LONGEVITY EXPERIMENT

Aim: To fill in the Cluster and observe Throughput variations.

Benchmark: S3bench by Seagate

Workload: Write only, Skip clean up and Skip Read for 128 clients total

	Clients	Object Size	Objects	Buckets	Total	Type	
[	13	128Mb	4900	100	63TB	WriteOnly	] x 8
[	12	128Mb	4900	100	63TB	WriteOnly	] x 2

Hardware:

- Primary: iu10-r22-pun.seagate.com
- Secondary: iu12-r22-pun.seagate.com
- Client: iu29-r22.pun.seagate.com

Build: 515

Duration: 27 November 2020 to 10 December 2020

Description:

The uniform workload is applied after the fresh deployment of #515. Observed decline in throughput from 2.4GBps at 0%, 1.8GBps at 70% full moving till 1.72GBps at 90%. The cluster is gracefully restarted at 67% space utilization. PerfPro benchmark tests ran at 70%, 80%, 90% and 99%.

Findings:

1. From the beginning write throughput has decreased steadily from 2.4GBps till 1.72GBps at 99% during the run.
2. For s3bench benchmark runs
    a. Overall Throughput increased after 70%; sustained same till 90% but dropped at 99% for large objects greater than 36MB.
    b. Overall latency increased till 80%; but dropped at 99% for large objects > 36MB.
    c. For small objects, major change is not observed.
3. For HSbench and COSbench benchmark runs
    a. Overall throughput seems readily decreasing till 99% for large objects.
    b. Overall latency also decreased till 99% for large objects.
    c. Almost remained constant for small objects.
4. Similar trends are observed for TTFB and IOPS.

For more details, please head over to http://cftic2.pun.seagate.com:5002/ and choose '515', '515-70%-PC5'.. '515-99%-PC5' from Cortx-1.0 branch. You can find graphs on Performance tab whereas statistics at the bottom of Engineer's reports tab.

Issues Identified and Reported:

1. EOS-15496 : Observed decline in the throughput during Longevity test
2. EOS-15519 : Alert for 70% is shown though space utilized crossed 90%

Performance Report

Product	**LYVE DRIVE Rack R1.0**
Space Utilization	**0%**
Date	**27/11/2020**
System	**iu10/12-r22-pun.seagate.com**

Single Bucket Performance Statistics (Average) using S3Bench

Statistics	4 KB	100 KB	1 MB	5 MB	36 MB	64 MB	128 MB	256 MB
Write Throughput (MBps)	0	6	59	515	1627	1781	2096	2463
Read Throughput (MBps)	2	46	582	1857	4009	4067	3994	3790
Write Latency (ms)	1066	1493	1693	953	2151	3539	5995	10121
Read Latency (ms)	165	211	170	267	882	1558	3172	6678
Write IOPS	90	66	59	103	45	28	16	9
Read IOPS	587	469	582	371	111	64	31	14
Write TTFB (ms)	1066	1493	1693	953	2151	3539	5995	10121
Read TTFB (ms)	165	176	162	246	628	787	838	913

Metadata Latencies (captured with 1KB object)

Operation Latency (ms)	Response Time
Add / Edit Object Tags	338.0
Read Object Tags	73.0
Read Object Metadata	73.0

Multiple Buckets Performance Statistics (Average) using HSBench and COSBench

(Throughput in MBps and Latency in ms)

Bench	Statistics	4 KB	100 KB	1 MB	5 MB	36 MB	64 MB	128 MB	256 MB
HSbench 1 Bucket 1000 Objects 100 Sessions	Write Throughput	0	6	61	478	1622	2111	2234	2374
	Read Throughput	2	45	545	1623	4216	4226	4014	4475
	write Latency	1012	1536	1608	934	2113	2875	5420	10385
	Read Latency	172	211	177	299	831	1428	2897	3660
	Write IOPS	91	63	61	96	45	33	17	9
	Read IOPS	559	457	545	325	117	66	31	17
HSbench 10 Buckets 100 Objects 100 Sessions	Write Throughput	0	5	60	465	1692	2107	2453	2447
	Read Throughput	2	47	603	1740	4093	4099	4154	4057
	Read Latency	1072	1628	1632	987	1991	2875	5013	10014
	write Latency	179	201	158	279	841	1484	2855	3815
	Write IOPS	87	59	60	93	47	33	19	9
	Read IOPS	534	483	603	348	114	64	32	15
HSbench 50 Buckets 100 Objects 100 Sessions	Write Throughput	0	6	61	526	1761	2161	2382	2413
	Read Throughput	2	41	506	1472	4198	4139	3840	3659
	Read Latency	1009	1490	1632	926	2016	2930	5322	10524
	write Latency	165	236	196	338	853	1530	3278	3748
	Write IOPS	97	67	61	105	49	34	18	9
	Read IOPS	601	420	506	294	117	65	30	14

COSbench 1 Bucket 1000 Objects 100 Sessions	**Write Throughput**	0	8	82	352	491	531	607	735
	Read Throughput	0	8	84	353	487	530	628	735
	Read Latency	1012	953	958	1076	5916	9674	16471	27179
	Write Latency	248	259	250	342	1421	2393	4463	7649
	Write IOPS	79	82	82	70	13	8	4	2
	Read IOPS	80	83	84	71	13	8	4	2
COSbench 10 Buckets 100 Objects 100 Sessions	**Write Throughput**	0	8	80	348	485	527	599	735
	Read Throughput	0	8	80	345	480	546	604	760
	Read Latency	1010	938	987	1095	6124	9911	17618	27617
	Write Latency	248	260	261	347	1316	2145	3729	6984
	Write IOPS	79	83	80	70	13	8	4	2
	Read IOPS	80	84	80	69	13	8	4	2
COSbench 50 Buckets 100 Objects 100 Sessions	**Write Throughput**	0	8	81	333	577	668	833	1034
	Read Throughput	0	8	81	330	574	662	849	1101
	Read Latency	1019	956	993	1146	5020	7670	11633	17668
	Write Latency	236	247	241	358	1222	1938	3669	6677
	Write IOPS	80	83	81	67	16	10	6	4
	Read IOPS	80	83	81	66	15	10	6	4

Trends of S3 Benchmark:

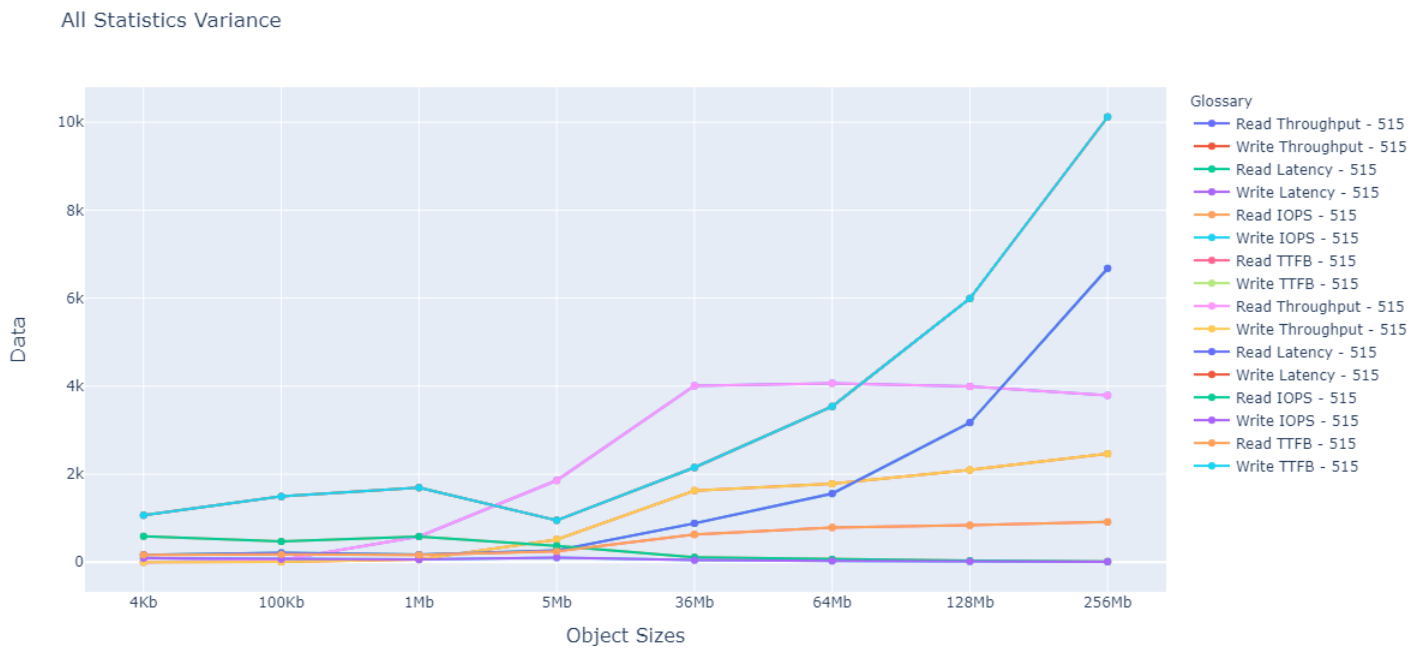

Fig 1. S3 benchmark trends at 0% space utilization

Trends during Put Object:

Fig 2. Performance graph at 22.5% space utilization

Fig 3. Performance graph at 39% space utilization

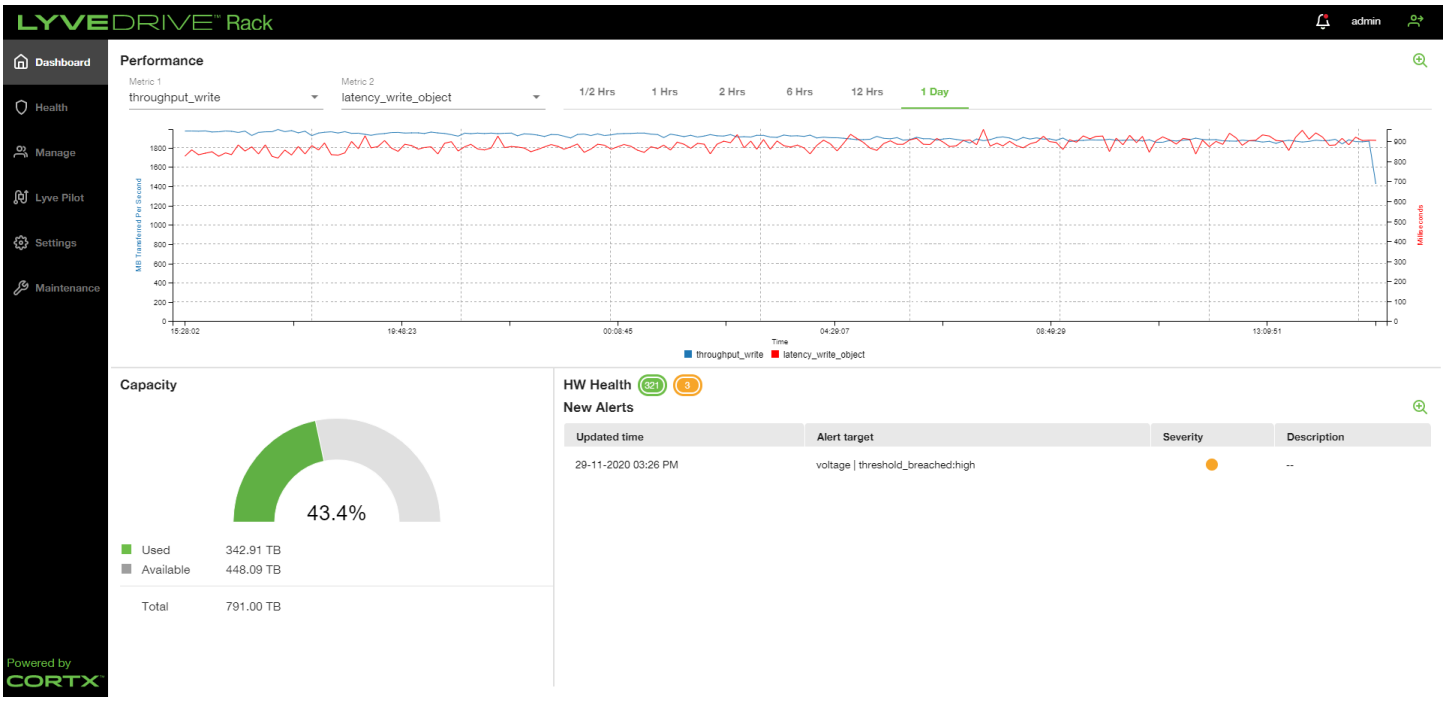

Fig 4. Performance graph at 43% space utilization

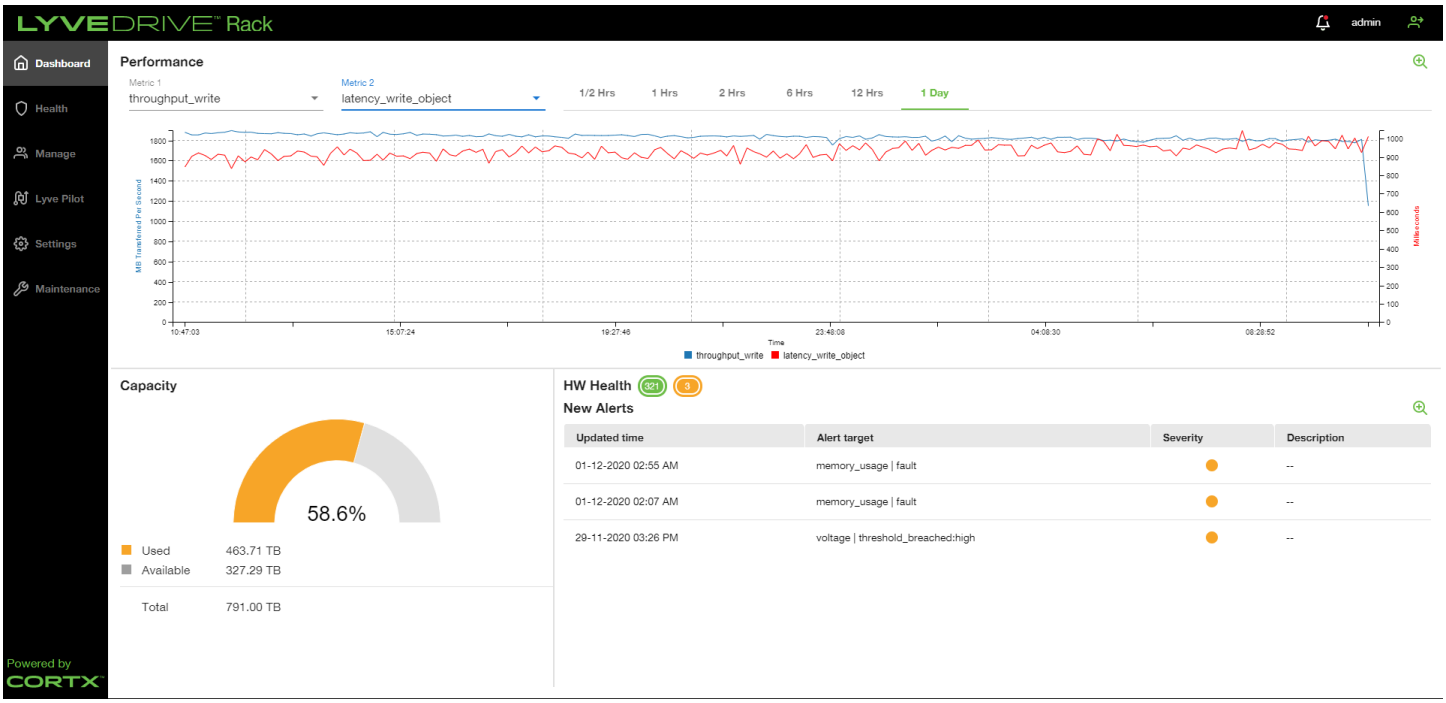

Fig 5. Performance graph at 58.6% space utilization

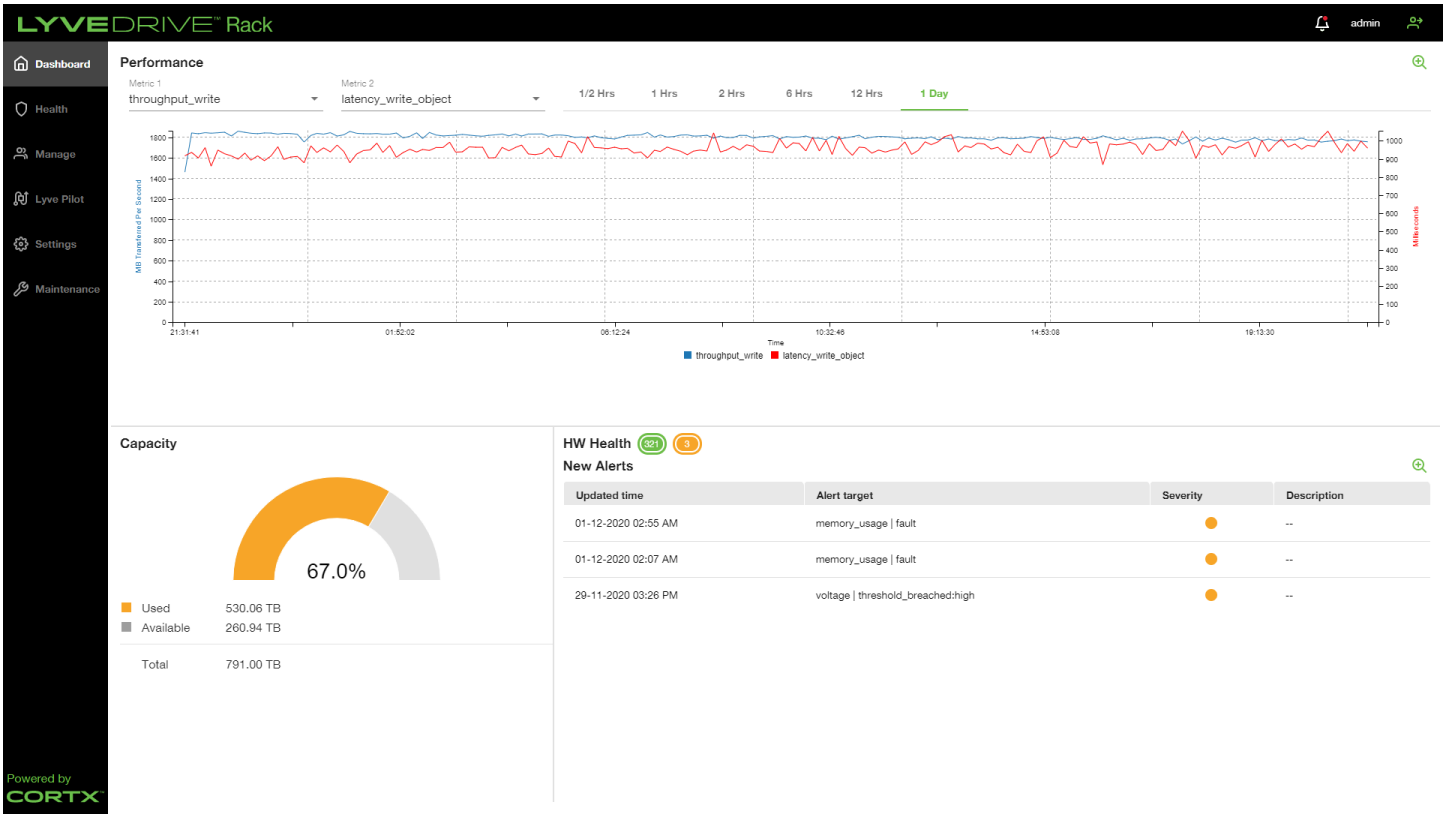

Fig 6. Performance graph at 67% space utilization

Failover – failback is done at 67% space utilization.

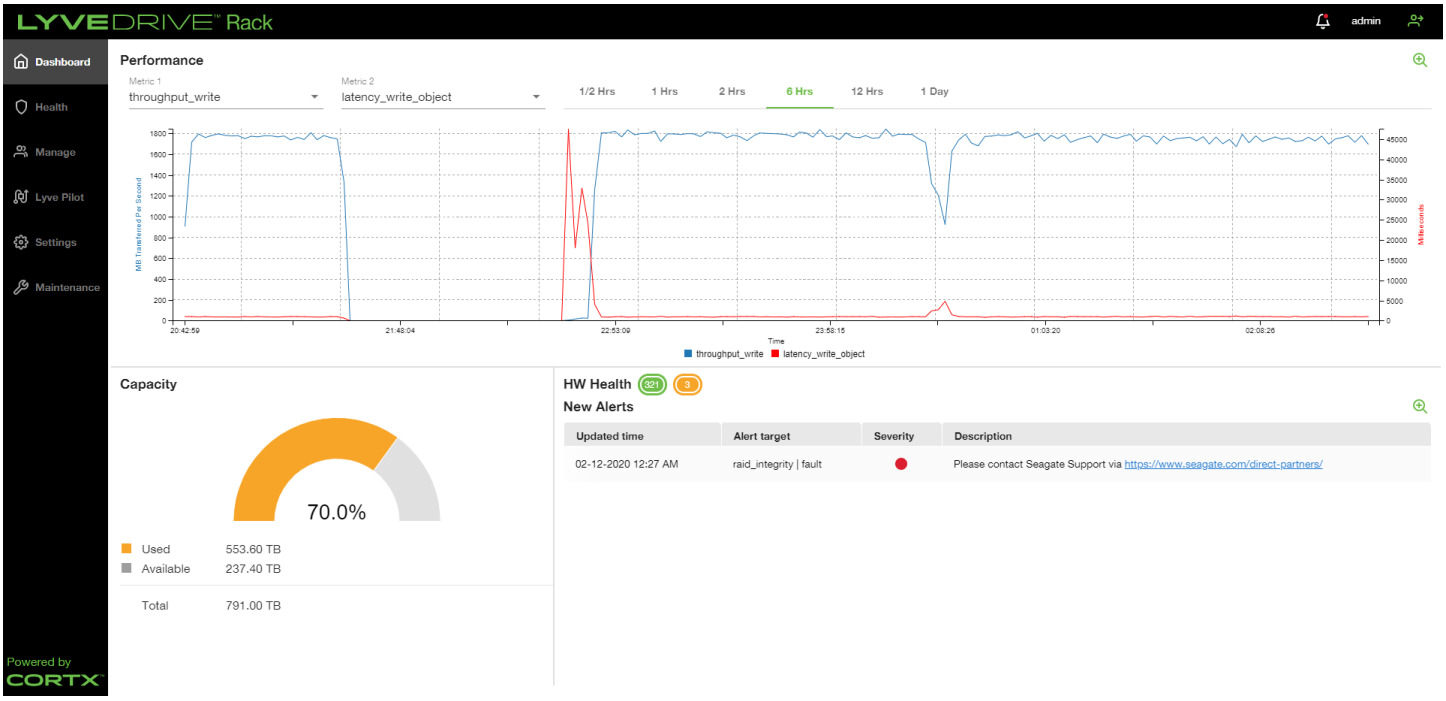

Fig 7. Performance graph at 70% space utilization

Performance Report

Product	**LYVE DRIVE Rack R1.0**
Space Utilization	**70%**
Date	**2/12/2020**
System	**iu10/12-r22-pun.seagate.com**

Single Bucket Performance Statistics (Average) using S3Bench

Statistics	4 KB	100 KB	1 MB	5 MB	36 MB	64 MB	128 MB	256 MB
Write Throughput (MBps)	0	6	60	490	1382	1623	1546	1687
Read Throughput (MBps)	2	44	554	1788	4148	4429	4266	4117
Write Latency (ms)	1821	1605	1639	1006	2529	3877	8097	14930
Read Latency (ms)	167	219	179	278	848	1419	2969	6114
Write IOPS	53	62	60	98	38	25	12	6
Read IOPS	581	452	554	358	115	69	33	16
Write TTFB (ms)	1821	1605	1639	1006	2529	3877	8097	14930
Read TTFB (ms)	167	186	171	257	598	728	809	853

Metadata Latencies (captured with 1KB object)

Operation Latency	Response Time(ms)
Add / Edit Object Tags	501.0
Read Object Tags	161.0
Read Object Metadata	175.0

Multiple Buckets Performance Statistics (Average) using HSBench and COSBench

(Throughput in MBps and Latency in ms)

Bench	Statistics	4 KB	100 KB	1 MB	5 MB	36 MB	64 MB	128 MB	256 MB
HSbench 1 Bucket 1000 Objects 100 Sessions	Write Throughput	0	5	60	434	1281	1549	1627	1573
	Read Throughput	2	44	565	1619	4279	4293	4443	4635
	write Latency	1778	1536	1621	1056	2675	3982	7519	15766
	Read Latency	171	210	170	297	810	1423	2646	3717
	Write IOPS	53	61	60	87	36	24	12	6
	Read IOPS	563	455	565	324	119	67	35	18
HSbench 10 Buckets 100 Objects 100 Sessions	Write Throughput	0	5	60	463	1316	1597	1609	1598
	Read Throughput	2	43	555	1638	4372	4504	4292	4451
	Read Latency	1738	1593	1633	993	2560	3840	7669	15490
	write Latency	173	221	173	292	798	1376	2717	3635
	Write IOPS	55	60	60	93	37	24	12	6
	Read IOPS	560	440	555	328	121	70	34	17
HSbench 50 Buckets 100 Objects 100 Sessions	Write Throughput	0	6	60	532	1431	1669	1676	1634
	Read Throughput	2	41	504	1406	4595	4371	3920	3961
	Read Latency	1731	1554	1647	923	2490	3799	7567	15521
	write Latency	170	233	196	353	775	1449	3205	3014
	Write IOPS	57	64	60	106	40	26	13	6
	Read IOPS	584	425	504	281	128	68	31	15

COSbench 1 Bucket 1000 Objects 100 Sessions	**Write Throughput**	0	8	81	346	506	517	604	714
	Read Throughput	0	8	80	344	504	514	599	735
	Read Latency	1771	946	990	1103	5756	10109	16929	27876
	Write Latency	187	245	252	343	1359	2282	4291	7705
	Write IOPS	51	84	81	69	14	8	4	2
	Read IOPS	51	84	80	69	14	8	4	2
COSbench 10 Buckets 100 Objects 100 Sessions	**Write Throughput**	0	8	80	343	478	502	609	709
	Read Throughput	0	8	79	345	481	515	622	765
	Read Latency	1810	955	997	1114	6265	10559	17290	28200
	Write Latency	118	252	260	343	1256	2129	3642	7283
	Write IOPS	52	83	80	69	13	7	4	2
	Read IOPS	52	83	79	69	13	8	4	2
COSbench 50 Buckets 100 Objects 100 Sessions	**Write Throughput**	0	8	81	335	564	673	841	978
	Read Throughput	0	8	81	337	563	677	870	1032
	Read Latency	1853	949	985	1130	5160	7511	11490	18869
	Write Latency	98	235	245	360	1221	1984	3600	6904
	Write IOPS	51	85	81	67	15	10	6	3
	Read IOPS	51	84	81	67	15	10	6	4

S3 Benchmark:

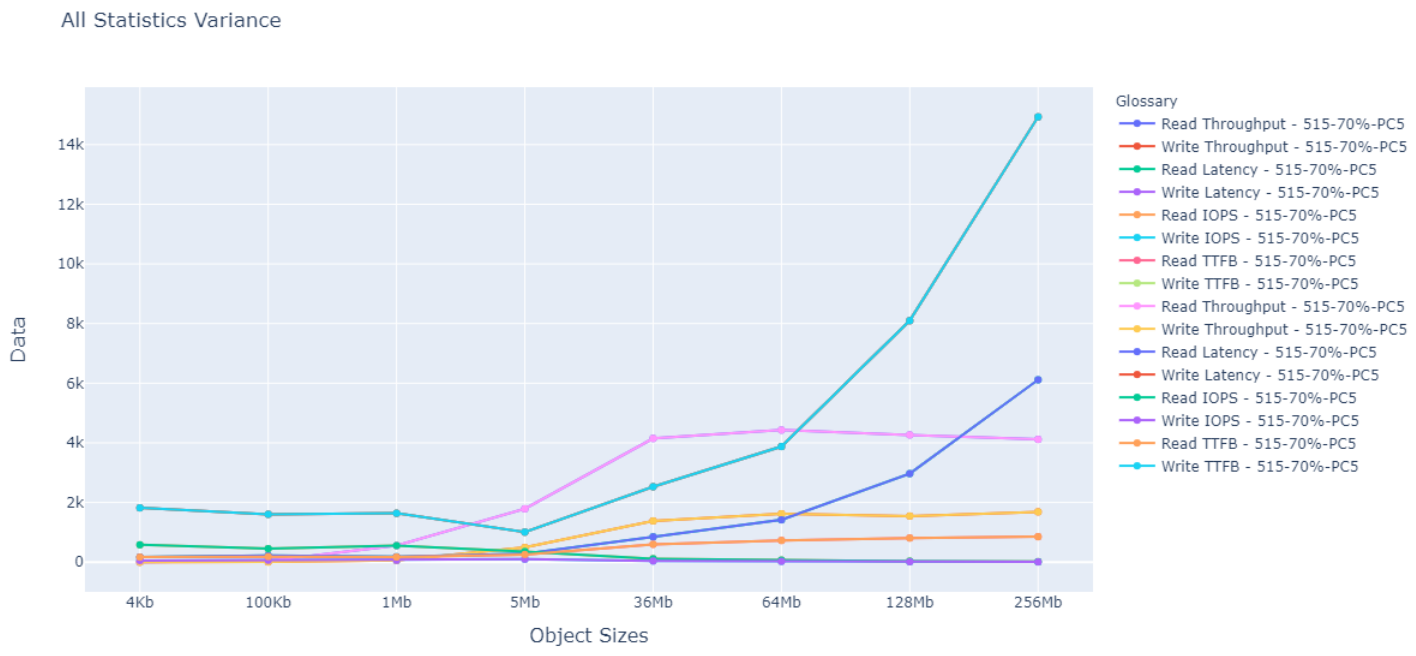

Fig 8. S3 benchmark trends at 70% space utilization

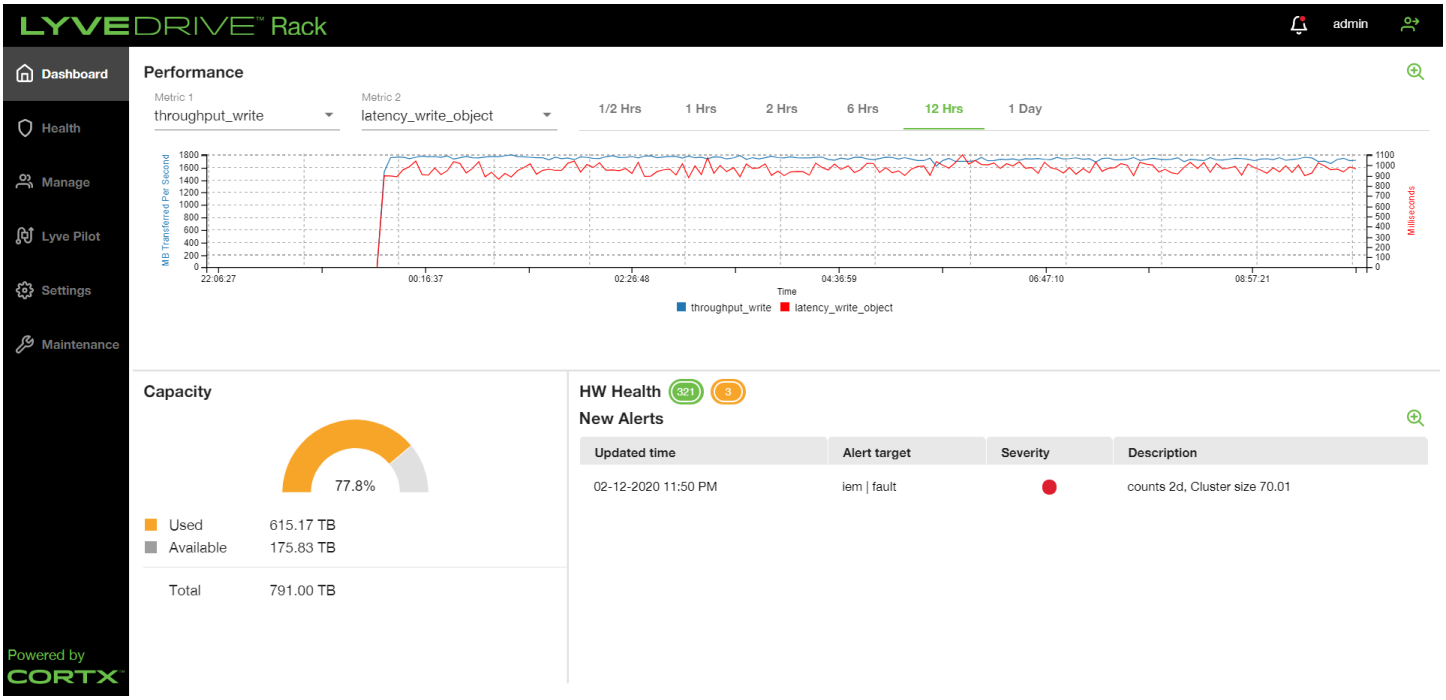

Fig 9. Performance graph at 77.8% space utilization

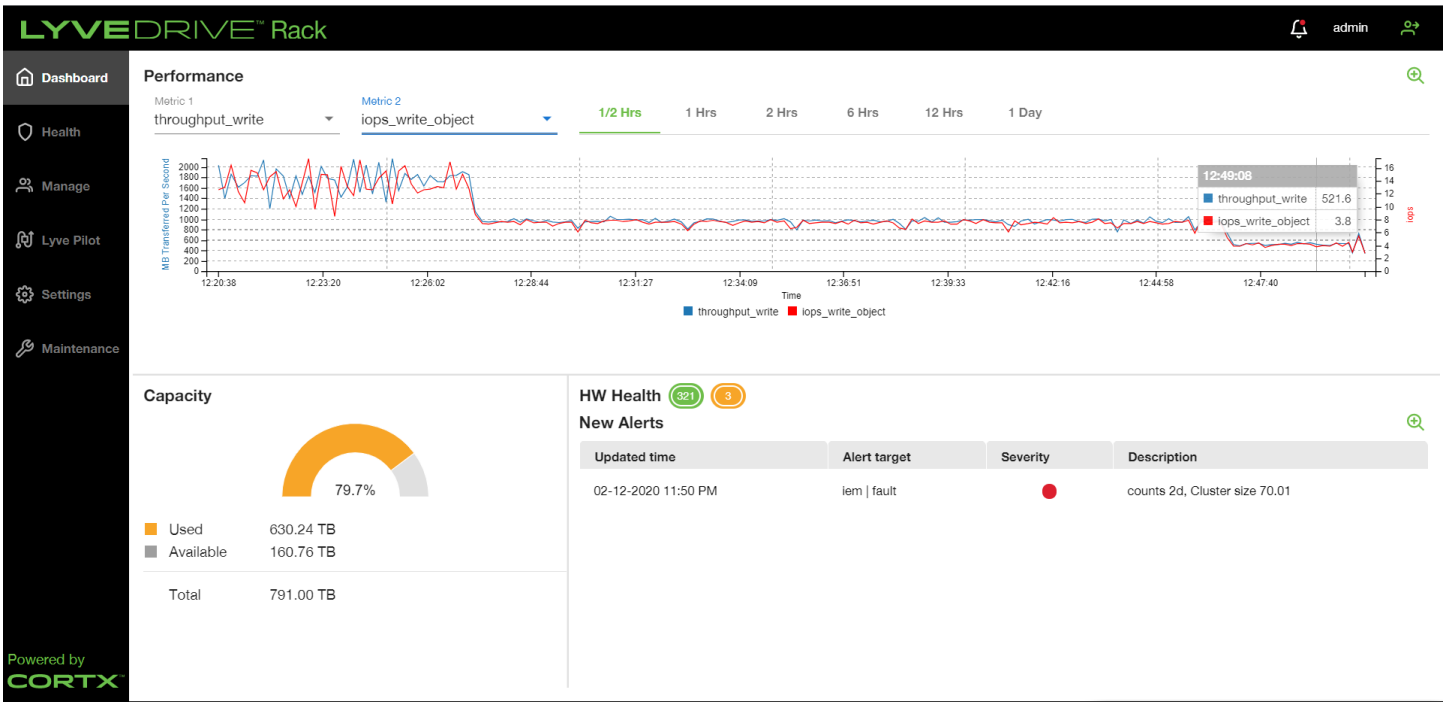

Fig 10. Performance graph at 79.7% space utilization

Performance Report

Product	**LYVE DRIVE Rack R1.0**
Space Utilization	**80%**
Date	**5/12/2020**
System	**iu10/12-r22-pun.seagate.com**

Single Bucket Performance Statistics (Average) using S3Bench

Statistics	4 KB	100 KB	1 MB	5 MB	36 MB	64 MB	128 MB	256 MB
Write Throughput (MBps)	0	6	59	521	1368	1404	1634	1676
Read Throughput (MBps)	1	46	562	1631	4197	4386	4224	4080
Write Latency (ms)	2015	1547	1680	942	2556	4447	7655	14984
Read Latency (ms)	197	210	176	304	836	1438	2958	6210
Write IOPS	48	64	59	104	38	21	12	6
Read IOPS	493	471	562	326	117	69	33	15
Write TTFB (ms)	2015	1547	1680	942	2556	4447	7655	14984
Read TTFB (ms)	197	178	168	284	591	746	831	880

Metadata Latencies (captured with 1KB object)

Operation Latency	Response Time(ms)
Add / Edit Object Tags	338.0
Read Object Tags	80.0
Read Object Metadata	81.0

Multiple Buckets Performance Statistics (Average) using HSBench and COSBench

(Throughput in MBps and Latency in ms)

Bench	Statistics	4 KB	100 KB	1 MB	5 MB	36 MB	64 MB	128 MB	256 MB
HSbench 1 Bucket 1000 Objects 100 Sessions	Write Throughput	0	6	62	427	1334	1540	1573	1639
	Read Throughput	2	47	561	1625	4289	4302	4050	4479
	write Latency	1831	1515	1537	1076	2608	3959	7859	14977
	Read Latency	176	202	171	296	805	1419	2867	3698
	Write IOPS	52	63	62	85	37	24	12	6
	Read IOPS	540	478	561	325	119	67	32	17
HSbench 10 Buckets 100 Objects 100 Sessions	Write Throughput	0	6	58	439	1317	1638	1644	1629
	Read Throughput	1	42	561	1497	4528	4301	4169	4565
	Read Latency	1900	1521	1652	1065	2570	3748	7506	15188
	write Latency	192	222	172	324	765	1404	2823	3682
	Write IOPS	50	62	58	88	37	25	12	6
	Read IOPS	493	434	561	299	126	67	33	17
HSbench 50 Buckets 100 Objects 100 Sessions	Write Throughput	0	6	61	530	1424	1653	1667	1642
	Read Throughput	2	41	504	1422	4686	4375	4025	3983
	Read Latency	1836	1548	1620	926	2497	3834	7617	15428
	write Latency	168	238	197	349	762	1447	3135	3121
	Write IOPS	54	64	61	106	40	25	13	6
	Read IOPS	589	418	504	284	130	68	31	15

COSbench 1 Bucket 1000 Objects 100 Sessions	**Write Throughput**	0	8	82	342	485	501	579	717
	Read Throughput	0	8	82	341	482	532	623	745
	Read Latency	1903	948	972	1121	6085	10295	17772	27979
	Write Latency	207	248	252	341	1352	2334	4034	7468
	Write IOPS	47	83	82	68	13	7	4	2
	Read IOPS	47	84	82	68	13	8	4	2
COSbench 10 Buckets 100 Objects 100 Sessions	**Write Throughput**	0	8	80	342	482	507	602	722
	Read Throughput	0	8	80	343	477	518	635	791
	Read Latency	1960	947	989	1117	6279	10515	17494	27730
	Write Latency	118	249	258	343	1207	2064	3571	7037
	Write IOPS	48	84	80	68	13	7	4	2
	Read IOPS	48	84	80	69	13	8	4	3
COSbench 50 Buckets 100 Objects 100 Sessions	**Write Throughput**	0	8	81	339	579	692	846	996
	Read Throughput	0	8	81	341	586	703	844	1024
	Read Latency	1994	948	990	1109	5029	7264	11550	18698
	Write Latency	101	233	246	363	1179	1952	3582	6828
	Write IOPS	48	85	81	68	16	10	6	3
	Read IOPS	47	85	81	68	16	10	6	4

S3 Benchmark:

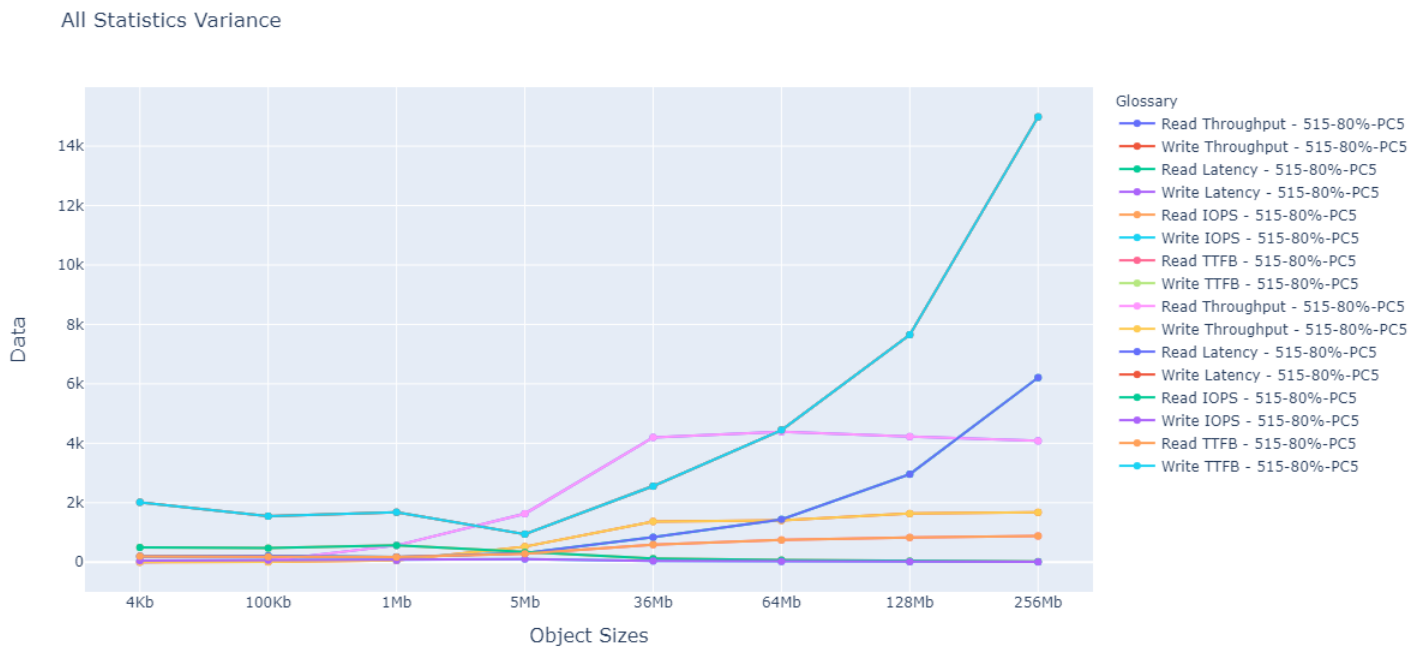

Fig 11. S3 Benchmark graph at 80% space utilization

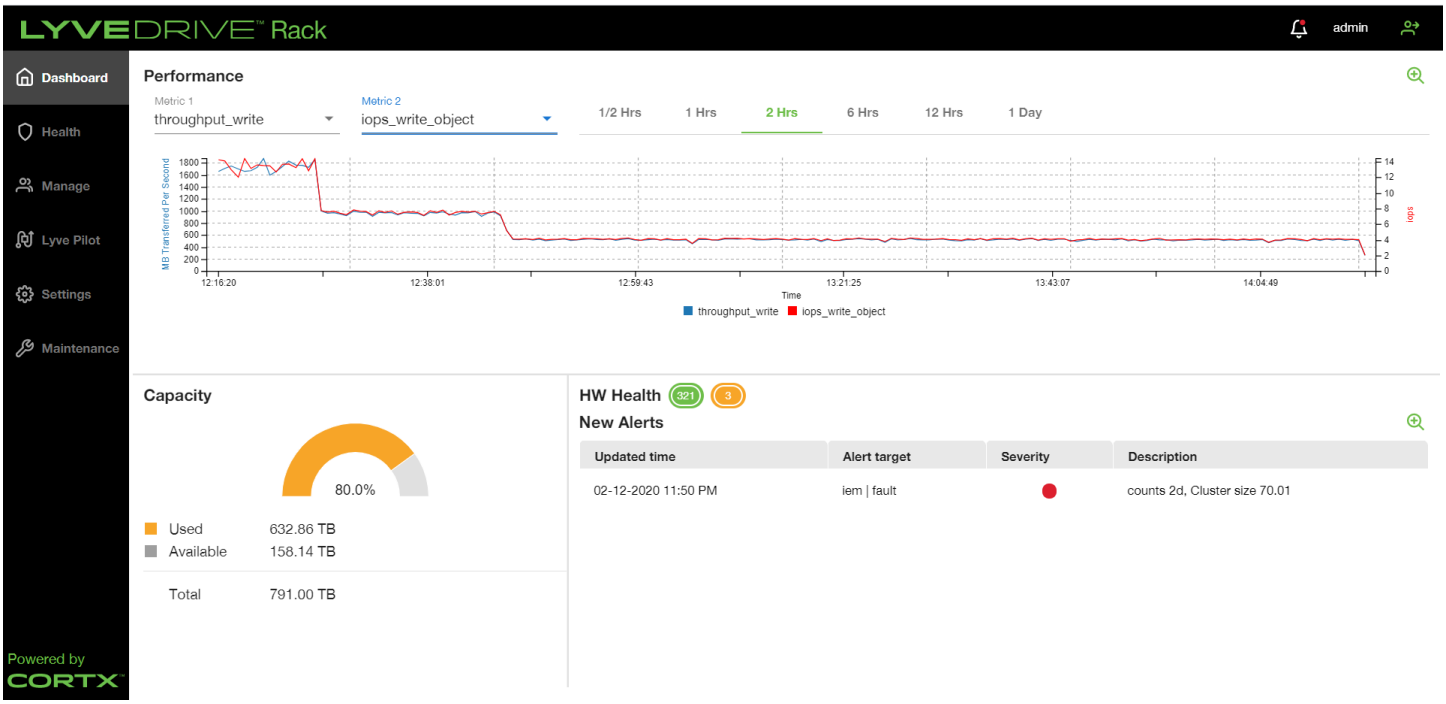

Fig 12. Performance graph at 80% space utilization

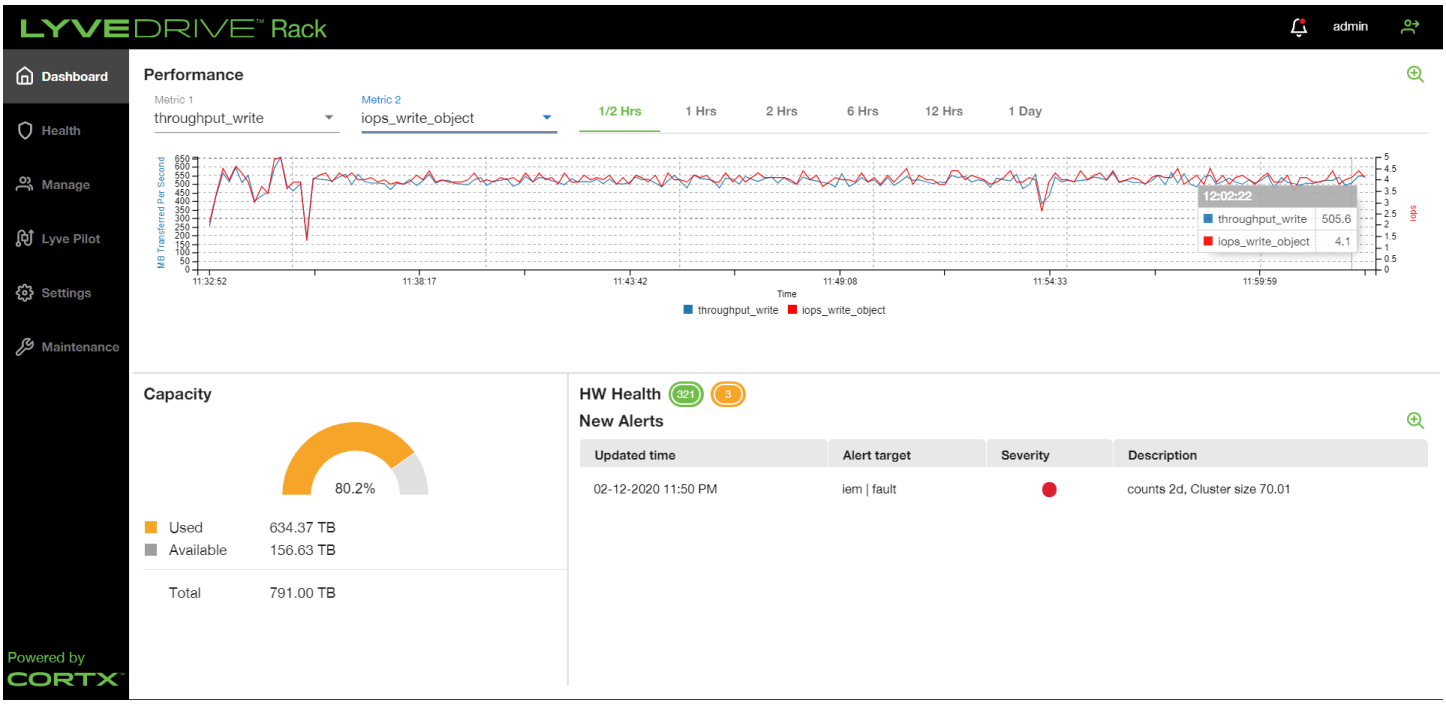

Fig 13. Performance graph at 80.2% space utilization

Performance Report

Product	**LYVE DRIVE Rack R1.0**
Space Utilization	**90%**
Date	**8/12/2020**
System	**iu10/12-r22-pun.seagate.com**

Single Bucket Performance Statistics (Average) using S3Bench

Statistics	4 KB	100 KB	1 MB	5 MB	36 MB	64 MB	128 MB	256 MB
Write Throughput (MBps)	0	6	60	479	1322	1363	1455	1660
Read Throughput (MBps)	2	46	509	1592	4175	4286	4271	3843
Write Latency (ms)	2126	1571	1647	1023	2646	4589	8589	15151
Read Latency (ms)	175	212	195	312	841	1465	2956	6565
Write IOPS	46	63	60	96	37	21	11	6
Read IOPS	555	467	509	318	116	67	33	15
Write TTFB (ms)	2126	1571	1647	1023	2646	4589	8589	15151
Read TTFB (ms)	175	179	187	293	588	754	834	945

Metadata Latencies (captured with 1KB object)

Operation Latency (ms)	Response Time
Add / Edit Object Tags	338.0
Read Object Tags	81.0
Read Object Metadata	79.0

Multiple Buckets Performance Statistics (Average) using HSBench and COSBench

(Throughput in MBps and Latency in ms)

Bench	Statistics	4 KB	100 KB	1 MB	5 MB	36 MB	64 MB	128 MB	256 MB
HSbench 1 Bucket 1000 Objects 100 Sessions	Write Throughput	0	5	59	441	1201	1479	1540	1554
	Read Throughput	2	44	541	1647	4318	4419	4370	4773
	write Latency	1968	1620	1601	1048	2846	4171	8077	15984
	Read Latency	172	216	178	295	814	1388	2719	3684
	Write IOPS	48	59	59	88	33	23	12	6
	Read IOPS	556	448	541	329	120	69	34	18
HSbench 10 Buckets 100 Objects 100 Sessions	Write Throughput	0	6	58	432	1256	1523	1629	1565
	Read Throughput	2	46	573	1654	4235	4274	4245	4607
	Read Latency	2066	1535	1634	1071	2707	4018	7544	15881
	write Latency	173	203	168	287	820	1426	2745	3584
	Write IOPS	46	62	58	86	35	23	12	6
	Read IOPS	554	470	573	331	118	67	33	17
HSbench 50 Buckets 100 Objects 100 Sessions	Write Throughput	0	6	60	536	1355	1634	1639	1602
	Read Throughput	2	41	511	1472	4610	4347	4009	4002
	Read Latency	2014	1508	1645	913	2633	3885	7730	15824
	write Latency	171	237	195	338	775	1458	3131	3163
	Write IOPS	49	66	60	107	38	25	12	6
	Read IOPS	581	420	511	294	128	68	31	15
COSbench 1 Bucket	Write Throughput	0	8	81	343	500	518	602	724

1000 Objects 100 Sessions	**Read Throughput**	0	8	81	347	499	508	594	773
	Read Latency	2097	949	975	1105	5821	10010	17130	27185
	Write Latency	206	247	254	348	1386	2396	4192	7655
	Write IOPS	43	84	81	69	13	8	4	2
	Read IOPS	43	84	81	69	13	7	4	3
COSbench 10 Buckets 100 Objects 100 Sessions	**Write Throughput**	0	8	80	346	486	505	604	730
	Read Throughput	0	8	80	346	501	502	627	724
	Read Latency	2173	948	988	1100	6160	10542	17337	27978
	Write Latency	121	248	260	346	1206	2148	3712	7199
	Write IOPS	44	84	80	69	13	7	4	2
	Read IOPS	44	83	80	69	13	7	4	2
COSbench 50 Buckets 100 Objects 100 Sessions	**Write Throughput**	0	8	81	340	569	668	748	827
	Read Throughput	0	8	81	338	563	667	754	845
	Read Latency	2192	945	994	1107	5169	7709	14034	25815
	Write Latency	101	231	245	366	1172	1871	3072	4998
	Write IOPS	44	85	81	68	15	10	5	3
	Read IOPS	44	84	81	68	15	10	5	3

S3 benchmark:

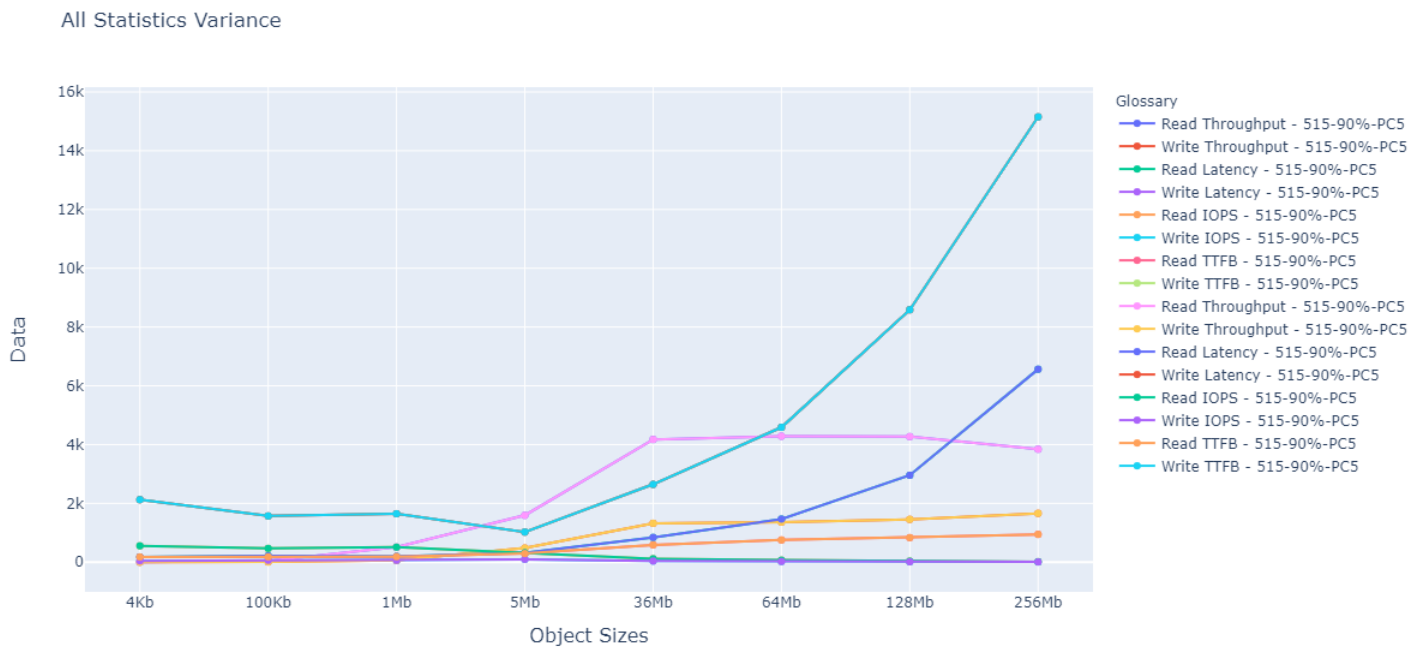

Fig 14. S3 Benchmark graph at 90% space utilization

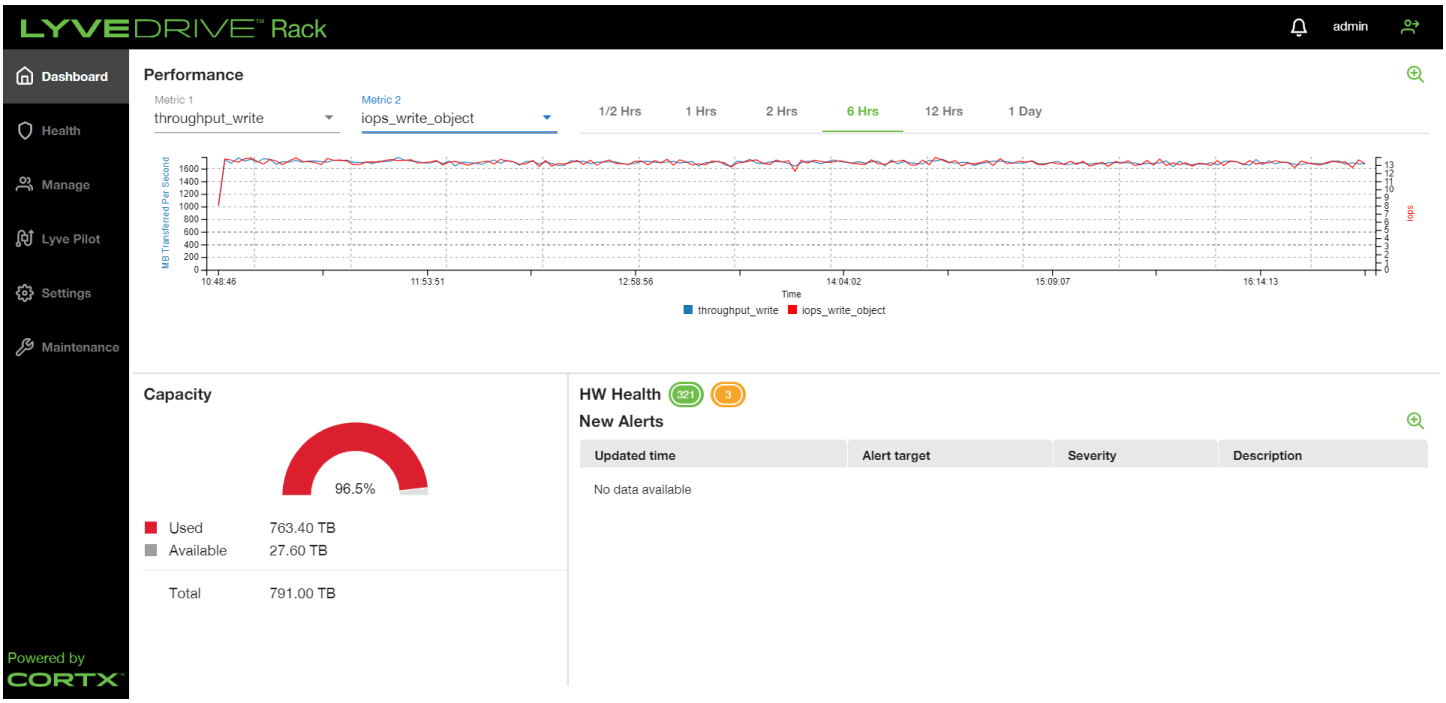

Fig 15. Performance graph at 96.5% space utilization

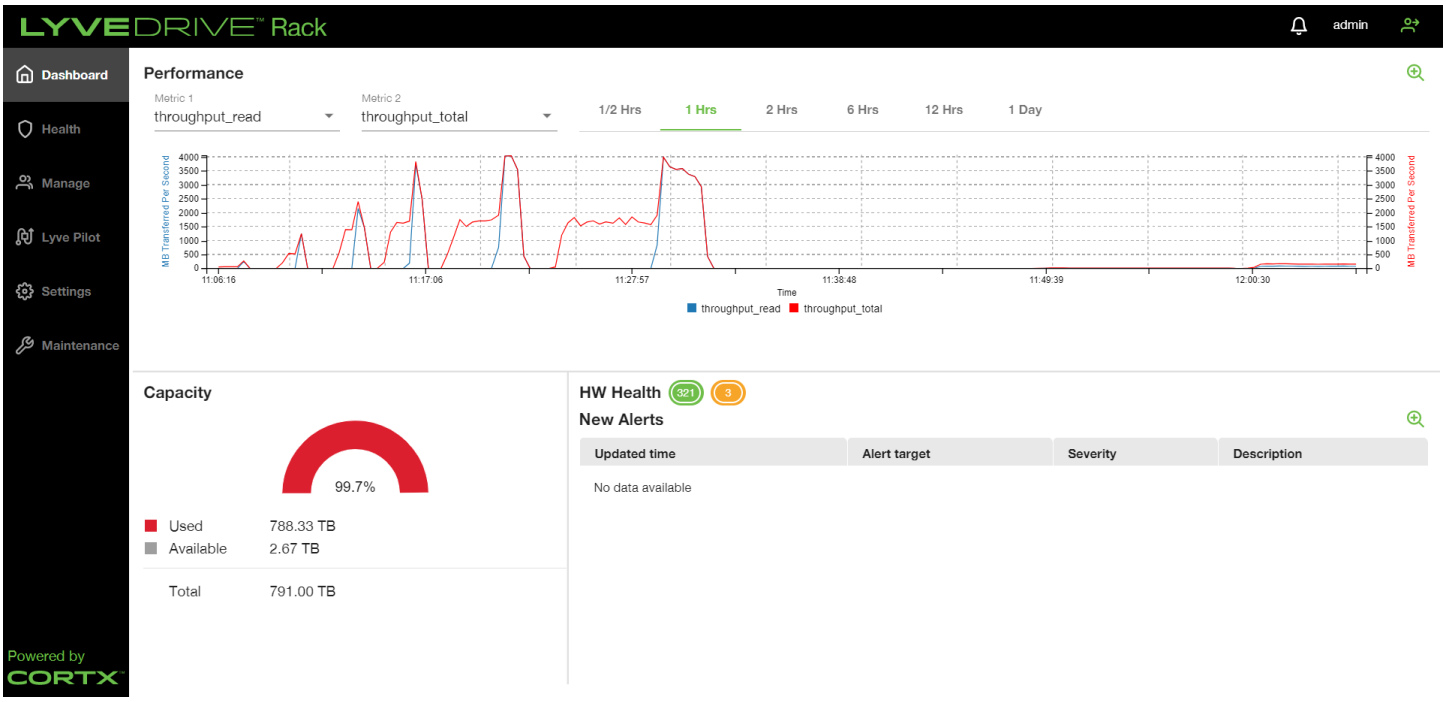

Fig 16. Performance graph at 99.7% space utilization

Performance Report

Product	**LYVE DRIVE Rack R1.0**
Space Utilization	**99%**
Date	**10/12/2020**
System	**iu10/12-r22-pun.seagate.com**

Single Bucket Performance Statistics (Average) using S3Bench

Statistics	4 KB	100 KB	1 MB	5 MB	36 MB	64 MB	128 MB	256 MB
Write Throughput (MBps)	0	6	59	489	1309	1310	1411	1446
Read Throughput (MBps)	2	44	587	1872	4183	4393	3993	3523
Write Latency (ms)	2272	1597	1680	1006	2683	4760	8910	17445
Read Latency (ms)	153	218	169	265	845	1431	3162	7188
Write IOPS	43	62	59	98	36	20	11	5
Read IOPS	635	454	587	374	116	69	31	13
Write TTFB (ms)	2272	1597	1680	1006	2683	4760	8910	17445
Read TTFB (ms)	153	185	161	245	591	734	853	988

Metadata Latencies (captured with 1KB object)

Operation Latency	Response Time (ms)
Add / Edit Object Tags	338.0
Read Object Tags	79.0
Read Object Metadata	80.0

Multiple Buckets Performance Statistics (Average) using HSBench and COSBench

(Throughput in MBps and Latency in ms)

Bench	Statistics	4 KB	100 KB	1 MB	5 MB	36 MB	64 MB	128 MB	256 MB
HSbench 1 Bucket 1000 Objects 100 Sessions	Write Throughput	0	6	64	469	1241	1571	1539	1519
	Read Throughput	2	46	530	1657	4368	4255	4240	4605
	write Latency	2049	1452	1490	975	2739	3944	7997	16114
	Read Latency	166	205	177	293	798	1434	2747	4002
	Write IOPS	47	65	64	94	34	24	12	5
	Read IOPS	579	470	530	331	121	66	33	17
HSbench 10 Buckets 100 Objects 100 Sessions	Write Throughput	0	6	62	467	1296	1590	1577	1575
	Read Throughput	2	45	618	1713	4497	4190	4378	4645
	Read Latency	2093	1502	1557	983	2644	3884	7767	15755
	write Latency	173	208	154	283	773	1434	2750	3585
	Write IOPS	46	64	62	93	36	24	12	6
	Read IOPS	556	465	618	343	125	65	34	18
HSbench 50 Buckets 100 Objects 100 Sessions	Write Throughput	0	5	61	546	1376	1594	1599	1580
	Read Throughput	2	42	520	1474	4616	4189	3787	3898
	Read Latency	2094	1631	1622	899	2583	3962	7939	16056
	write Latency	161	230	191	337	774	1507	3329	3517
	Write IOPS	47	61	61	109	38	24	12	6
	Read IOPS	616	432	520	295	128	65	30	15

COSbench 1 Bucket 1000 Objects 100 Sessions	**Write Throughput**	0	8	81	345	489	548	603	699
	Read Throughput	0	8	82	340	485	571	588	745
	Read Latency	2179	963	974	1107	5992	9304	17263	28252
	Write Latency	219	248	254	346	1380	2273	4088	7901
	Write IOPS	42	83	81	69	13	8	4	2
	Read IOPS	42	83	82	68	13	8	4	2
COSbench 10 Buckets 100 Objects 100 Sessions	**Write Throughput**	0	8	82	349	460	524	591	714
	Read Throughput	0	8	82	345	468	525	622	748
	Read Latency	2348	923	977	1100	6584	10133	17779	28536
	Write Latency	112	234	247	337	1215	2082	3669	7058
	Write IOPS	41	86	82	70	12	8	4	2
	Read IOPS	41	87	82	69	13	8	4	2
COSbench 50 Buckets 100 Objects 100 Sessions	**Write Throughput**	0	8	82	341	578	666	759	817
	Read Throughput	0	8	83	338	586	684	760	896
	Read Latency	2288	927	979	1116	5062	7681	13803	25728
	Write Latency	100	223	235	354	1152	1879	3063	5127
	Write IOPS	42	87	82	68	16	10	5	3
	Read IOPS	42	87	83	68	16	10	5	3

S3 Benchmark:

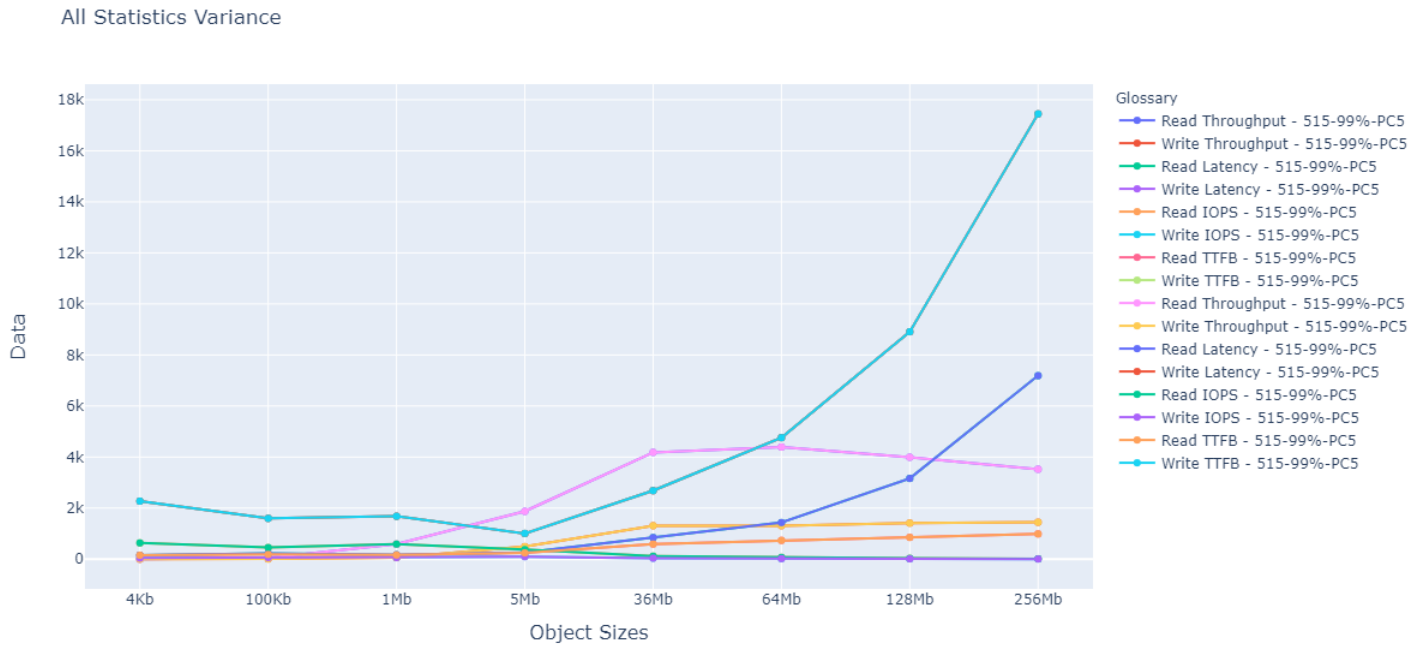

Fig 17. S3 Benchmark graph at 99% space utilization

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