QNAP

TS-h2490FU

Performance Test Plan and Result

h5.0.0 VS h4.5.4

SMB IOPS

write
▲ 250%

read
▲ 300%

SMB Seq.

write
▲ 20%

read
▲ 50%

Introduction

The QNAP TS-h2490FU AFA (All Flash Array) solution uses an enterprise ZFS filesystem and supports optimization technologies to improve SDD performance. The I/O performance of NAS is not only bound by drive specifications , but also by CPU frequency and memory size. The data compression and data deduplication technology supported by the ZFS filesystem also has a great impact on data processing efficiency. These documented tests focus on the overall I/O performance of the TS-h2490FU.

Performance Test Plan

About Cache Hit and Directly Written to Drive

Whether the total size of the transferred files is greater than the main memory (RAM) determines the performance of the read and write performance of the NAS system. If the written data is less than the RAM capacity, the data will be written to memory and the writing is reported to be completed (Cache Hit) which can achieve relatively high performance. Conversely, when the total amount of reads/writes is greater than the RAM capacity, all IO will be direct to the drives, and the performance will be affected by the drive configurations.

About Data Compression and Data Deduplication

Data Compression uses CPU resources to compress files, while Data Deduplication mainly consumes RAM resources for comparison and a small amount of CPU computing. Usage of these technologies will impact overall system performance.

In these tests, we use unique (non-duplicate) files that cannot be compressed to verify the actual performance using the maximum consumption of computing resources.

Note: If a compressible and repeatable file is used in testing, the gain effect will be close to the performance of Cache Hit and will cause the test results to be distorted. Therefore, these tests are verified under the most stringent conditions, and the actual usage of end-users should receive better performance than the test results.

Test Configuration, Environment, and Results

TS-h2490FU-7302P-128G

· Test Environment

NAS:

TS-h2490FU-7302P-128G NAS with QuTS hero 4.5.0 / h4.5.4 / h5.0.0

WD Ultrastar DC SN640 NVMe SSD *24 (RAID 50)

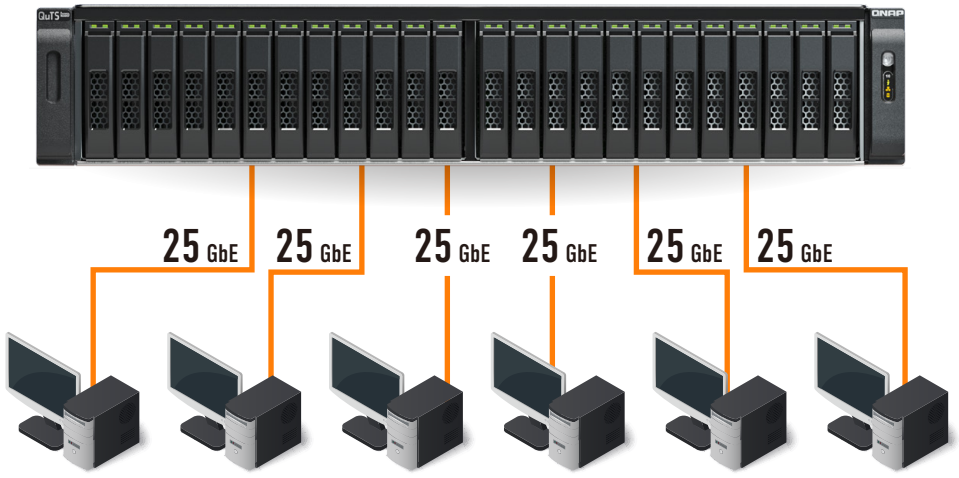
Broadcom Dual-port 25GbE NIC with NetXtreme® -E Series BCM57414 controller *3

Client PC:

Intel Core™ i7-7700 4.20GHz CPU, 32GB DDR4 RAM, QXG-25G2SF-CX4, Windows® Server 2016

Intel Core™ i3-8100 3.60GHz CPU, 4GB DDR4 RAM, QXG-25G2SF-CX4, Windows® Server 2016

· Test Configuration



6 Client PCs connected simultaneously for reading and writing,

A Each Client uses a 16GB test file (total amount 96 GB) to verify the performance when Cache Hit.

B Each Client uses a 512GB test file (total amount 3TB) to verify the performance when Directly Written to Drives.

Written to Drives.
Random I/O runs on 4K block size LUN
Sequential I/O runs on 128K block size LUN

When TS-h2490FU announced on 2020/09/16

RECAP

			Cache Hit Performance							
			Compression ON, Dedupe OFF				Compression ON, Dedupe ON			
Protocol	Unit	IO Access	6 hosts 25GbEx6	Latency ms		NAS CPU %	6 hosts 25GbEx6	Latency ms		NAS CPU %
				Avg.	Max.			Avg.	Max.	
iSCSI	Throughput (MB/s)	SW-512K	10582	15	805	56%	10394	17	652	69%
		SR-512K	14028	11	1344	28%	13575	13	388	29%
	IOPS	RW-4K	204612	0.35	66	72%	129200	0.63	66	48%
		RR-4K	471714	0.15	30	56%	395000	0.19	105	61%
SAMBA	Throughput (MB/s)	SW-512K	8399	19	341	31%	9260	18	337	31%
		SR-512K	11504	14	31	22%	11078	14	39	22%
	IOPS	RW-4K	99761	6	36	33%	101100	6	25	47%
		RR-4K	310369	2	27	62%	278700	3	166	47%

When TS-h2490FU announced on 2020/09/16

RECAP

			Real Performance							
			Compression ON, Dedupe OFF				Compression ON, Dedupe ON			
Protocol	Unit	IO Access	6 hosts 25GbEx6	Latency ms		NAS CPU %	6 hosts 25GbEx6	Latency ms		NAS CPU %
				Avg.	Max.			Avg.	Max.	
iSCSI	Throughput (MB/s)	SW-512K	4344	18	577	62%	3755	22	665	68%
		SR-512K	9235	9	150	83%	5499	15	1771	63%
	IOPS	RW-4K	145325	4	85	71%	104500	7	516	58%
		RR-4K	229217	3	101	71%	200400	3	152	69%
SAMBA	Throughput (MB/s)	SW-512K	4302	22	455	59%	5035	20	334	75%
		SR-512K	3926	24	197	19%	6853	19	165	23%
	IOPS	RW-4K	85507	7	37	41%	79100	8	43	46%
		RR-4K	159808	4	4676	56%	110000	6	6884	46%

Note: TS-h2490FU default settings are Compression ON, Dedupe OFF

Test Result between QuTS hero h4.5.4 and h5.0.0 (kernel improvement)

			Cache Hit Performance							
			h5.0.0				h4.5.4			
Protocol	Unit	IO Access	6 hosts 25GbEx6	Latency ms		NAS CPU %	6 hosts 25GbEx6	Latency ms		NAS CPU %
				Avg.	Max.			Avg.	Max.	
iSCSI	Throughput (MB/s)	SW-512K	10958	17	2686	29%	10929	15	666	55%
		SR-512K	15104	10	11006	30%	13746	12	2154	30%
	IOPS	RW-4K	245006	2.61	108	63%	215842	0.37	1277	71%
		RR-4K	661110	0.97	112	70%	447883	0.18	30	61%
SAMBA	Throughput (MB/s)	SW-512K	9275	17	127	43%	8267	20	330	34%
		SR-512K	16236	10	63	39%	11125	15	29	22%
	IOPS	RW-4K	284680	2	33	56%	109680	6	39	32%
		RR-4K	981474	1	19	78%	316955	2	35	60%

Test Result between QuTS hero h4.5.4 and h5.0.0 (kernel improvement)

			Real Performance							
			h5.0.0				h4.5.4			
Protocol	Unit	IO Access	6 hosts 25GbEx6	Latency ms		NAS CPU %	6 hosts 25GbEx6	Latency ms		NAS CPU %
				Avg.	Max.			Avg.	Max.	
iSCSI	Throughput (MB/s)	SW-512K	5186	15	463	55%	4528	17	551	64%
		SR-512K	5207	15	134	79%	5499	9	138	85%
	IOPS	RW-4K	185336	3	105	67%	144938	4	363	72%
		RR-4K	180107	4	309	45%	235078	3	25	74%
SAMBA	Throughput (MB/s)	SW-512K	5955	13	191	54%	4632	21	607	63%
		SR-512K	7492	11	97	70%	3489	28	81	22%
	IOPS	RW-4K	219430	3	45	68%	86953	7	153	40%
		RR-4K	192374	3	18	41%	150621	4	3260	56%

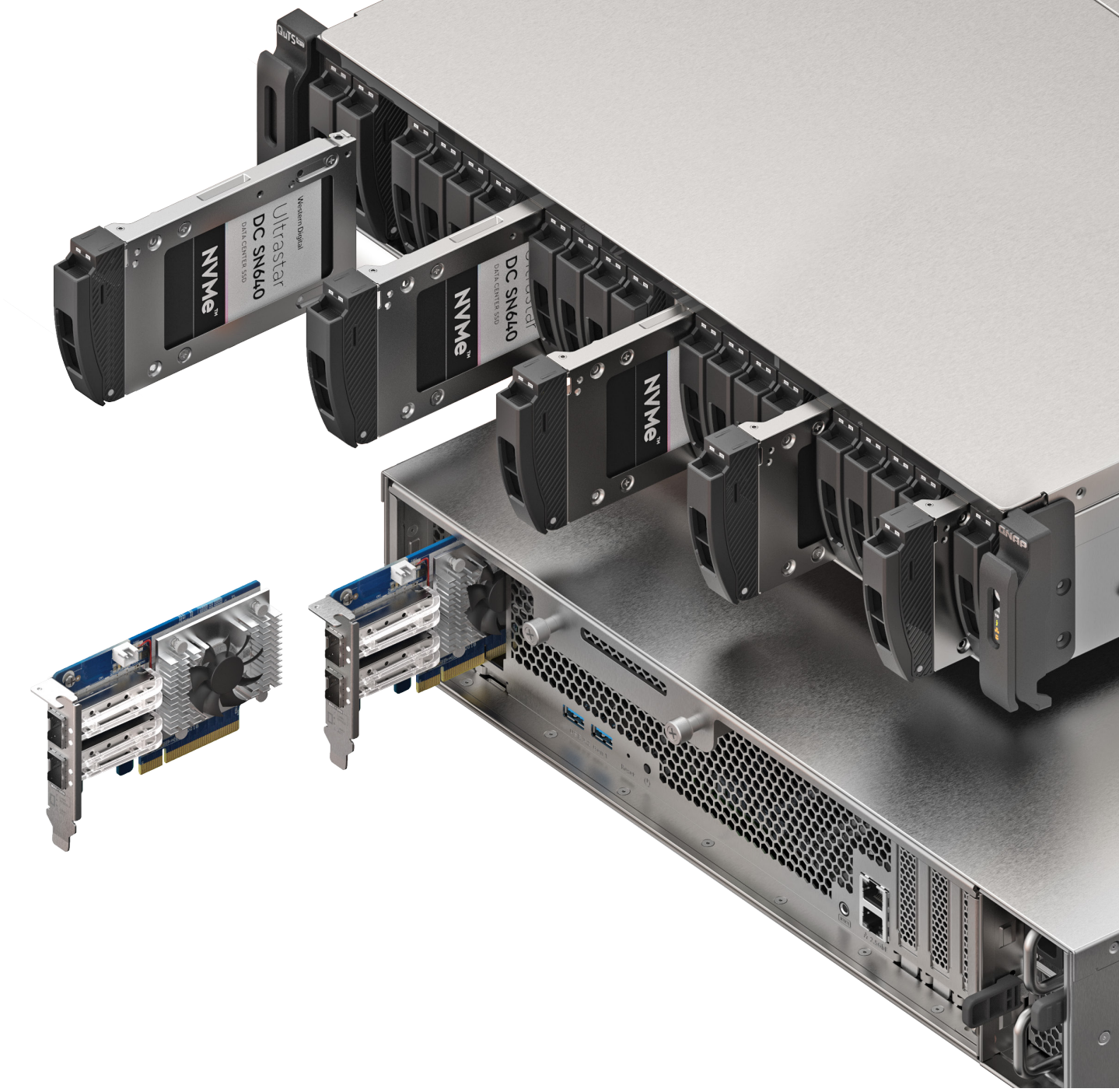
Note: TS-h2490FU default settings are Compression ON, Dedupe OFF.

Conclusion

1. When using the 16 GB test file, even if all 6 Client connections are read and written, since the total read and write volume of 96 GB is less than the NAS RAM capacity, after the data is written to memory, it will report that the write action is complete, which is Cache Hit.
   When using the 512 GB test file, and all 6 Client connections read and write. Since the total read and write volume of 3072 GB is greater than the NAS RAM capacity, all data will be written directly to the SSD.
   The overall performance of Cache Hit is greater than the performance of directly writing to drives as RAM is significantly faster than SSDs.

2. Compared with the older version of QuTS hero (h4.5.x), the newer version of QuTS hero (h5.0.0) with an updated Kernel provides better (up to double) performance, and also has reduced CPU usage and latency.

3. When test data is less than 128 GB, 4K random-read can reach 981K IOPS performance, and 512K sequential-read can reach 16 GB/s (equivalent to streaming a 2-hour long 4K video from Netflix every second).



TS-h2490FU

QTS hero edition AMD Rome NAS

AMD EPYC 7002 Series

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