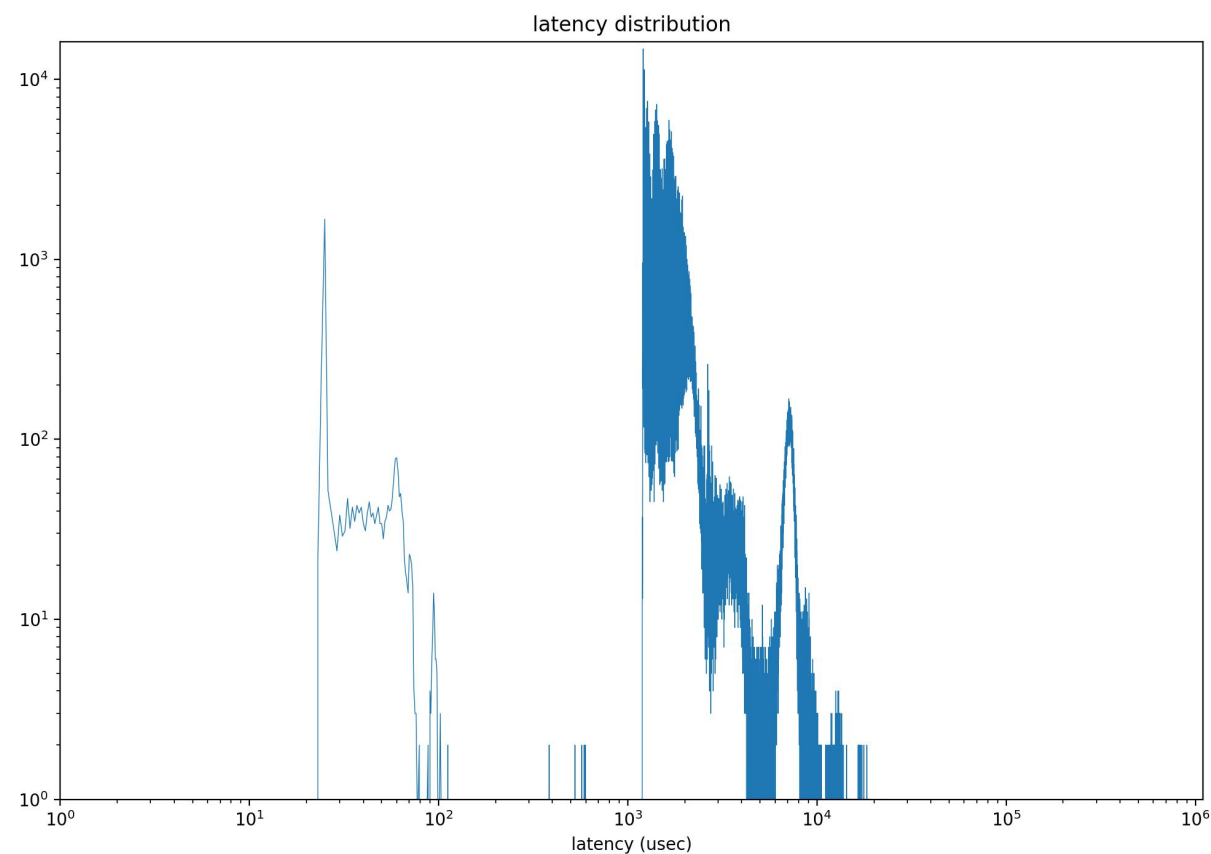
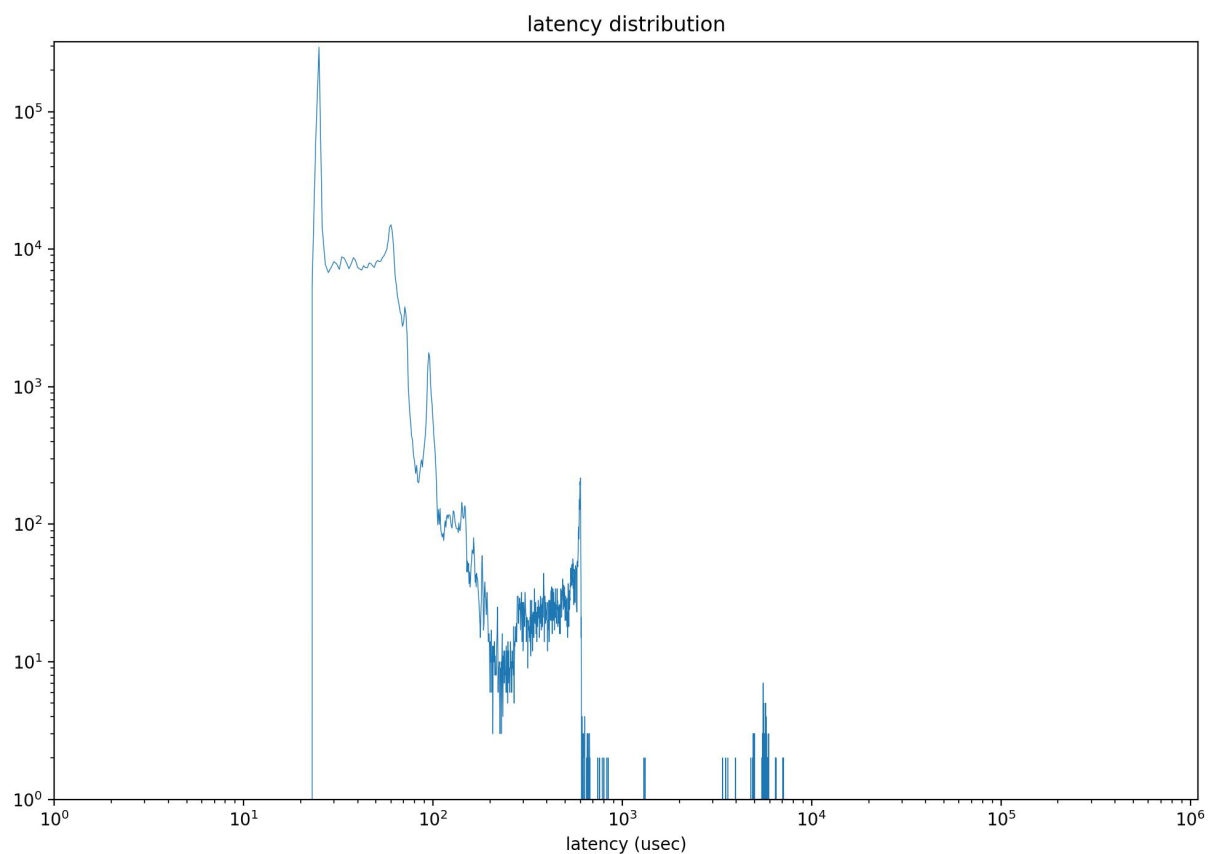
sequential read



sequential read

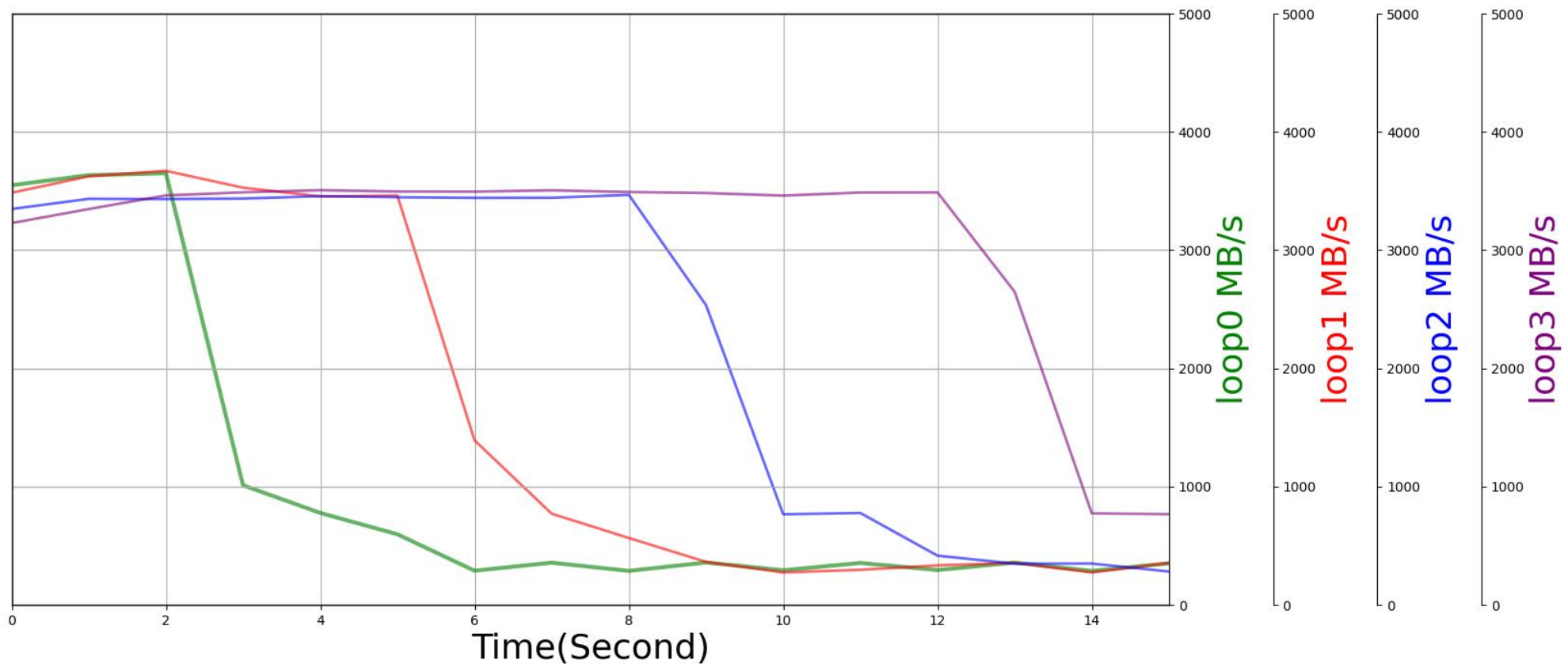


TP5: Write Latency



TP6: SLC-Cache Reclaim Speed

SN770 SLC cache reclaim



TP7: Full Drive Performance

Write bandwidth (MB/s)	10% space occupied	50% space occupied	90% space occupied
990Pro	5535.679	1661.820	1421.784
P41	5519.930	1735.471	955.609
Rocket4Plus	5372.183	1097.728	771.419



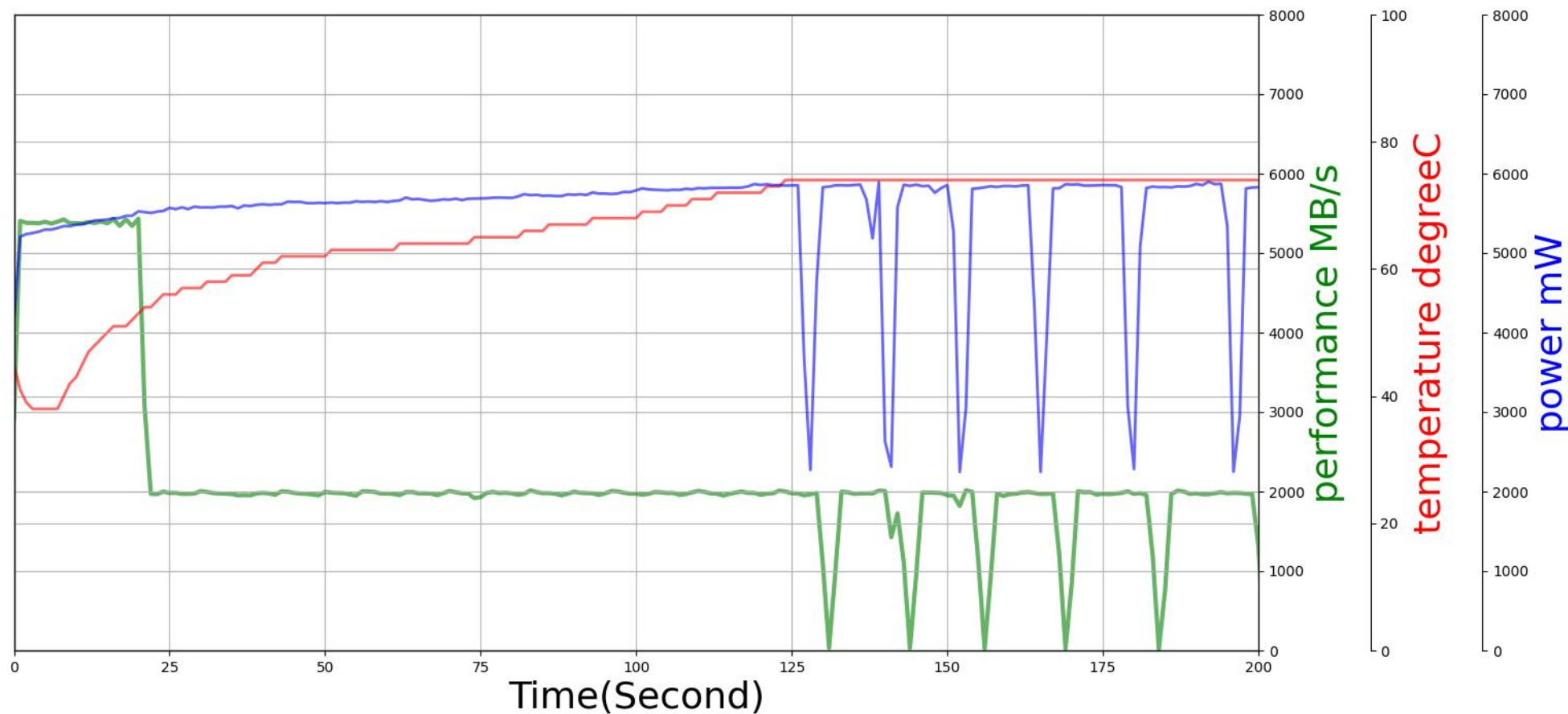
TP8: Aged Drive Performance

Write bandwidth (MB/s)	TiPlus7100	NM710	P41
300 PE	2671.769	2336.024	4262.101
600 PE	2661.653	720.599	4265.609
900 PE	2665.166	716.710	4263.250



TP9: Performance Consistency

Y9000 200s

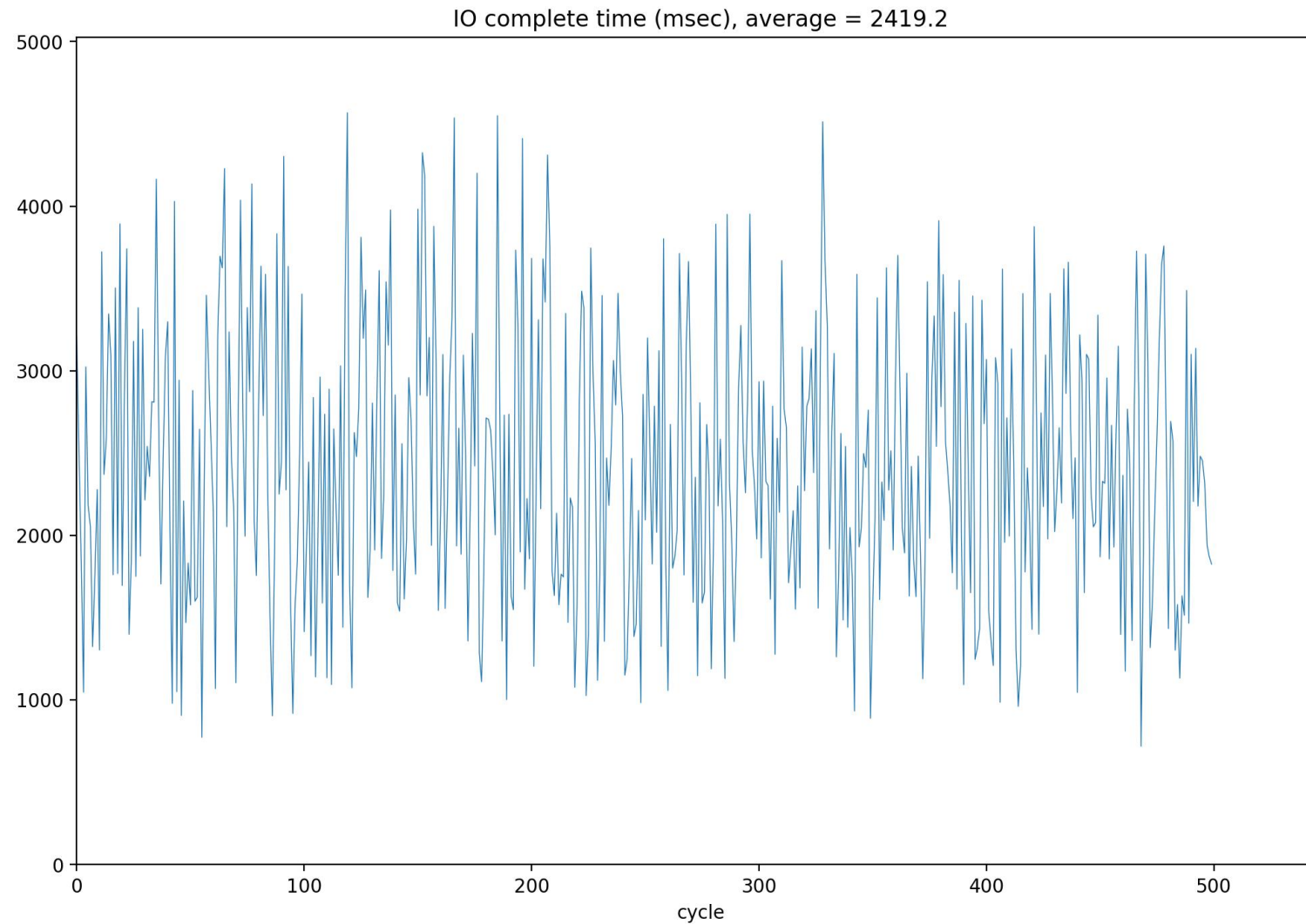


TP10: Mixed Performance

	read/write mixed throughput (K IOPS)	read/write/trim mixed throughput (K IOPS)	read/write/trim mixed Latency 99.9% (ms)
P41	218.772	11.671	10.953
990Pro	510.325	6.936	9.249
980Pro	267.420	1.355	78.370



TP11: Poweron Time



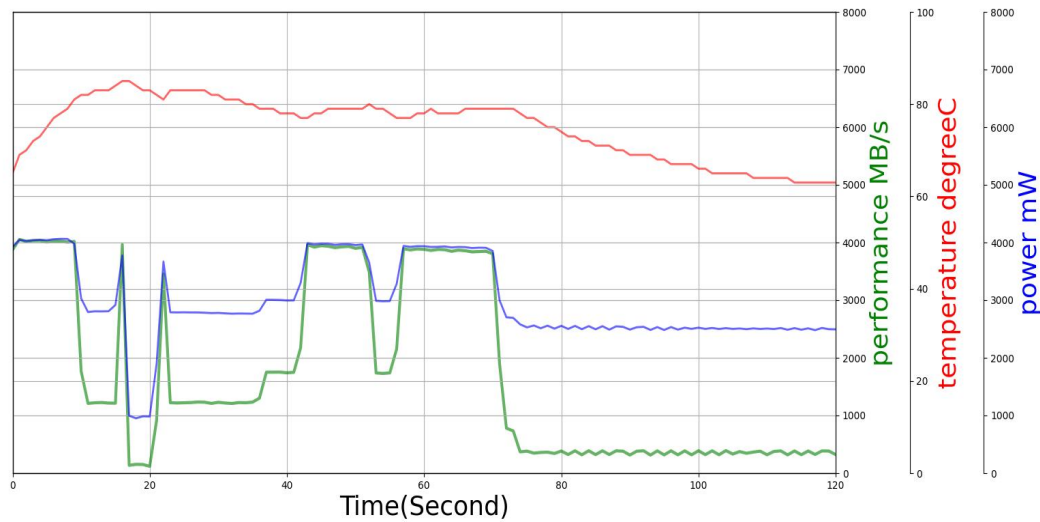
TP12: Gen4 Power

PCIe	sequential read (MB/s)	sequential read (mW)	power efficiency (GB/J)
Gen4	2735	2850	0.96
Gen3	2714	2652	1.02
Gen2	1754	1960	0.89

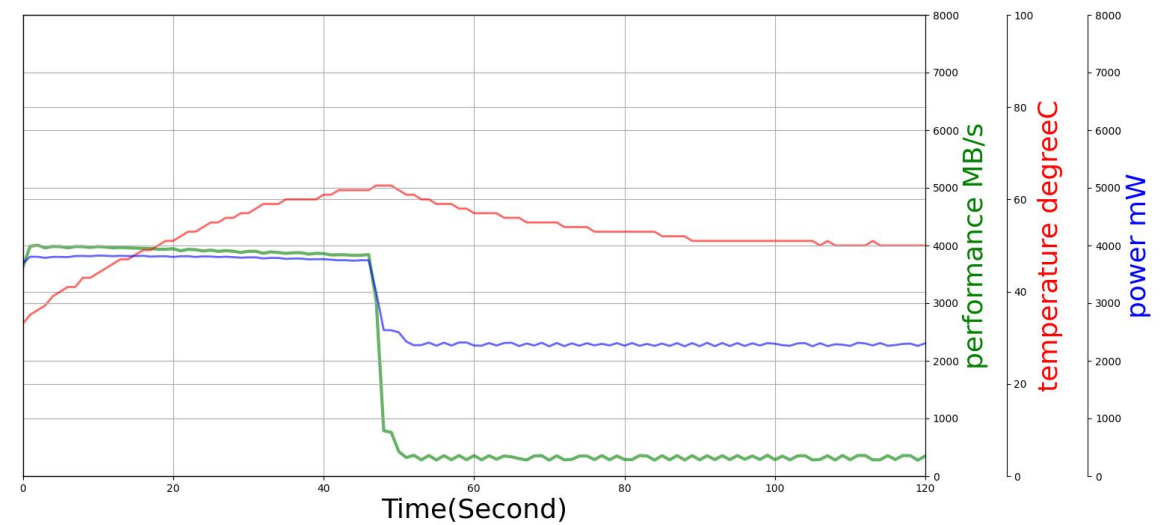


TP13: 2230 Form Factor

SN740 2230

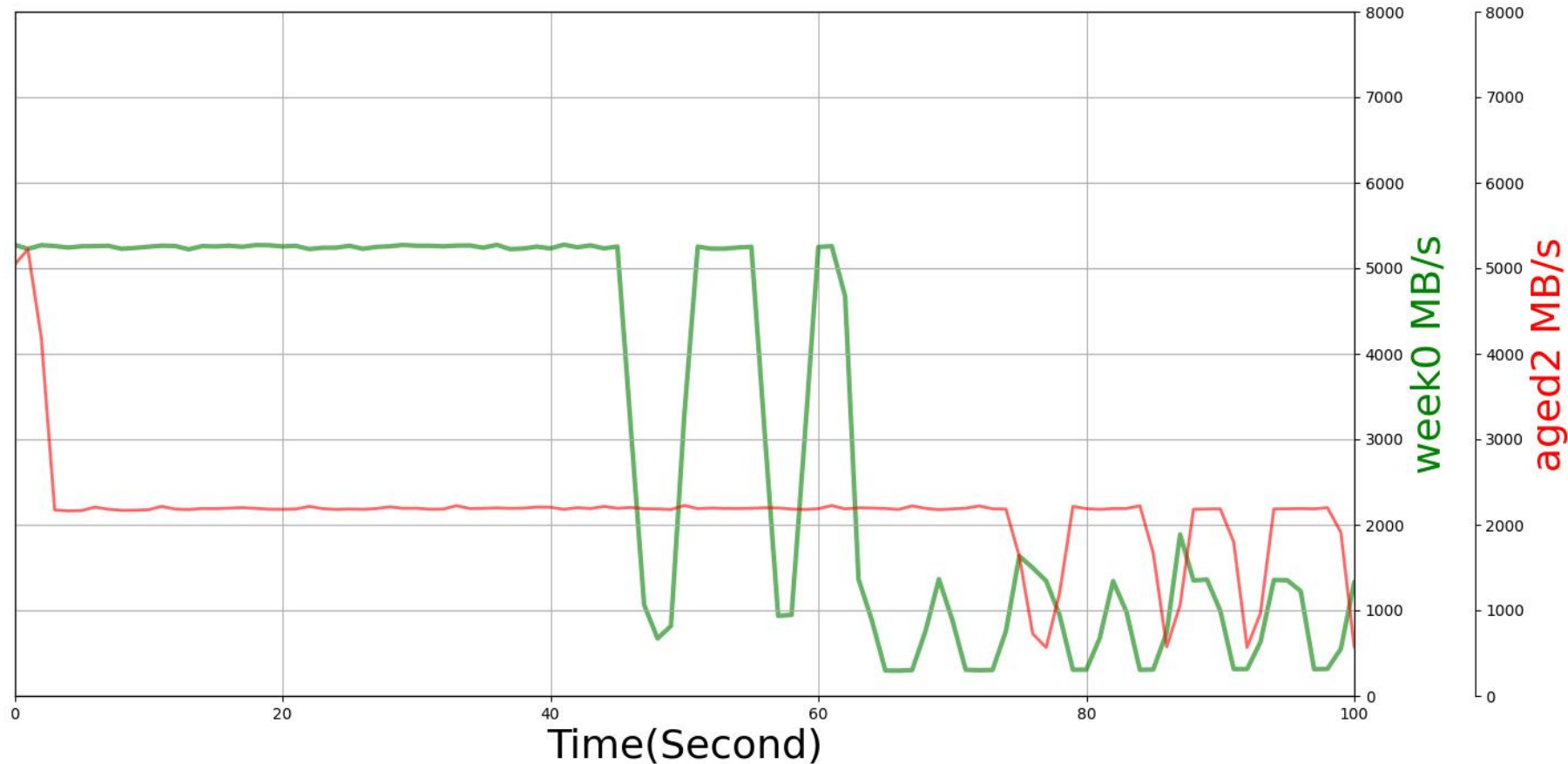


SN770 2280



TP14: SLC Cache

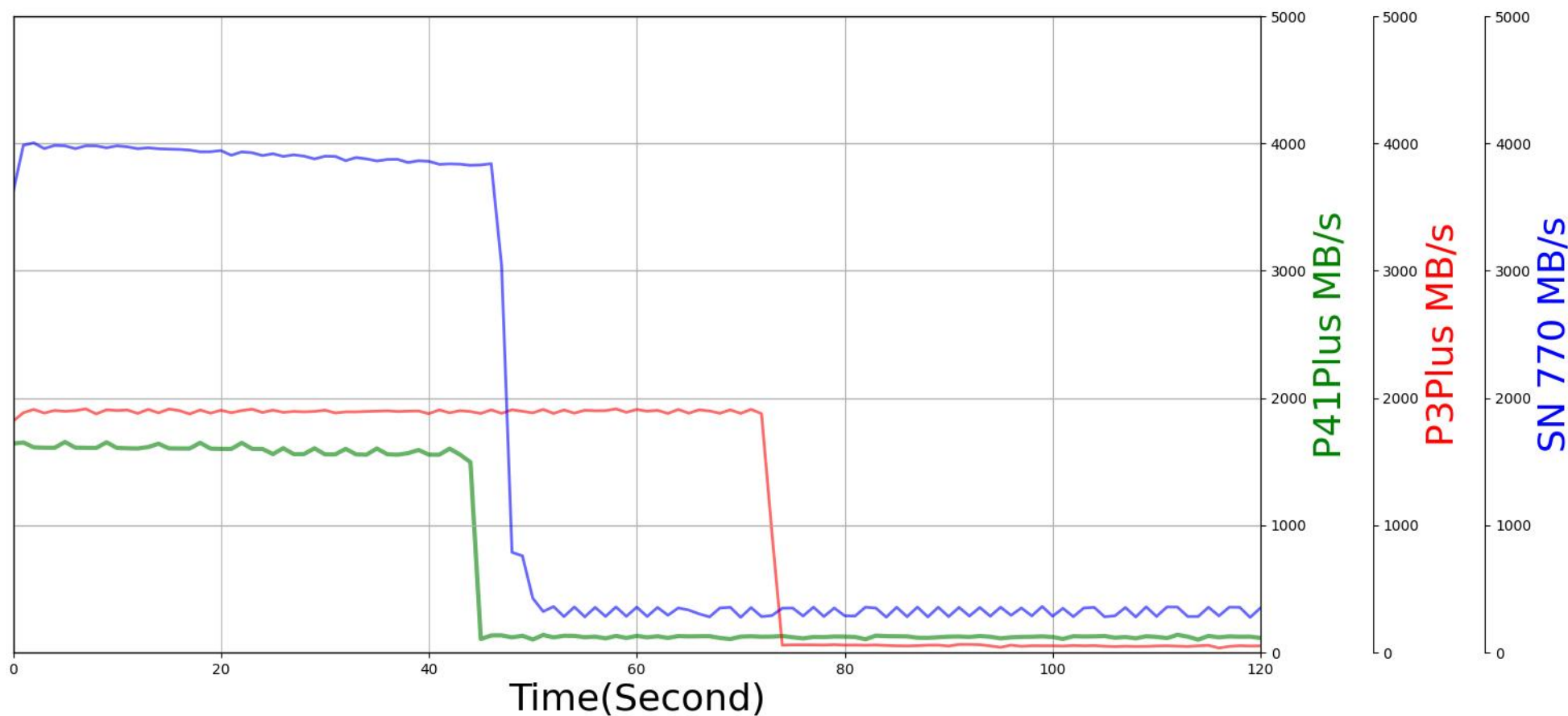
filling half drive





TP15: QLC

sequential write performance



Summary



Flash Memory Summit



Filter & Find Reports:

Application

☐ Client ☐ Data Center

DRAM

☐ No ☐ Yes

Form Factor

☐ 2280 ☐ U.2

NAND

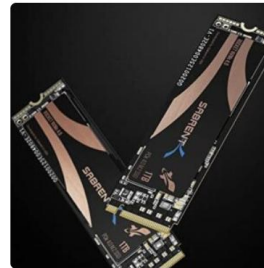
☐ QLC ☐ TLC

PCIe

☐ Gen4



GIGABYTE AORUS
7000s 1TB



Sabrent Rocket 4 Plus
1TB



Samsung 990Pro 1TB



Hynix P41 1TB



<https://pynv.me/>



Thanks!

<https://pynv.me>

Welcome to Booth #950