VMmark® 3.1.1 Results

Server Vendor & Model: HPE ProLiant DL345 Gen10 Plus **Storage Vendor & Model: VMware vSAN 7.0 U2 - All Flash** **Hypervisor: VMware ESXi 7.0 U2a, Build 17867351** **Datacenter Management Software: VMware vCenter Server 7.0 U2b, Build 17958471**	**VMmark 3.1.1 Score = 21.53 @ 22 Tiles**

Number of Hosts: 4	**Uniform Hosts [yes/no]: yes**	**Total sockets/cores/threads in test: 4/256/512**
Tested By: Hewlett Packard Enterprise		**Test Date: 05-04-2022**

Performance Section	**Configuration Section**	**Notes Section**
Performance	Configuration	Notes for Workload

Performance

	weathervane			weathervaneE			dvdstoreA			dvdstoreB			dvdstoreC			
TILE_0	Actual	Ratio	QoS(nRT|MaxPctF)	Actual	Ratio	QoS(nRT|MaxPctF)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	GM
p0	3579.17	0.99	0.81 | 0.00	564.76	0.99	0.50 | 0.23	951.02	1.30	755.18	696.67	1.39	866.58	518.25	1.49	948.90	1.21
p1	3558.78	0.99	0.87 | 0.00	561.32	0.98	0.61 | 0.21	956.98	1.30	739.33	673.95	1.35	856.64	473.90	1.37	963.90	1.18
p2	3545.63	0.99	0.86 | 0.02	555.32	0.97	0.58 | 0.31	938.52	1.28	781.85	695.70	1.39	877.08	487.12	1.40	994.55	1.19
TILE_1	Actual	Ratio	QoS(nRT|MaxPctF)	Actual	Ratio	QoS(nRT|MaxPctF)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	GM
p0	3566.01	0.99	1.43 | 0.06	563.16	0.98	1.55 | 0.84	954.95	1.30	738.45	679.73	1.36	848.15	499.10	1.44	939.43	1.20
p1	3548.47	0.99	1.44 | 0.05	559.68	0.98	1.24 | 0.52	961.83	1.31	725.28	681.25	1.36	842.68	477.90	1.38	930.05	1.19
p2	3538.41	0.98	1.59 | 0.05	553.28	0.97	0.92 | 0.25	952.58	1.30	745.68	704.58	1.41	839.83	521.65	1.50	928.83	1.21
TILE_2	Actual	Ratio	QoS(nRT|MaxPctF)	Actual	Ratio	QoS(nRT|MaxPctF)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	GM
p0	3564.87	0.99	1.09 | 0.00	566.58	0.99	0.56 | 0.20	934.17	1.27	793.96	652.73	1.30	936.62	478.32	1.38	1034.24	1.18
p1	3553.08	0.99	1.37 | 0.03	566.70	0.99	0.78 | 0.33	927.62	1.26	822.03	651.02	1.30	960.91	453.05	1.31	1062.36	1.16
p2	3536.58	0.98	1.21 | 0.01	565.29	0.99	0.81 | 0.39	920.33	1.25	834.60	665.50	1.33	976.56	491.88	1.42	1072.01	1.18
TILE_3	Actual	Ratio	QoS(nRT|MaxPctF)	Actual	Ratio	QoS(nRT|MaxPctF)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	GM
p0	3561.88	0.99	1.29 | 0.03	561.19	0.98	0.81 | 0.36	972.40	1.32	700.52	685.25	1.37	817.42	481.45	1.39	902.61	1.20
p1	3541.90	0.98	1.23 | 0.02	557.11	0.97	0.66 | 0.18	966.62	1.32	711.22	688.38	1.38	815.51	504.43	1.45	911.05	1.20
p2	3520.88	0.98	1.29 | 0.02	554.47	0.97	0.79 | 0.22	973.10	1.33	692.17	677.65	1.35	767.34	525.58	1.52	810.31	1.21
TILE_4	Actual	Ratio	QoS(nRT|MaxPctF)	Actual	Ratio	QoS(nRT|MaxPctF)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	GM
p0	3570.91	0.99	0.82 | 0.00	565.36	0.99	0.55 | 0.33	969.52	1.32	716.59	681.20	1.36	841.34	482.02	1.39	920.17	1.20
p1	3558.12	0.99	0.92 | 0.00	561.78	0.98	0.62 | 0.34	963.98	1.31	723.88	704.00	1.41	833.94	502.15	1.45	917.99	1.21
p2	3541.83	0.98	0.97 | 0.00	560.03	0.98	0.58 | 0.26	970.12	1.32	712.20	679.20	1.36	842.86	502.82	1.45	922.50	1.20
TILE_5	Actual	Ratio	QoS(nRT|MaxPctF)	Actual	Ratio	QoS(nRT|MaxPctF)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	GM
p0	3567.08	0.99	1.58 | 0.07	569.96	1.00	1.43 | 0.69	962.83	1.31	714.36	684.77	1.37	827.13	461.25	1.33	899.47	1.19

p1	3552.71	0.99	1.51 | 0.06	570.79	1.00	1.44 | 0.80	953.38	1.30	733.71	705.50	1.41	833.32	527.50	1.52	907.01	1.22
p2	3525.71	0.98	1.55 | 0.05	563.86	0.99	1.11 | 0.44	963.52	1.31	714.22	659.70	1.32	832.10	484.05	1.40	896.80	1.18
TILE_6	Actual	Ratio	QoS(nRT|MaxPctF)	Actual	Ratio	QoS(nRT|MaxPctF)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	GM
p0	3573.53	0.99	0.85 | 0.01	566.16	0.99	0.67 | 0.35	937.95	1.28	788.88	658.65	1.32	913.49	460.27	1.33	1030.17	1.17
p1	3559.16	0.99	0.91 | 0.00	562.67	0.98	0.61 | 0.32	930.20	1.27	801.18	677.70	1.35	924.34	504.57	1.45	1015.47	1.19
p2	3548.90	0.99	0.95 | 0.00	556.98	0.97	0.58 | 0.25	953.25	1.30	749.20	671.33	1.34	878.81	466.77	1.35	986.27	1.18
TILE_7	Actual	Ratio	QoS(nRT|MaxPctF)	Actual	Ratio	QoS(nRT|MaxPctF)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	GM
p0	3570.58	0.99	1.16 | 0.02	568.00	0.99	0.81 | 0.29	969.55	1.32	705.93	681.73	1.36	832.25	485.00	1.40	909.47	1.20
p1	3557.11	0.99	1.18 | 0.01	560.52	0.98	0.81 | 0.44	965.35	1.31	721.41	701.12	1.40	840.37	527.33	1.52	900.36	1.22
p2	3537.66	0.98	1.31 | 0.02	523.91	0.92	0.85 | 0.13	963.17	1.31	725.38	650.92	1.30	864.88	453.52	1.31	939.56	1.15
TILE_8	Actual	Ratio	QoS(nRT|MaxPctF)	Actual	Ratio	QoS(nRT|MaxPctF)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	GM
p0	3570.27	0.99	0.94 | 0.00	566.45	0.99	0.63 | 0.34	958.48	1.31	733.55	700.40	1.40	844.89	500.12	1.44	935.26	1.21
p1	3554.30	0.99	1.09 | 0.02	565.72	0.99	0.63 | 0.22	951.08	1.30	761.36	666.85	1.33	890.45	494.12	1.42	964.94	1.19
p2	3547.21	0.99	0.96 | 0.00	564.52	0.99	0.54 | 0.34	959.80	1.31	728.77	676.88	1.35	850.84	477.02	1.38	941.08	1.19
TILE_9	Actual	Ratio	QoS(nRT|MaxPctF)	Actual	Ratio	QoS(nRT|MaxPctF)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	GM
p0	3576.65	0.99	1.25 | 0.04	564.45	0.99	0.86 | 0.31	951.98	1.30	739.47	701.23	1.40	835.47	503.38	1.45	909.63	1.21
p1	3564.50	0.99	1.22 | 0.04	562.44	0.98	0.83 | 0.25	957.00	1.30	734.50	681.88	1.36	831.59	480.65	1.39	916.61	1.19
p2	3542.06	0.98	1.31 | 0.05	559.00	0.98	1.01 | 0.32	953.02	1.30	736.74	682.73	1.36	829.02	502.12	1.45	919.57	1.20
TILE_10	Actual	Ratio	QoS(nRT|MaxPctF)	Actual	Ratio	QoS(nRT|MaxPctF)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	GM
p0	3564.27	0.99	0.95 | 0.00	568.14	0.99	0.53 | 0.31	933.05	1.27	805.22	675.20	1.35	933.02	501.60	1.45	1022.24	1.20
p1	3540.72	0.98	1.02 | 0.02	564.73	0.99	0.71 | 0.39	935.60	1.27	792.83	652.55	1.30	936.16	456.60	1.32	1036.88	1.16
p2	3531.95	0.98	0.98 | 0.00	563.19	0.98	0.70 | 0.32	920.80	1.25	832.43	675.08	1.35	938.90	475.50	1.37	1054.50	1.18
TILE_11	Actual	Ratio	QoS(nRT|MaxPctF)	Actual	Ratio	QoS(nRT|MaxPctF)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	GM
p0	3561.61	0.99	1.25 | 0.03	562.48	0.98	0.87 | 0.21	957.10	1.30	732.31	703.67	1.41	843.19	526.75	1.52	897.99	1.22
p1	3543.06	0.98	1.29 | 0.04	560.38	0.98	1.07 | 0.37	960.60	1.31	723.37	678.42	1.36	840.36	458.25	1.32	908.58	1.18
p2	3530.10	0.98	1.46 | 0.07	558.41	0.98	0.97 | 0.36	941.67	1.28	767.62	690.17	1.38	874.55	517.08	1.49	941.05	1.20
TILE_12	Actual	Ratio	QoS(nRT|MaxPctF)	Actual	Ratio	QoS(nRT|MaxPctF)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	GM
p0	3573.87	0.99	1.02 | 0.01	567.10	0.99	0.61 | 0.26	969.40	1.32	705.57	684.08	1.37	822.94	505.57	1.46	901.31	1.21
p1	3560.95	0.99	1.17 | 0.04	568.51	0.99	0.75 | 0.37	965.40	1.31	720.68	683.75	1.37	831.63	480.10	1.38	921.59	1.20
p2	3546.88	0.99	1.07 | 0.01	565.14	0.99	0.51 | 0.19	962.08	1.31	727.55	705.80	1.41	834.81	521.85	1.50	926.81	1.22
TILE_13	Actual	Ratio	QoS(nRT|MaxPctF)	Actual	Ratio	QoS(nRT|MaxPctF)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	GM
p0	3565.86	0.99	2.18 | 0.13	567.74	0.99	0.98 | 0.29	953.35	1.30	747.63	675.65	1.35	862.18	496.80	1.43	938.96	1.20
p1	3544.63	0.99	2.23 | 0.13	562.73	0.98	0.83 | 0.20	953.12	1.30	747.72	677.23	1.35	857.70	471.75	1.36	953.87	1.18
p2	3527.14	0.98	2.54 | 0.16	560.93	0.98	0.95 | 0.25	950.27	1.29	750.79	700.50	1.40	847.66	521.12	1.50	929.41	1.21
TILE_14	Actual	Ratio	QoS(nRT|MaxPctF)	Actual	Ratio	QoS(nRT|MaxPctF)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	GM
p0	3577.45	0.99	1.79 | 0.04	571.63	1.00	1.13 | 0.88	945.50	1.29	776.44	663.77	1.33	895.57	461.95	1.33	1015.45	1.18

p1	3564.10	0.99	2.05 | 0.10	567.79	0.99	1.08 | 0.58	927.92	1.26	814.00	680.45	1.36	919.72	479.48	1.38	1029.35	1.18
p2	3537.55	0.98	1.94 | 0.07	564.80	0.99	0.67 | 0.23	931.80	1.27	809.46	651.62	1.30	941.11	478.62	1.38	1042.91	1.17
TILE_15	Actual	Ratio	QoS(nRT|MaxPctF)	Actual	Ratio	QoS(nRT|MaxPctF)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	GM
p0	3574.29	0.99	1.12 | 0.01	570.26	1.00	0.94 | 0.43	966.85	1.32	698.53	689.60	1.38	807.28	490.70	1.41	870.97	1.21
p1	3560.11	0.99	1.11 | 0.02	565.43	0.99	0.77 | 0.35	956.92	1.30	733.42	706.60	1.41	824.47	505.82	1.46	902.14	1.21
p2	3533.01	0.98	1.27 | 0.02	565.03	0.99	0.84 | 0.32	957.55	1.30	731.82	679.88	1.36	832.02	481.68	1.39	915.78	1.19
TILE_16	Actual	Ratio	QoS(nRT|MaxPctF)	Actual	Ratio	QoS(nRT|MaxPctF)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	GM
p0	3566.37	0.99	1.12 | 0.09	566.83	0.99	0.62 | 0.30	971.10	1.32	705.92	683.58	1.37	827.77	481.43	1.39	911.37	1.20
p1	3549.59	0.99	1.13 | 0.04	560.94	0.98	0.94 | 0.53	960.25	1.31	731.16	705.95	1.41	837.94	526.38	1.52	907.06	1.22
p2	3531.12	0.98	1.06 | 0.01	558.52	0.98	0.72 | 0.41	975.62	1.33	698.47	687.25	1.37	821.77	479.43	1.38	923.23	1.19
TILE_17	Actual	Ratio	QoS(nRT|MaxPctF)	Actual	Ratio	QoS(nRT|MaxPctF)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	GM
p0	3572.05	0.99	2.15 | 0.13	562.98	0.98	1.03 | 0.41	961.00	1.31	717.41	688.12	1.37	811.26	488.52	1.41	879.50	1.20
p1	3553.60	0.99	2.10 | 0.11	557.37	0.97	1.09 | 0.45	951.80	1.30	740.17	703.90	1.41	839.69	528.30	1.52	900.37	1.22
p2	3532.80	0.98	2.60 | 0.21	556.19	0.97	0.97 | 0.28	963.00	1.31	709.88	688.92	1.38	809.99	488.20	1.41	876.65	1.19
TILE_18	Actual	Ratio	QoS(nRT|MaxPctF)	Actual	Ratio	QoS(nRT|MaxPctF)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	GM
p0	3576.52	0.99	1.61 | 0.02	563.62	0.99	0.93 | 0.54	931.27	1.27	805.69	675.88	1.35	936.75	479.95	1.38	1026.01	1.18
p1	3552.42	0.99	1.67 | 0.05	557.78	0.97	0.63 | 0.30	934.52	1.27	794.65	654.90	1.31	923.76	483.12	1.39	1015.04	1.17
p2	3542.34	0.98	1.90 | 0.05	556.69	0.97	0.65 | 0.26	933.65	1.27	799.43	651.02	1.30	937.79	455.85	1.31	1042.56	1.16
TILE_19	Actual	Ratio	QoS(nRT|MaxPctF)	Actual	Ratio	QoS(nRT|MaxPctF)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	GM
p0	3575.28	0.99	1.10 | 0.01	567.05	0.99	0.73 | 0.34	962.12	1.31	713.48	710.90	1.42	811.77	513.45	1.48	874.80	1.22
p1	3552.65	0.99	1.11 | 0.03	564.40	0.99	0.72 | 0.33	962.67	1.31	722.24	680.62	1.36	834.94	507.43	1.46	901.27	1.21
p2	3540.39	0.98	1.31 | 0.10	562.14	0.98	0.72 | 0.29	956.50	1.30	733.56	679.38	1.36	847.14	483.18	1.39	909.45	1.19
TILE_20	Actual	Ratio	QoS(nRT|MaxPctF)	Actual	Ratio	QoS(nRT|MaxPctF)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	GM
p0	3569.33	0.99	1.09 | 0.01	565.26	0.99	0.51 | 0.26	945.60	1.29	764.16	691.15	1.38	884.20	515.05	1.49	969.42	1.21
p1	3551.89	0.99	1.13 | 0.06	565.19	0.99	0.65 | 0.24	953.90	1.30	745.71	671.75	1.34	872.81	472.20	1.36	956.11	1.18
p2	3538.23	0.98	1.13 | 0.06	564.54	0.99	0.70 | 0.50	955.42	1.30	739.58	701.73	1.40	849.37	500.52	1.44	919.02	1.21
TILE_21	Actual	Ratio	QoS(nRT|MaxPctF)	Actual	Ratio	QoS(nRT|MaxPctF)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	GM
p0	3566.88	0.99	1.59 | 0.03	566.12	0.99	1.23 | 0.67	953.80	1.30	751.03	701.77	1.40	855.26	520.95	1.50	942.58	1.22
p1	3545.96	0.99	1.60 | 0.04	557.79	0.97	0.77 | 0.24	965.62	1.31	717.86	685.67	1.37	824.92	478.30	1.38	934.29	1.19
p2	3530.43	0.98	1.65 | 0.05	554.83	0.97	0.74 | 0.26	970.50	1.32	714.71	713.50	1.43	806.21	506.82	1.46	906.61	1.21

p0_score:	26.39
p1_score:	26.27
p2_score:	26.21

Infrastructure_Operations_Scores:	vMotion	SVMotion	XVMotion	Deploy
Completed_Ops_PerHour	57.00	52.00	42.00	23.00

Avg_Seconds_To_Complete	5.73	83.96	101.79	270.10
Failures	0.00	0.00	0.00	0.00
Ratio	2.19	2.89	2.33	2.88
Number_Of_Threads	2	2	2	2

Summary	Run_Is_Compliant	Turbo_Setting:0
	Number_Of_Compliance_Issues(0)*	Median_Phase(p1)
Unreviewed_VMmark3_Applications_Score	26.27	
Unreviewed_VMmark3_Infrastructure_Score	2.55	
Unreviewed_VMmark3_Score	21.53	

Configuration

Virtualization Software	
Hypervisor Vendor, Product, Version, and Build / Availability Date (MM-DD-YYYY)	VMware ESXi 7.0 U2a, Build 17867351 / 04-29-2021
Datacenter Management Software Vendor, Product, Version, and Build / Availability Date (MM-DD-YYYY)	VMware vCenter Server 7.0 U2b, Build 17958471 / 05-25-2021
Supplemental Software	None
Servers	
Number of Servers in System Under Test (all subsequent fields in this section are per server)	4
Server Manufacturer and Model	HPE ProLiant DL345 Gen10 Plus
Processor Vendor and Model	AMD EPYC 7763
Processor Speed (GHz) / Turbo Boost Speed (GHz)	2.45 / 3.5
Total Sockets/Total Cores/Total Threads	1 Socket / 64 Cores / 128 Threads
Primary CPU Cache	32 KB I + 32 KB D on chip per core
Secondary CPU Cache	512 KB I+D on chip per core
Other CPU Cache	256 MB I+D on chip per chip, 32MB shared / 8 cores
BIOS Version	A43 v2.56 (02/10/2022)

Memory Size (in GB, Number of DIMMs)	1024, 16
Memory Type and Speed	64 GB 2Rx4 PC4-3200 MHz RDIMM
Disk Subsystem Type	vSAN, FC SAN
Number of Disk Controllers	1
Disk Controller Vendors and Models	Samsung 1.6 TB PM1735 NVMe SSD
Total Number of Physical Disks for Hypervisor	1
Disk Vendors, Models, Capacities, and Speeds	Samsung 1.6 TB PM1735 NVMe SSD
Number of Host Bus Adapters	1
Host Bus Adapter Vendors and Models	HPE SN1610Q 32Gb 2p FC HBA
Number of Network Controllers	2
Network Controller Vendors and Models	1 x Marvell QL41232HLCU Ethernet 10/25Gb 2-port SFP28 Adapter for HPE 1 x Mellanox ConnectX-5 EN 100Gb/s 2-port Ethernet Adapter
Other Hardware	None
Other Software	None
Hardware Availability Date (MM-DD-YYYY)	05-04-2021
BIOS Availability Date (MM-DD-YYYY)	02-10-2022
Software Availability Date (MM-DD-YYYY)	04-29-2021
Network	
Network Switch Vendors and Models	Mellanox MSN2410 56-port Switch
Network Speed	2 x 100 Gb/s for Management, vMotion, vSAN, and Standby VMs 2 x 25 Gb/s for Weathervane and DS3 VMs
Primary Storage	
Storage Category	VMware vSAN
Storage Vendors, Models, and Firmware Versions	4 x HPE ProLiant DL345 Gen10 Plus servers in a VMware vSAN 7.0 U2 cluster
Storage Configuration Summary	VMware vSAN • 2 x Disk Groups per host • 2 x HPE 1.6TB NVMe Disks per host for cache (P/N P40570-B21) • 8 x HPE 3.2TB NVMe Disks per host for capacity (P/N P40571-B21)

Datacenter Management Server	
System Model	HPE ProLiant DL365 Gen10 Plus
Processor Vendor and Model	AMD EPYC 7543
Processor Speed (GHz)	2.8
Total Sockets/Total Cores/Total Threads	2 Sockets / 64 Cores / 128 Threads
Memory Size (in GB, Number of DIMMs)	256, 8
Network Controller(s) Vendors and Models	1 x Mellanox MCX512F-ACHT Ethernet 10/25Gb 2-port SFP28 Adapter for HPE
Operating System, Version, Bitness, and Service Pack	VMware ESXi 7.0 U2a, Build 17867351
Virtual Center VM Number of vCPUs	8
Virtual Center VM Virtual Memory (in GB)	28
Virtual Center VM Operating System, Version, Bitness, and Service Pack	VMware vCenter Server 7.0 U2b, Build 17958471
Other Hardware	None
Other Software	None

Clients	
Total Number of Virtual Clients / Virtual Client Hosts	23 / 2
System Model(s)	HPE ProLiant DL365 Gen10 Plus
Processor Vendor(s) and Model(s)	AMD EPYC 7713
Processor Speed(s) (GHz)	2.0
Total Sockets/Total Cores/Total Threads	4 Sockets / 256 Cores / 512 Threads
Memory per Virtual Client Host	512 GB
Network Controller(s) Vendors and Models	1 x Mellanox MCX512F-ACHT Ethernet 10/25Gb 2-port SFP28 Adapter for HPE
Virtual Client Networking Notes	2 x vmnic on standard vSwitch for management, vMotion, and workload (25 Gb/s)
Virtual Client Storage Notes	Details in Storage Notes
Other Hardware	Details in Client Notes
Other Software	VMware ESXi 7.0 U2a, Build 17867351

Security Mitigations

Vulnerability	CVE	Exploit Name	Public Vulnerability Name	Mitigated		
				Server Firmware	ESXi	Guest OS
Spectre	2017-5753	Variant 1	Bounds Check Bypass	N/A	Not Vulnerable	Not Vulnerable
Spectre	2017-5715	Variant 2	Branch Target Injection	Not Vulnerable	Not Vulnerable	Not Vulnerable
Meltdown	2017-5754	Variant 3	Rogue Data Cache Load	N/A	Not Vulnerable	Not Vulnerable
Spectre-NG	2018-3640	Variant 3a	Rogue System Register Read	Not Vulnerable	N/A	N/A
Spectre-NG	2018-3639	Variant 4	Speculative Store Bypass	N/A	Not Vulnerable	Not Vulnerable
Foreshadow	2018-3615	Variant 5	L1 Terminal Fault - SGX	N/A	N/A	N/A
Foreshadow-NG	2018-3620	Variant 5	L1 Terminal Fault - OS	N/A	N/A	Not Vulnerable
Foreshadow-NG	2018-3646	Variant 5	L1 Terminal Fault - VMM	N/A	Not Vulnerable	N/A

Notes for Workload

Template deployed with disk type: Thin

Virtualization Software Notes

- Cluster DRS Automation Level set to Fully Automated
- vSphere DRS Migration Threshold level set to 1
- vSphere DRS Advanced Option AggressiveCPUActive set to 1
- Logical CPU layout changed for all multi-CPU workload VMs to 1 socket with multiple cores (default single core per socket)
- Logging was disabled for all VMs (default enabled)
- All ElasticDB VMs had CPU shares set to High (default Normal)
- All ElasticLB VMs had CPU shares set to High (default Normal)
- All DS3WebA VMs had CPU shares set to High (default Normal)
- All Standby VMs had CPU shares set to Low (default Normal)
- All DS3DB VMs had CPU and memory shares set to High (default Normal)
- All memory reserved for all DS3DB and client VMs except for PrimeClient (default 0)
- sched.mem.pin set to TRUE for all DS3DB and client VMs except for PrimeClient (Default FALSE)
- sched.mem.lpage.enable1GPage set to TRUE for all DS3DB VMs (Default FALSE)
- DS3DB0 was configured to not use the third virtual disk before building tiles 1-21.
- CD and floppy devices were removed from all VMs except for PrimeClient, client, and template VMs (default installed)

Advanced Settings

- Cpu.CreditAgePeriod = 1000 (default 3000)
- Cpu.HTWholeCoreThreshold = 0 (default 800)
- Disk.IdleCredit = 64 (default 32)
- Disk.ReqCallThreshold = 1 (default 8)
- Mem.CtlMaxPercent = 0 (default 65)
- Mem.ShareScanGHz = 0 (default 4)

- Numa.LocalityWeightActionAffinity = 0 (default 130)
- Power.CpuPolicy = High Performance (default Balanced)
- UserVars.SuppressShellWarning = 1 (default 0)

Server Notes

Server BIOS Settings

- HPE Workload Profile set to 'Virtualization Max Performance ' (default : General Power Efficient Compute)
  - After changing to 'Virtualization Max Performance ' which modifies other settings, changed to 'Custom' to unlock settings to allow for modifications.
- Thermal configuration set to Enhanced CPU Cooling (default : Optimal Cooling)
- L2 Stream HW Prefetcher set to Disabled (default : Enabled)
- Data Fabric C-State Enable set to Disabled (default: Auto)
- C-State Efficiency Mode set to Disabled (default: Enabled)
- Infinity Fabric Power Management set to Disabled (default: Enabled)
- Infinity Fabric Performance State set to P0 (default: Auto)

Networking Notes

vSwitch Configuration

- standard vSwitch: vSwitch0
  - Uplink: vmnic0 (100 Gb/s)
  - vmk0 for management and vSAN
  - "VM Network" port group for Standby and Deploy VMs
  - MTU set to 9000 for the vSwitch, vmk0, and all uplinks
- standard vSwitch: vSwitch1 (unused)
  - Uplinks: vmnic1 (100 Gb/s)
  - vmk1 for iSCSI traffic (unused) and vMotion
  - MTU set to 9000 for the vSwitch, vmk1, and all uplinks
- standard vSwitch: vSwitch2
  - Uplink: vmnic2, vmnic3 (25 Gb/s)
  - "auction" port group for Weathervane Auction VMs
  - "ds3" port group for DS3 VMs
  - "elastic" port group for Weathervane Elastic VMs
  - MTU set to 9000 for the vSwitch and all uplinks

Storage Notes

OS storage

- VMware ESXi 7.0 U2a was installed on 1 x Samsung 1.6 TB PM1735 NVMe SSD Boot Drive for each host.

Primary storage: VMware vSAN storage

- VMware vSAN 7.0 U2
  - Capacity: 102.4 TB

    - Cache: 12.8 TB
    - Hardware Configuration
        - Each host had 2 disk groups. Each disk group had:
            - Cache Tier: 1 x HPE 1.6TB High Performance Mixed Use SFF BC U.3 NVMe SSD (P/N P40570-B21)
            - Capacity Tier: 4 x HPE 3.2TB High Performance Mixed Use SFF BC U.3 NVMe SSD (P/N P40571-B21)
    - Software Configuration
        - The "vSAN Default Storage Policy" was modified by setting "Disable object checksum" to enable (default: disable) and was used for all SUT VMs stored on the vSAN datastore.

Secondary storage: fiber channel storage

- HPE Alletra 6090 SAN Dual Controller Storage
- Physical Configuration:
    - 2 controllers each with 8 x 16 Gb FC ports
    - 24 x HPE Alletra 7.68 TB NVMe SFF SSDs
    - Compression was enabled across the entire array
    - Deduplication was enabled across the entire array
    - The HPE Alletra storage array is VAAI capable and enabled
- Software Configuration:
    - 3 x 1TB LUNs were configured to be used for infrastructure operation targets
        - 1 LUN was used exclusively for Standby VM Storage vMotion operations
        - 1 LUN was used exclusively for DS3WebA VM XvMotion operations
        - 1 LUN was used exclusively for Deploy VM operations
    - All FC LUNs were configured with
        - Round Robin Path Policy (Default : Most Recently Used)
        - IO Operations Limit 1 (Default : 1000)

Datacenter Management Server Notes

VMware vCenter Server Appliance 7.0 U2b, Build 17958471 was hosted on a HPE ProLiant DL365 Gen10 Plus system that was not part of the client or SUT clusters.

Operating System Notes

SUT and Client hosts used HPE customized ESXi 7.0 U2 ISO (VMware-ESXi-7.0.2-17867351-HPE-702.0.0.10.7.0.52-May2021.iso) for OS installation.

Software Notes

None

Client Notes

VMware ESXi 7.0 U2a was installed on a Samsung 1.6 TB PM1735 NVMe SSD

Advanced ESXi Settings:

- Power.CpuPolicy = High Performance (default Balanced)
- UserVars.SuppressShellWarning = 1 (default 0)

Server BIOS Settings:

- HPE Workload Profile set to 'Virtualization Max Performance ' (default : General Power Efficient Compute)
- Thermal configuration set to Maximum Cooling (default : Optimal Cooling)

The Client VMs were distributed across the client hosts as follows:

- Client Host 1: Client0, Client2, Client4, Client6, Client8, Client10, Client12, Client14, Client16, Client18, Client20
- Client Host 2: Client1, Client3, Client5, Client7, Client9, Client11, Client13, Client15, Client17, Client19, Client21, PrimeClient

Client hosts vSwitch configuration:

- vSwitch0 on vmnic0 and vmnic1 for Management Network and VM Network portgroup
- Each port is connected to the switch at 25Gb/s
- MTU set to 9000 for the vSwitch, vmk0, and all uplinks

Client storage for VMs

- All client VMs were stored on the local datastore created at install time on a Samsung 1.6 TB PM1735 NVMe SSD

Other Notes

VMmark3.properties file modifications:

- ScrubConfigFile was set to true (default false)
- TileDelay was set to 30 (default 60)
- DebugLevel was set to 3 (default 0)
- VCscratchDir was set to /root/VMmark3/results/scratch/ (default /root/VMmark3/samples/)
- ErrorImmediate = true (default false)

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