VMmark® 3.1 Results

Server Vendor & Model: HPE Synergy 480 Gen10 **Storage Vendor & Model: HPE 3PAR StoreServ 9450** **Hypervisor: VMware ESXi 6.7 EP 06 Build 11675023** **Datacenter Management Software: VMware vCenter 6.7 U1 Build 10244857**	**VMmark 3.1 Score = 16.91 @ 18 Tiles**

Number of Hosts: 6	**Uniform Hosts [yes/no]: yes**	**Total sockets/cores/threads in test: 12/288/576**
Tested By: Hewlett Packard Enterprise	**Test Date: 06-18-2019**	

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	3583.73	1.00	0.63 | 0.00	564.78	0.99	0.66 | 0.25	869.67	1.18	968.08	611.98	1.22	1102.82	450.00	1.30	1201.04	1.13
p1	3563.65	0.99	0.61 | 0.00	562.94	0.98	0.75 | 0.40	866.38	1.18	977.60	620.05	1.24	1079.33	436.07	1.26	1186.36	1.12
p2	3549.07	0.99	0.50 | 0.01	556.04	0.97	0.64 | 0.41	865.77	1.18	981.20	631.15	1.26	1111.56	465.73	1.34	1220.63	1.14
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	3581.20	1.00	0.65 | 0.01	571.44	1.00	0.96 | 0.90	875.67	1.19	938.45	623.08	1.24	1049.81	458.57	1.32	1153.80	1.14
p1	3568.31	0.99	0.65 | 0.02	565.92	0.99	0.63 | 0.62	875.33	1.19	944.02	629.55	1.26	1026.16	443.32	1.28	1114.37	1.13
p2	3557.43	0.99	0.66 | 0.01	564.75	0.99	0.67 | 0.33	868.02	1.18	963.16	640.67	1.28	1077.40	474.82	1.37	1166.62	1.15
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	3566.88	0.99	0.62 | 0.12	565.02	0.99	0.63 | 0.48	873.40	1.19	958.35	617.20	1.23	1080.16	454.27	1.31	1188.42	1.13
p1	3559.52	0.99	0.62 | 0.00	563.44	0.98	0.59 | 0.20	880.52	1.20	929.98	619.98	1.24	1073.07	436.25	1.26	1165.27	1.13
p2	3541.92	0.98	0.62 | 0.00	560.86	0.98	0.71 | 0.43	874.67	1.19	945.07	622.73	1.24	1061.96	457.43	1.32	1152.54	1.14
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	3574.05	0.99	0.51 | 0.00	565.38	0.99	0.63 | 0.36	890.95	1.21	911.02	602.25	1.20	1062.56	435.52	1.26	1163.43	1.12
p1	3558.30	0.99	0.53 | 0.03	565.17	0.99	0.54 | 0.26	871.60	1.19	970.65	637.60	1.27	1100.27	450.45	1.30	1205.01	1.14
p2	3552.87	0.99	0.58 | 0.00	563.20	0.98	0.61 | 0.37	880.77	1.20	945.84	620.15	1.24	1083.78	451.35	1.30	1195.72	1.13
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	3585.83	1.00	0.59 | 0.01	569.74	1.00	1.01 | 0.66	873.83	1.19	966.05	612.38	1.22	1110.19	424.60	1.22	1221.42	1.12
p1	3576.89	0.99	0.57 | 0.01	567.39	0.99	0.63 | 0.48	877.30	1.19	955.13	637.00	1.27	1088.31	450.70	1.30	1192.31	1.14
p2	3553.64	0.99	0.48 | 0.00	563.02	0.98	0.58 | 0.33	873.33	1.19	952.32	616.88	1.23	1084.12	451.48	1.30	1211.38	1.13
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	3590.99	1.00	0.64 | 0.05	563.64	0.99	1.12 | 0.79	861.98	1.17	994.15	606.65	1.21	1143.41	420.20	1.21	1261.68	1.11
p1	3569.94	0.99	0.63 | 0.07	558.73	0.98	0.69 | 0.33	856.70	1.17	1002.46	623.00	1.24	1141.68	440.20	1.27	1247.20	1.12
p2	3559.60	0.99	0.61 | 0.00	556.01	0.97	0.75 | 0.38	857.40	1.17	1001.20	602.08	1.20	1156.00	420.55	1.21	1281.95	1.10
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	3576.61	0.99	0.63 | 0.06	569.90	1.00	0.97 | 0.59	868.70	1.18	979.25	612.17	1.22	1120.59	404.05	1.17	1253.26	1.11
p1	3561.03	0.99	0.62 | 0.11	566.67	0.99	0.56 | 0.17	868.55	1.18	980.35	627.40	1.25	1135.35	463.85	1.34	1247.93	1.14
p2	3540.43	0.98	0.62 | 0.00	561.36	0.98	0.64 | 0.27	860.00	1.17	991.58	584.58	1.17	1135.44	420.60	1.21	1263.60	1.10
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	3575.80	0.99	0.64 | 0.03	567.47	0.99	0.66 | 0.37	878.90	1.20	927.74	608.17	1.22	1040.32	420.18	1.21	1154.59	1.12
p1	3562.32	0.99	0.60 | 0.04	566.74	0.99	0.62 | 0.28	877.75	1.20	947.94	657.67	1.31	1084.58	473.70	1.37	1176.89	1.16
p2	3539.96	0.98	0.49 | 0.01	562.94	0.98	0.77 | 0.42	883.45	1.20	926.09	604.75	1.21	1054.63	435.07	1.25	1165.41	1.12
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	3587.37	1.00	0.62 | 0.01	562.14	0.98	0.87 | 0.50	878.92	1.20	937.16	625.92	1.25	1043.63	436.52	1.26	1157.58	1.13
p1	3570.17	0.99	0.49 | 0.10	552.70	0.97	0.57 | 0.30	887.20	1.21	926.55	649.67	1.30	1046.64	478.85	1.38	1154.25	1.16
p2	3553.35	0.99	0.48 | 0.02	547.57	0.96	0.63 | 0.29	890.80	1.21	914.61	627.48	1.25	1044.67	436.27	1.26	1161.49	1.13
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	3571.14	0.99	0.58 | 0.00	569.57	1.00	0.84 | 0.55	882.92	1.20	934.08	627.33	1.25	1042.81	436.73	1.26	1165.34	1.13
p1	3559.20	0.99	0.60 | 0.02	562.27	0.98	0.70 | 0.41	878.38	1.20	940.81	648.52	1.30	1048.34	473.10	1.36	1177.32	1.15
p2	3551.89	0.99	0.56 | 0.03	558.30	0.98	0.60 | 0.24	883.27	1.20	938.42	622.95	1.24	1070.17	416.55	1.20	1169.06	1.12
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	3585.30	1.00	0.67 | 0.04	567.60	0.99	0.77 | 0.45	896.12	1.22	885.30	641.30	1.28	983.26	448.12	1.29	1097.52	1.15
p1	3567.50	0.99	0.65 | 0.00	564.46	0.99	0.82 | 0.52	889.55	1.21	913.46	654.85	1.31	1022.91	484.43	1.40	1118.85	1.17
p2	3557.46	0.99	0.63 | 0.11	564.89	0.99	0.71 | 0.44	892.20	1.22	909.73	612.77	1.22	1020.52	421.15	1.21	1140.89	1.12
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	3575.63	0.99	0.66 | 0.00	570.18	1.00	0.71 | 0.53	897.65	1.22	889.37	638.92	1.28	992.68	452.95	1.31	1069.50	1.15
p1	3555.78	0.99	0.77 | 0.03	564.62	0.99	0.72 | 0.32	895.48	1.22	888.05	637.90	1.27	999.11	468.73	1.35	1085.80	1.15
p2	3547.60	0.99	0.70 | 0.01	559.04	0.98	0.65 | 0.27	889.02	1.21	898.27	639.88	1.28	995.04	446.50	1.29	1106.92	1.14
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	3583.99	1.00	0.68 | 0.00	571.22	1.00	0.96 | 0.83	872.77	1.19	974.48	636.77	1.27	1087.97	448.05	1.29	1205.58	1.14
p1	3570.32	0.99	0.72 | 0.01	568.50	0.99	0.86 | 0.86	878.60	1.20	946.12	616.58	1.23	1097.94	450.50	1.30	1204.83	1.14
p2	3548.72	0.99	0.73 | 0.02	566.23	0.99	0.97 | 0.73	873.92	1.19	959.87	613.12	1.23	1099.51	427.30	1.23	1216.15	1.12
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	3587.66	1.00	0.57 | 0.00	572.93	1.00	0.88 | 0.81	881.02	1.20	926.54	648.50	1.30	1044.67	463.25	1.34	1135.44	1.16
p1	3562.78	0.99	0.51 | 0.01	566.67	0.99	0.62 | 0.36	883.15	1.20	929.82	624.12	1.25	1065.98	456.43	1.32	1165.80	1.14

p2	3553.83	0.99	0.49 | 0.01	563.37	0.98	0.54 | 0.16	884.75	1.20	923.50	624.50	1.25	1041.67	437.60	1.26	1152.33	1.13
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	3584.92	1.00	0.60 | 0.02	564.56	0.99	0.61 | 0.30	880.90	1.20	942.13	642.60	1.28	1058.58	452.40	1.30	1190.01	1.15
p1	3567.18	0.99	0.55 | 0.00	557.45	0.97	0.60 | 0.30	882.10	1.20	937.03	618.75	1.24	1082.96	453.50	1.31	1176.67	1.13
p2	3552.13	0.99	0.52 | 0.00	556.53	0.97	0.60 | 0.24	877.67	1.20	938.29	627.02	1.25	1056.07	433.38	1.25	1188.99	1.12
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	3589.60	1.00	0.76 | 0.00	566.49	0.99	0.73 | 0.33	857.67	1.17	1017.10	632.15	1.26	1117.48	445.60	1.28	1238.01	1.13
p1	3566.83	0.99	0.81 | 0.00	562.78	0.98	0.75 | 0.41	862.92	1.18	997.65	586.88	1.17	1131.20	423.05	1.22	1255.52	1.10
p2	3548.12	0.99	0.77 | 0.01	556.55	0.97	0.60 | 0.28	855.02	1.16	1019.86	625.77	1.25	1139.49	443.15	1.28	1256.04	1.12
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	3578.68	0.99	0.65 | 0.00	567.76	0.99	0.86 | 0.59	836.75	1.14	1079.99	634.83	1.27	1195.74	448.75	1.29	1345.94	1.13
p1	3563.07	0.99	0.56 | 0.01	560.36	0.98	0.54 | 0.27	859.65	1.17	1020.63	580.12	1.16	1176.61	418.23	1.21	1300.89	1.10
p2	3545.53	0.99	0.55 | 0.02	563.75	0.99	0.72 | 0.31	849.38	1.16	1051.50	620.20	1.24	1186.23	433.32	1.25	1325.86	1.12
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	3567.59	0.99	0.56 | 0.01	567.56	0.99	0.98 | 0.61	870.70	1.19	970.05	637.70	1.27	1101.70	472.45	1.36	1208.74	1.15
p1	3553.50	0.99	0.59 | 0.00	567.75	0.99	0.82 | 0.41	881.50	1.20	943.48	623.62	1.25	1077.62	431.05	1.24	1219.79	1.13
p2	3543.05	0.98	0.51 | 0.01	562.61	0.98	0.65 | 0.36	871.88	1.19	971.34	642.35	1.28	1083.07	451.93	1.30	1203.21	1.14

p0_score:	20.41
p1_score:	20.47
p2_score:	20.27

Infrastructure_Operations_Scores:	vMotion	SVMotion	XVMotion	Deploy
Completed_Ops_PerHour	70.50	63.00	48.00	22.50
Avg_Seconds_To_Complete	29.36	135.94	189.51	431.38
Failures	0.00	0.00	0.00	0.00
Ratio	2.71	3.50	2.67	2.81
Number_Of_Threads	3	3	3	3

Summary	Run_Is_Compliant	Turbo_Setting:0
	Number_Of_Compliance_Issues(0)*	Median_Phase(p0)
Unreviewed_VMmark3_Applications_Score	20.41	
Unreviewed_VMmark3_Infrastructure_Score	2.90	
Unreviewed_VMmark3_Score	16.91	

Configuration

Virtualization Software	
Hypervisor Vendor, Product, Version, and Build / Availability Date (MM-DD-YYYY)	VMware ESXi 6.7 EP 06 Build 11675023 / 01-17-2019
Datacenter Management Software Vendor, Product, Version, and Build / Availability Date (MM-DD-YYYY)	VMware vCenter 6.7 U1 Build 10244857 / 10-16-2018
Supplemental Software	None
Servers	
Number of Servers in System Under Test (all subsequent fields in this section are per server)	6
Server Manufacturer and Model	HPE Synergy 480 Gen10
Processor Vendor and Model	Intel Xeon Gold 6252
Processor Speed (GHz) / Turbo Boost Speed (GHz)	2.1 / 3.7
Total Sockets/Total Cores/Total Threads	2 Sockets / 48 Cores / 96 Threads
Primary CPU Cache	32 KB I + 32 KB D on chip per core
Secondary CPU Cache	1 MB I+D on chip per core
Other CPU Cache	35.75 MB I+D on chip per chip
BIOS Version	I42 v2.04 (04/18/2019)
Memory Size (in GB, Number of DIMMs)	768, 24
Memory Type and Speed	32 GB 2Rx4 PC4-2933 MHz RDIMM
Disk Subsystem Type	FC SAN
Number of Disk Controllers	1
Disk Controller Vendors and Models	HPE Smart Array P204i-c SR Gen10
Total Number of Physical Disks for Hypervisor	2
Disk Vendors, Models, Capacities, and Speeds	HPE 600GB 12G SAS 15K SFF SC HDD (HPE P/N 868527-B21)
Number of Host Bus Adapters	1

Host Bus Adapter Vendors and Models	HPE Synergy 3830C 16Gb FC HBA (dual port)
Number of Network Controllers	2
Network Controller Vendors and Models	HPE Synergy 3820C 10/20Gb CNA (dual port)
Other Hardware	Details in Other Notes
Other Software	HPE OneView version 4.20.01.01
Hardware Availability Date (MM-DD-YYYY)	04-02-2019
BIOS Availability Date (MM-DD-YYYY)	05-14-2019
Software Availability Date (MM-DD-YYYY)	05-14-2019
Network	
Network Switch Vendors and Models	4 x HPE Virtual Connect SE 40Gb F8 Module for HPE Synergy
Network Speed	1 Gb/s for management 1 Gb/s for vMotion 3 x 20 Gb/s and 1 x 18 Gb/s for VMs
Primary Storage	
Storage Category	FC SAN Storage
Storage Vendors, Models, and Firmware Versions	HPE 3PAR StoreServ 9450, 3PAR OS 3.3.1.476 (MU4)
Storage Configuration Summary	FC SAN switches: • 2 x Brocade 16 Gb FC SAN Switch Module for HPE Synergy • 2 x HPE SN6000B 48 port FC SAN Switch HPE 3PAR StoreServ 9450 • 4 controller nodes (128 GB cache per controller node) • 7 disk enclosures • 22 x HPE 3PAR 9000 1.92TB SAS SFF (2.5in) SSD (HPE P/N Q1J36A) • 43 LUNs (RAID5)

Datacenter Management Server	
System Model	HPE Synergy 480 Gen9
Processor Vendor and Model	Intel Xeon E5-2699 v4
Processor Speed (GHz)	2.2 GHz
Total Sockets/Total Cores/Total Threads	2 Sockets / 44 Cores / 88 Threads

Memory Size (in GB, Number of DIMMs)	512 GB
Network Controller(s) Vendors and Models	2 x HPE Synergy 3820C 10/20Gb CNA (dual port)
Operating System, Version, Bitness, and Service Pack	VMware ESXi 6.7 EP 06 Build 11675023
Virtual Center VM Number of vCPUs	16
Virtual Center VM Virtual Memory (in GB)	32
Virtual Center VM Operating System, Version, Bitness, and Service Pack	VMware vCenter Appliance 6.7 U1 Build 10244857
Other Hardware	Details in Client Notes and Other Notes
Other Software	None

Clients	
Total Number of Virtual Clients / Virtual Client Hosts	19 / 5
System Model(s)	HPE Synergy 480 Gen9
Processor Vendor(s) and Model(s)	Intel Xeon E5-2699 v4
Processor Speed(s) (GHz)	2.2 GHz
Total Sockets/Total Cores/Total Threads	2 Sockets / 44 Cores / 88 Threads
Memory per Virtual Client Host	512 GB
Network Controller(s) Vendors and Models	2 x HPE Synergy 3820C 10/20Gb CNA (dual port)
Virtual Client Networking Notes	Details in Other Notes
Virtual Client Storage Notes	Details in Client Notes
Other Hardware	1 x HPE Synergy 3830C 16Gb FC HBA (dual port)
Other Software	VMware ESXi 6.7 EP 06 Build 11675023

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	Yes	Yes
Spectre	2017-5715	Variant 2	Branch Target Injection	Yes	Yes	Yes

Meltdown	2017-5754	Variant 3	Rogue Data Cache Load	N/A	Yes	Yes
Spectre-NG	2018-3640	Variant 3a	Rogue System Register Read	Yes	N/A	N/A
Spectre-NG	2018-3639	Variant 4	Speculative Store Bypass	N/A	Yes	Yes
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	Yes
Foreshadow-NG	2018-3646	Variant 5	L1 Terminal Fault - VMM	N/A	Yes	N/A

Notes for Workload

Template deployed with disk type: Thick Provision Eager Zeroed

Virtualization Software Notes

- vSphere DRS Migration Threshold level set to 2
- Logging was disabled for all SUT VMs (Default is Enabled)
- CDROM & Floppy removed for all SUT VMs (Default is Enabled)
- CPU and Memory shares set to high for all DS3DB VMs (Default is Normal)
- Disk shares set to high for all DS3 VMs (Default is Normal)
- All Memory Reserved for DS3DB VMs (Default is Not reserved)
- CPU shares set to Low for all Standby VMs (Default is Normal)
- Third virtual disk removed from DS3DB0 before cloning DS3DB VMs for other tiles.

Advanced settings:

- Config.HostAgent.log.level = warning (default info)
- Cpu.CreditAgePeriod = 1000 (default 3000)
- Cpu.HTWholeCoreThreshold = 0 (default 800)
- DataMover.HardwareAcceleratedInit = 0 (default 1)
- DataMover.HardwareAcceleratedMove = 0 (default 1)
- Disk.IdleCredit = 64 (default 32)
- Disk.ReqCallThreshold = 1 (default 8)
- Mem.CtlMaxPercent = 0 (default 65)
- Mem.ShareScanGHz = 0 (default 4)
- Misc.TimerMaxHardPeriod = 4000 (default 500000)
- Net.MaxPortRxQueueLen = 160 (default 80)
- Numa.LTermFairnessInterval = 0 (default 5)
- Numa.MigImbalanceThreshold = 57 (default 10)
- Numa.PageMigEnable = 0 (default 1)
- Numa.PreferHT = 1 (default 0)
- Numa.RebalancePeriod = 60000 (default 2000)
- Numa.SwapLoadEnable = 0 (default 1)
- Numa.SwapLocalityEnable = 0 (default 1)
- Power.CpuPolicy = High Performance (default Balanced)
- Syslog.global.defaultSize = 112 (default 1024)
- VMFS3.HardwareAcceleratedLocking = 0 (default 1)
- VMkernel.Boot.hyperthreadingMitigation = true (default false)

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 Maximum Cooling (default : Optimal Cooling)
- Sub Numa Clustering set to Disabled (default : Enabled)
- XPT Prefetcher set to Disabled (default : Auto)

Networking Notes

VMware ESXi 6.7 EP 06											HPE OneView Server Profile			
Virtual Switch Name	Virtual Switch Type	Virtual Switch MTU	Load Balancing	vmnic	vmnic MTU	Uplink Type	vmknic	Port Groups	Purpose	Speed	Physical Port	Requested Bandwidth	Allocated Bandwidth	Max Bandwidth
vSwitch0	standard vSwitch	1500	Default	vmnic0	1500	Active	vmk0	Management Network VM Network (unused*)	Managment (unused)	1 Gb/s	Mezzanine 2 Port 1-a	1 Gb/s	1 Gb/s	1 Gb/s
vSwitch1	standard vSwitch	1500	Default	vmnic2	1500	Active	vmk1	VMkernel	vMotion	1 Gb/s	Mezzanine 2 Port 1-b	1 Gb/s	1 Gb/s	1 Gb/s
vSwitch2	standard vSwitch	1500	Default	vmnic1	1500	Active	N/A	LAN 1	virtual machines	20 Gb/s	Mezzanine 2 Port 2-a	20 Gb/s	20 Gb/s	20 Gb/s
				vmnic3	1500	Active	N/A			20 Gb/s	Mezzanine 2 Port 1-c	18 Gb/s	18 Gb/s	20 Gb/s
				vmnic4	1500	Active	N/A			20 Gb/s	Mezzanine 3 Port 1-a	20 Gb/s	20 Gb/s	20 Gb/s
				vmnic5	1500	Active	N/A			20 Gb/s	Mezzanine 3 Port 2-a	20 Gb/s	20 Gb/s	20 Gb/s
vSwitch3	standard vSwitch	1500	Default	N/A	N/A	N/A	N/A	LAN 2	(unused)	N/A	N/A			
vSwitch4	standard vSwitch	1500	Default	N/A	N/A	N/A	N/A	LAN 3	(unused)	N/A				
vSwitch5	standard vSwitch	1500	Default	N/A	N/A	N/A	N/A	LAN 4	(unused)	N/A				

Each HPE Synergy 3820C 10/20Gb CNA has 2 physical ports capable of 20 Gb/s. When combined with HPE Synergy Virtual Connect modules, each physical port of the HPE Synergy 3820c NIC can be configured to have up to 4 virtual ports with configurable bandwidth speeds. The total bandwidth speeds of all virtual ports of a physical port cannot exceed 20 Gb/s. Each virtual port can be configured for use as ethernet or fiber channel connections. Virtual port configuration is achieved by configuring server profiles in the HPE OneView management software.

VMware ESXi 6.7 is identifying the max bandwidth from the HPE OneView Server Profile as the detected port speed for each vmnic.

Storage Notes

OS storage (SUT hosts):

- VMware ESXi 6.7 was installed on 2 x HPE 600GB 12G SAS 15K SFF SC HDD configured in a RAID1 volume for each host.

HPE 3PAR Storage

- HPE 3PAR StoreServ 9450
- Physical Configuration:
  - HPE 3PAR OS 3.3.1.476 (MU4)
  - 4 x HPE 3PAR StoreServ 9450 Controller Nodes
    - 128 GB cache
    - 2 x HPE 3PAR 9000 4-port 16Gb Fiber Channel Host Bus Adapter
  - 7 x HPE 3PAR StoreServ 9000 24-disk 2U SFF SAS Drive Enclosure
    - 4 enclosures had 4 SSDs
    - 3 enclosures had 2 SSDs
  - 22 x HPE 3PAR 9000 1.92TB SAS SFF (2.5in) SSD
- Virtual Configuration:
  - All LUNs were configured from one Common Provisioning Group that was configured as:
    - Uses all SSDs
    - RAID 5
    - Set size configured for 7 data, 1 parity
    - Availability configured for Magazine
  - All LUNs were configured with the following settings:
    - Provisioning set to Thin
    - Deduplication enabled
    - Compression enabled
  - Total LUNs: 43
    - 3 LUNs (100 GB) for deploy targets
    - 3 LUNs (100 GB) for svMotion targets
    - 3 LUNs (100 GB) for xvMotion targets
    - 1 LUN (100 GB) for template VMs
    - 1 LUN (1050 GB) for Auction* VMs for tiles 0 & 11
    - 1 LUN (600 GB) for Elastic* VMs for tiles 0 & 11
    - 1 LUN (1400 GB) for DS3* VMs for tiles 0 & 11
    - 1 LUN (1050 GB) for Auction* VMs for tiles 1 & 10
    - 1 LUN (600 GB) for Elastic* VMs for tiles 1 & 10
    - 1 LUN (1200 GB) for DS3* VMs for tiles 1 & 10
    - 1 LUN (1050 GB) for Auction* VMs for tiles 2 & 13
    - 1 LUN (600 GB) for Elastic* VMs for tiles 2 & 13
    - 1 LUN (1200 GB) for DS3* VMs for tiles 2 & 13
    - 1 LUN (1050 GB) for Auction* VMs for tiles 3 & 12
    - 1 LUN (600 GB) for Elastic* VMs for tiles 3 & 12
    - 1 LUN (1200 GB) for DS3* VMs for tiles 3 & 12
    - 1 LUN (1050 GB) for Auction* VMs for tiles 4 & 15
    - 1 LUN (600 GB) for Elastic* VMs for tiles 4 & 15
    - 1 LUN (1200 GB) for DS3* VMs for tiles 4 & 15
    - 1 LUN (1050 GB) for Auction* VMs for tiles 5 & 14
    - 1 LUN (600 GB) for Elastic* VMs for tiles 5 & 14
    - 1 LUN (1200 GB) for DS3* VMs for tiles 5 & 14
    - 1 LUN (1050 GB) for Auction* VMs for tiles 6 & 17
    - 1 LUN (600 GB) for Elastic* VMs for tiles 6 & 17
    - 1 LUN (1200 GB) for DS3* VMs for tiles 6 & 17

- 1 LUN (1050 GB) for Auction* VMs for tiles 7 & 16
- 1 LUN (600 GB) for Elastic* VMs for tiles 7 & 16
- 1 LUN (1200 GB) for DS3* VMs for tiles 7 & 16
- 1 LUN (700 GB) for Auction* VMs for tile 8
- 1 LUN (400 GB) for Elastic* VMs for tile 8
- 1 LUN (800 GB) for DS3* VMs for tile 8
- 1 LUN (700 GB) for Auction* VMs for tile 9
- 1 LUN (400 GB) for Elastic* VMs for tile 9
- 1 LUN (800 GB) for DS3* VMs for tile 9
- 1 LUN (300 GB) for Standby VMs for tiles 0, 3, 6, 9, 12, 15
- 1 LUN (270 GB) for Standby VMs for tiles 1, 4, 7, 10, 13, 16
- 1 LUN (270 GB) for Standby VMs for tiles 2, 5, 8, 11, 14, 17

All SUT hosts were configure with a claim rule for 3PAR LUNs. The claim rule had the following settings:

- Path Policy: Round Robin (default Most Recently Used)
- IOPS limit: 1 (default 1000)

Datacenter Management Server Notes

VMware vCenter Appliance 6.7.0 Build 10244857 was hosted on a HPE Synergy480 Gen9 system that was not part of the client or SUT clusters.

Operating System Notes

All hosts (Clients, SUTs, vCenter) originally had VMware ESXi 6.7 build 10302608 installed using the HPE custom image download named 'VMware-ESXi-6.7.0-Update1-10302608-HPE-Gen9plus-670.U1.10.3.5.12-Oct2018.iso' .
Later all hosts were upgraded to VMware ESXi 6.7.0 Build 11675023 using the HPE custom image download named 'VMware-ESXi-6.7.0-Update1-11675023-HPE-Gen9plus-670.U1.10.4.0.19-Apr2019.iso'.

Software Notes

None

Client Notes

VMware ESXi 6.7 EP 06 was installed on a RAID 1 volume created from 2 x 400GB 12G SAS SFF SC HDD.

Advanced ESXi Settings:

- Power.CpuPolicy = High Performance (default Balanced)
- VMkernel.Boot.hyperthreadingMitigation = true (default false)

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

- Client Host 1 : Client0, Client5, Client10, Client15
- Client Host 2 : Client1, Client6, Client11, Client16
- Client Host 3 : Client2, Client7, Client12, Client17
- Client Host 4 : Client3, Client8, Client13
- Client Host 5 : Client4, Client9, Client14, PrimeClient

The PrimeClient virtual machine was modified as follows:

- 2 Virtual NICs

    - 1 Virtual NIC connected to 'VM Network' port group for access from management network
    - 1 Virtual NIC connected to 'LAN 1' port group for communication with VMmark 3.1 VMs
- Second Virtual Disk
    - Size : 1 TB

Client hosts' networking configuration:

VMware ESXi 6.7 EP 06									HPE OneView Server Profile			
Virtual Switch Name	Virtual Switch Type	Virtual Switch MTU	vmnic	vmnic MTU	vmknic	Port Groups	Purpose	Speed	Physical Port	Requested Bandwidth	Allocated Bandwidth	Max Bandwidth
vSwitch0	standard vSwitch	1500	vmnic0	1500	vmk0	Management Network VM Network	management PrimeClient	1 Gb/s	Mezzanine 2 Port 1-a	1 Gb/s	1 Gb/s	1 Gb/s
vSwitch1	standard vSwitch	1500	vmnic2	1500	vmk1	VMkernel	vMotion	1 Gb/s	Mezzanine 2 Port 1-b	1 Gb/s	1 Gb/s	1 Gb/s
vSwitch2	standard vSwitch	1500	vmnic1	1500	N/A	LAN 1	virtual machines	20 Gb/s	Mezzanine 2 Port 2-a	20 Gb/s	20 Gb/s	20 Gb/s
vSwitch3	standard vSwitch	1500	vmnic4	1500	N/A	LAN 2	virtual machines	20 Gb/s	Mezzanine 3 Port 1-a	20 Gb/s	20 Gb/s	20 Gb/s
vSwitch4	standard vSwitch	1500	vmnic5	1500	N/A	LAN 3	virtual machines	20 Gb/s	Mezzanine 3 Port 2-a	20 Gb/s	20 Gb/s	20 Gb/s
vSwitch5	standard vSwitch	1500	vmnic3	1500	N/A	LAN 4	virtual machines	20 Gb/s	Mezzanine 2 Port 1-c	18 Gb/s	18 Gb/s	20 Gb/s

Client hosts' storage configuration:

- Storage Box
    - Hardware Configuration
        - HPE Proliant DL380p Gen8
        - 2 x Intel Xeon E5-2690 2.9 GHz Processors
        - 256 GB (16 x 16 Gb RDIMM) Memory
        - 2 x HPESN1000Q 16GB 2P FC HBAs
        - 1 x HPE Smart Array P420i controller for ION OS
        - HPE Ethernet 1GB 4-port 331 FLR Adapter
        - 2 x 146 GB HDD for ION OS
        - 3 x HPE 2.4TB HH/HL Light Endurance (LE) PCIe Workload Accelerator flash cards
        - SanDisk ION Accelerator version 2.5.5
    - Software Configuration
        - A single Storage pool was created using 3 x HPE2.4TB HH/HL Light Endurance (LE) PCIe Workload Accelerator flash cards.
        - All LUNs are RAID0.
        - All LUNs were configured as block devices and no system memory was used for cache.
        - All LUNs were accessible from all client hosts and the vCenter host.
    - LUN details :
        - LUN1 (3000 GB): vCenter Server Appliance
        - LUN2 (1200 GB): PrimeClient
        - LUN3 (150 GB): Client0, Client15, Client16
        - LUN4 (150 GB): Client1, Client14, Client17
        - LUN5 (150 GB): Client2, Client13
        - LUN6 (150 GB): Client3, Client12
        - LUN7 (200 GB): Client4, Client11
        - LUN8 (200 GB): Client5, Client10
        - LUN9 (200 GB): Client6, Client9
        - LUN10 (200 GB): Client7, Client8
        - LUN11 (500 GB): Unused

Other Notes

VMmark3.properties changes:

- TileDelay was set to 15 (default 60).

This result used a single HPE Synergy 12000 frame:

- 1 x HPE Synergy Composer Module
- Interconnect Modules
  - 2 x Brocade 16 Gb FC SAN Switch Module for HPE Synergy
  - 4 x HPE Virtual Connect SE 40Gb F8 Module for HPE Synergy
- Compute and Storage Modules
  - 6 x HPE Synergy 480 Gen10 Compute Module
  - 6 x HPE Synergy 480 Gen9 Compute Module
- All HPE Synergy 480 Gen10 Compute Modules were configured as follows:
  - 2 x Intel Xeon Gold 6252
  - 24 x 32 GB 2Rx4 PC4-2933 MHz RDIMM
  - 2 x HPE 600GB 12G SAS 15K SFF SC HDD (for OS)
  - 1 x HPE Smart Array P204i-c SR Gen10
  - 1 x HPE Synergy 3830C 16Gb FC HBA
  - 2 x HPE Synergy 3820C 10/20Gb CNA
- All HPE Synergy 480 Gen9 Compute Modules were configured as follows:
  - 2 x Intel Xeon E5-2699 v4
  - 16 x 32 GB 2Rx4 PC4-2400 MHz RDIMM
  - 2 x HPE 400GB 12G SAS SFF SC HDD (for OS)
  - 1 x HPE Smart Array P240nr
  - 1 x HPE Synergy 3830C 16Gb FC HBA
  - 2 x HPE Synergy 3820C 10/20Gb CNA
