

## VMmark® 3.1.1 Results

**Server Vendor & Model:** HPE ProLiant DL380 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 U2, Build 17694817

**VMmark 3.1.1 Score =**  
**24.26 @ 26 Tiles**

Number of Hosts: 4	Uniform Hosts [yes/no]: yes	Total sockets/cores/threads in test: 8/320/640
Tested By: Hewlett Packard Enterprise		Test Date: 05-16-2021
Performance Section <a href="#">Performance</a>	Configuration Section <a href="#">Configuration</a>	Notes Section <a href="#">Notes for Workload</a>

### 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	3577.57	0.99	0.88   0.01	565.93	0.99	1.25   0.81	820.25	1.12	1077.44	582.48	1.16	1193.67	432.73	1.25	1283.30	1.10
p1	3564.85	0.99	0.91   0.01	561.54	0.98	0.95   0.67	832.83	1.13	1047.10	590.40	1.18	1167.41	413.85	1.19	1275.96	1.09
p2	3548.44	0.99	0.86   0.01	562.58	0.98	0.76   0.36	832.23	1.13	1046.55	607.92	1.21	1171.01	451.20	1.30	1272.93	1.12
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	3581.62	1.00	0.60   0.00	571.37	1.00	1.07   0.78	941.70	1.28	764.38	674.05	1.35	867.57	494.05	1.42	950.20	1.20
p1	3567.66	0.99	0.62   0.00	567.92	0.99	0.75   0.68	949.58	1.29	753.37	680.73	1.36	842.32	481.90	1.39	926.56	1.19
p2	3554.61	0.99	0.69   0.00	563.50	0.98	0.69   0.34	927.10	1.26	802.41	690.00	1.38	885.22	513.38	1.48	969.42	1.20
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	3578.81	0.99	0.56   0.03	564.59	0.99	0.56   0.24	892.70	1.22	878.46	632.48	1.26	999.07	470.50	1.36	1060.01	1.15
p1	3570.90	0.99	0.53   0.00	562.81	0.98	0.57   0.38	893.00	1.22	877.37	633.98	1.27	990.01	450.27	1.30	1064.69	1.14
p2	3553.78	0.99	0.57   0.04	561.42	0.98	0.48   0.22	870.25	1.19	917.37	641.42	1.28	1045.30	470.65	1.36	1064.97	1.15
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	3567.75	0.99	0.62   0.00	569.08	0.99	0.78   0.60	870.60	1.19	937.60	611.02	1.22	1058.71	459.90	1.33	1122.48	1.14
p1	3553.96	0.99	0.70   0.01	566.53	0.99	0.47   0.26	865.67	1.18	945.17	615.52	1.23	1061.60	433.93	1.25	1143.99	1.12
p2	3548.10	0.99	0.71   0.01	563.99	0.99	0.63   0.35	863.42	1.18	945.77	617.35	1.23	1043.05	458.45	1.32	1124.65	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	3575.01	0.99	0.90   0.01	564.06	0.99	0.61   0.45	867.40	1.18	966.97	586.70	1.17	1113.56	424.77	1.22	1204.92	1.11
p1	3561.75	0.99	0.82   0.01	557.20	0.97	0.59   0.26	870.70	1.19	957.33	629.58	1.26	1104.94	445.62	1.28	1219.39	1.13
p2	3551.12	0.99	0.92   0.04	556.10	0.97	0.72   0.52	865.08	1.18	972.30	611.58	1.22	1089.73	449.57	1.30	1195.26	1.12
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	3580.59	1.00	0.55   0.00	567.88	0.99	0.69   0.55	888.38	1.21	886.96	632.38	1.26	994.64	448.75	1.29	1054.85	1.14

<b>p1</b>	3563.00	0.99	0.58   0.04	565.59	0.99	0.69   0.35	892.42	1.22	860.04	667.30	1.33	945.91	477.57	1.38	1025.61	1.17
<b>p2</b>	3554.47	0.99	0.55   0.01	561.82	0.98	0.75   0.41	885.60	1.21	882.15	635.83	1.27	985.75	472.48	1.36	1047.47	1.15
<b>TILE_6</b>	Actual	Ratio	QoS(nRT MaxPctF)	Actual	Ratio	QoS(nRT MaxPctF)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	GM
<b>p0</b>	3569.76	0.99	0.61   0.00	567.68	0.99	0.96   0.66	928.40	1.26	812.72	651.12	1.30	942.58	454.57	1.31	1044.11	1.16
<b>p1</b>	3549.92	0.99	0.60   0.00	567.06	0.99	0.54   0.30	921.92	1.26	829.47	677.42	1.35	940.36	480.00	1.38	1036.49	1.18
<b>p2</b>	3540.54	0.98	0.58   0.00	561.64	0.98	0.71   0.42	924.58	1.26	820.81	650.42	1.30	942.42	479.20	1.38	1032.59	1.17
<b>TILE_7</b>	Actual	Ratio	QoS(nRT MaxPctF)	Actual	Ratio	QoS(nRT MaxPctF)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	GM
<b>p0</b>	3575.38	0.99	0.59   0.00	570.97	1.00	1.24   0.87	889.17	1.21	897.84	630.95	1.26	1013.13	442.27	1.28	1118.39	1.14
<b>p1</b>	3558.70	0.99	0.58   0.00	567.85	0.99	0.63   0.49	892.17	1.21	889.77	654.83	1.31	995.34	464.43	1.34	1105.45	1.16
<b>p2</b>	3548.53	0.99	0.63   0.00	562.24	0.98	0.57   0.21	900.50	1.23	866.31	638.35	1.28	986.88	468.32	1.35	1073.06	1.15
<b>TILE_8</b>	Actual	Ratio	QoS(nRT MaxPctF)	Actual	Ratio	QoS(nRT MaxPctF)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	GM
<b>p0</b>	3581.81	1.00	0.67   0.00	565.89	0.99	0.63   0.36	833.25	1.13	1056.60	581.52	1.16	1211.56	405.60	1.17	1334.13	1.09
<b>p1</b>	3567.21	0.99	0.66   0.00	565.96	0.99	0.78   0.48	835.98	1.14	1048.24	608.50	1.22	1192.66	429.90	1.24	1300.95	1.11
<b>p2</b>	3556.21	0.99	0.62   0.00	564.85	0.99	0.58   0.23	843.35	1.15	1012.93	590.65	1.18	1158.74	413.60	1.19	1271.92	1.10
<b>TILE_9</b>	Actual	Ratio	QoS(nRT MaxPctF)	Actual	Ratio	QoS(nRT MaxPctF)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	GM
<b>p0</b>	3581.20	1.00	0.69   0.01	568.30	0.99	0.66   0.51	928.88	1.26	787.81	668.58	1.34	885.91	462.68	1.33	1001.66	1.17
<b>p1</b>	3571.86	0.99	0.67   0.01	563.48	0.98	0.47   0.23	919.12	1.25	820.17	681.52	1.36	907.24	483.90	1.40	999.07	1.18
<b>p2</b>	3562.37	0.99	0.71   0.00	561.20	0.98	0.61   0.34	912.55	1.24	838.89	646.02	1.29	956.57	453.35	1.31	1049.12	1.15
<b>TILE_10</b>	Actual	Ratio	QoS(nRT MaxPctF)	Actual	Ratio	QoS(nRT MaxPctF)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	GM
<b>p0</b>	3588.33	1.00	0.51   0.00	570.50	1.00	0.98   0.78	914.17	1.24	841.30	628.65	1.26	956.68	451.18	1.30	1083.11	1.15
<b>p1</b>	3577.01	0.99	0.53   0.00	570.91	1.00	0.80   0.73	908.50	1.24	852.88	691.75	1.38	956.95	490.52	1.41	1083.65	1.19
<b>p2</b>	3566.60	0.99	0.52   0.00	569.51	1.00	0.98   0.79	921.85	1.26	820.05	631.65	1.26	940.83	453.05	1.31	1063.57	1.15
<b>TILE_11</b>	Actual	Ratio	QoS(nRT MaxPctF)	Actual	Ratio	QoS(nRT MaxPctF)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	GM
<b>p0</b>	3577.21	0.99	0.60   0.01	569.39	1.00	0.81   0.56	839.30	1.14	1015.20	578.70	1.16	1132.99	418.23	1.21	1242.49	1.10
<b>p1</b>	3567.58	0.99	0.59   0.00	566.52	0.99	0.66   0.36	846.48	1.15	1001.78	620.60	1.24	1135.89	460.52	1.33	1212.31	1.13
<b>p2</b>	3551.75	0.99	0.56   0.00	564.04	0.99	0.59   0.36	865.23	1.18	947.65	611.08	1.22	1071.45	428.82	1.24	1170.51	1.12
<b>TILE_12</b>	Actual	Ratio	QoS(nRT MaxPctF)	Actual	Ratio	QoS(nRT MaxPctF)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	GM
<b>p0</b>	3579.72	0.99	0.71   0.00	570.45	1.00	0.99   0.62	865.48	1.18	967.16	614.58	1.23	1090.32	421.88	1.22	1234.23	1.12
<b>p1</b>	3556.03	0.99	0.74   0.01	566.93	0.99	0.66   0.41	860.70	1.17	987.48	630.00	1.26	1112.47	459.27	1.32	1229.48	1.14
<b>p2</b>	3541.76	0.98	0.75   0.01	563.71	0.99	0.53   0.27	871.08	1.19	957.23	614.73	1.23	1093.02	425.98	1.23	1223.51	1.12
<b>TILE_13</b>	Actual	Ratio	QoS(nRT MaxPctF)	Actual	Ratio	QoS(nRT MaxPctF)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	GM
<b>p0</b>	3571.64	0.99	0.67   0.00	566.93	0.99	0.79   0.57	892.17	1.21	869.25	640.83	1.28	961.72	452.65	1.31	1049.52	1.15
<b>p1</b>	3561.47	0.99	0.51   0.00	561.79	0.98	0.71   0.48	890.52	1.21	878.76	664.48	1.33	962.12	495.77	1.43	1043.69	1.17
<b>p2</b>	3550.50	0.99	0.54   0.00	557.90	0.98	0.65   0.37	892.88	1.22	867.59	637.73	1.27	980.31	445.73	1.29	1079.74	1.14
<b>TILE_14</b>	Actual	Ratio	QoS(nRT MaxPctF)	Actual	Ratio	QoS(nRT MaxPctF)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	GM
<b>p0</b>	3572.82	0.99	0.52   0.00	573.44	1.00	1.05   0.85	864.62	1.18	951.81	619.15	1.24	1054.68	430.23	1.24	1167.32	1.12

<b>p1</b>	3555.21	0.99	0.54   0.00	569.15	0.99	0.88   0.54	871.48	1.19	941.62	641.15	1.28	1055.68	473.50	1.37	1159.03	1.15
<b>p2</b>	3533.92	0.98	0.54   0.00	565.86	0.99	0.61   0.28	878.25	1.20	914.89	624.38	1.25	1036.22	431.30	1.24	1157.83	1.13
<b>TILE_15</b>	Actual	Ratio	QoS(nRT MaxPctF)	Actual	Ratio	QoS(nRT MaxPctF)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	GM
<b>p0</b>	3583.80	1.00	0.70   0.01	567.08	0.99	1.21   0.80	908.58	1.24	852.84	646.02	1.29	964.27	449.73	1.30	1075.41	1.15
<b>p1</b>	3581.18	1.00	0.66   0.00	561.57	0.98	0.66   0.35	900.55	1.23	868.97	665.70	1.33	971.67	468.62	1.35	1094.55	1.17
<b>p2</b>	3568.47	0.99	0.67   0.00	555.92	0.97	0.62   0.37	911.33	1.24	839.08	622.88	1.24	968.55	448.40	1.29	1086.63	1.14
<b>TILE_16</b>	Actual	Ratio	QoS(nRT MaxPctF)	Actual	Ratio	QoS(nRT MaxPctF)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	GM
<b>p0</b>	3579.91	0.99	0.82   0.00	571.90	1.00	1.29   0.86	860.88	1.17	984.50	611.33	1.22	1096.28	424.30	1.22	1206.05	1.12
<b>p1</b>	3560.58	0.99	0.84   0.01	567.10	0.99	1.00   0.63	871.75	1.19	957.23	629.38	1.26	1101.54	446.82	1.29	1198.89	1.14
<b>p2</b>	3548.67	0.99	0.81   0.00	565.38	0.99	0.68   0.46	870.05	1.18	950.94	593.85	1.19	1083.08	428.23	1.23	1200.42	1.11
<b>TILE_17</b>	Actual	Ratio	QoS(nRT MaxPctF)	Actual	Ratio	QoS(nRT MaxPctF)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	GM
<b>p0</b>	3572.82	0.99	0.66   0.00	570.03	1.00	0.83   0.70	913.73	1.24	839.39	655.73	1.31	925.81	456.18	1.32	1042.95	1.16
<b>p1</b>	3560.61	0.99	0.59   0.00	565.03	0.99	0.44   0.18	925.02	1.26	813.17	680.25	1.36	924.61	480.57	1.39	1029.62	1.18
<b>p2</b>	3548.05	0.99	0.60   0.00	559.67	0.98	0.57   0.25	908.50	1.24	855.53	619.17	1.24	984.60	449.85	1.30	1076.15	1.14
<b>TILE_18</b>	Actual	Ratio	QoS(nRT MaxPctF)	Actual	Ratio	QoS(nRT MaxPctF)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	GM
<b>p0</b>	3585.56	1.00	0.61   0.00	562.87	0.98	0.66   0.37	894.77	1.22	887.20	658.33	1.32	996.52	466.98	1.35	1087.56	1.16
<b>p1</b>	3565.58	0.99	0.70   0.00	562.66	0.98	0.50   0.28	901.65	1.23	866.04	635.65	1.27	1002.24	467.98	1.35	1087.64	1.15
<b>p2</b>	3560.82	0.99	0.71   0.01	560.57	0.98	0.67   0.35	905.85	1.23	857.18	642.33	1.28	966.83	452.10	1.30	1054.13	1.15
<b>TILE_19</b>	Actual	Ratio	QoS(nRT MaxPctF)	Actual	Ratio	QoS(nRT MaxPctF)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	GM
<b>p0</b>	3573.95	0.99	0.63   0.11	565.86	0.99	0.49   0.32	915.70	1.25	838.24	675.52	1.35	940.63	479.43	1.38	1040.00	1.18
<b>p1</b>	3563.65	0.99	0.66   0.00	565.82	0.99	0.75   0.41	911.17	1.24	841.50	648.65	1.30	953.41	474.68	1.37	1051.28	1.17
<b>p2</b>	3543.90	0.98	0.55   0.00	562.62	0.98	0.52   0.28	918.83	1.25	824.95	653.50	1.31	934.75	456.75	1.32	1032.52	1.16
<b>TILE_20</b>	Actual	Ratio	QoS(nRT MaxPctF)	Actual	Ratio	QoS(nRT MaxPctF)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	GM
<b>p0</b>	3572.04	0.99	0.78   0.00	571.54	1.00	1.32   0.91	844.58	1.15	1025.35	616.10	1.23	1151.99	435.60	1.26	1275.43	1.12
<b>p1</b>	3563.82	0.99	0.82   0.01	569.87	1.00	1.31   0.86	847.83	1.15	1018.43	597.98	1.19	1158.87	438.30	1.26	1269.42	1.11
<b>p2</b>	3557.96	0.99	0.78   0.01	566.21	0.99	0.60   0.27	865.90	1.18	963.74	610.05	1.22	1101.74	423.25	1.22	1234.33	1.11
<b>TILE_21</b>	Actual	Ratio	QoS(nRT MaxPctF)	Actual	Ratio	QoS(nRT MaxPctF)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	GM
<b>p0</b>	3571.10	0.99	0.75   0.03	562.72	0.98	0.60   0.28	934.05	1.27	784.83	688.15	1.37	883.67	493.57	1.42	969.49	1.19
<b>p1</b>	3566.74	0.99	0.78   0.00	564.63	0.99	0.57   0.31	931.55	1.27	798.14	663.58	1.33	896.94	487.68	1.41	999.83	1.18
<b>p2</b>	3551.68	0.99	0.82   0.00	557.60	0.97	0.70   0.47	925.75	1.26	820.08	654.98	1.31	931.66	454.93	1.31	1038.78	1.16
<b>TILE_22</b>	Actual	Ratio	QoS(nRT MaxPctF)	Actual	Ratio	QoS(nRT MaxPctF)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	GM
<b>p0</b>	3577.38	0.99	0.68   0.00	563.64	0.99	0.54   0.25	914.00	1.24	839.45	680.17	1.36	922.87	484.27	1.40	1012.37	1.18
<b>p1</b>	3570.71	0.99	0.71   0.01	562.44	0.98	0.74   0.34	926.08	1.26	816.18	656.92	1.31	929.23	460.43	1.33	1024.31	1.16
<b>p2</b>	3559.54	0.99	0.63   0.01	558.05	0.98	0.60   0.25	919.77	1.25	824.05	658.40	1.32	913.08	485.18	1.40	1010.63	1.17
<b>TILE_23</b>	Actual	Ratio	QoS(nRT MaxPctF)	Actual	Ratio	QoS(nRT MaxPctF)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	GM
<b>p0</b>	3574.05	0.99	0.72   0.00	565.85	0.99	0.66   0.50	843.12	1.15	1004.03	626.27	1.25	1099.76	464.68	1.34	1195.22	1.14

<b>p1</b>	3565.13	0.99	0.71   0.02	561.59	0.98	0.55   0.28	849.55	1.16	986.02	589.52	1.18	1065.23	430.35	1.24	1159.20	1.10
<b>p2</b>	3550.49	0.99	0.71   0.05	557.16	0.97	0.58   0.28	849.98	1.16	972.73	636.38	1.27	1052.69	451.35	1.30	1172.30	1.13
<b>TILE_24</b>	Actual	Ratio	QoS(nRT MaxPctF)	Actual	Ratio	QoS(nRT MaxPctF)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	GM
<b>p0</b>	3573.81	0.99	0.62   0.01	562.77	0.98	0.64   0.35	866.23	1.18	966.19	635.10	1.27	1086.16	468.98	1.35	1196.22	1.15
<b>p1</b>	3565.88	0.99	0.66   0.00	562.69	0.98	0.66   0.36	883.05	1.20	927.11	619.92	1.24	1060.29	430.35	1.24	1191.41	1.12
<b>p2</b>	3551.06	0.99	0.69   0.00	556.60	0.97	0.77   0.52	881.88	1.20	931.80	643.00	1.28	1054.47	456.88	1.32	1156.78	1.14
<b>TILE_25</b>	Actual	Ratio	QoS(nRT MaxPctF)	Actual	Ratio	QoS(nRT MaxPctF)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	Actual	Ratio	QoS(ms)	GM
<b>p0</b>	3574.73	0.99	0.54   0.01	564.45	0.99	0.44   0.20	944.05	1.29	755.42	702.40	1.40	841.13	524.35	1.51	924.52	1.22
<b>p1</b>	3567.21	0.99	0.57   0.00	563.33	0.98	0.56   0.27	957.65	1.30	726.97	684.73	1.37	825.85	478.35	1.38	930.30	1.19
<b>p2</b>	3552.35	0.99	0.57   0.00	557.21	0.97	0.60   0.33	939.88	1.28	768.88	703.70	1.41	851.18	495.73	1.43	943.20	1.20
<b>p0_score:</b>	29.81															
<b>p1_score:</b>	29.96															
<b>p2_score:</b>	29.71															

<b>Infrastructure_Operations_Scores:</b>	vMotion	SVMotion	XVMotion	Deploy
<b>Completed_Ops_PerHour</b>	53.00	40.00	32.00	19.00
<b>Avg_Seconds_To_Complete</b>	13.52	131.92	167.06	334.06
<b>Failures</b>	0.00	0.00	0.00	0.00
<b>Ratio</b>	2.04	2.22	1.78	2.38
<b>Number_Of_Threads</b>	2	2	2	2

<b>Summary</b>	Run_Is_Compliant	Turbo_Setting:0
	Number_Of_Compliance_Issues(0)*	Median_Phase(p0)
<b>Unreviewed_VMmark3_Applications_Score</b>	29.81	
<b>Unreviewed_VMmark3_Infrastructure_Score</b>	2.09	
<b>Unreviewed_VMmark3_Score</b>	24.26	

## 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 U2, Build 17694817 / 03-09-2021

Supplemental Software	None
<b>Servers</b>	
Number of Servers in System Under Test (all subsequent fields in this section are per server)	4
Server Manufacturer and Model	HPE ProLiant DL380 Gen10 Plus
Processor Vendor and Model	Intel Xeon Platinum 8380
Processor Speed (GHz) / Turbo Boost Speed (GHz)	2.3 / 3.4
Total Sockets/Total Cores/Total Threads	2 Sockets / 80 Cores / 160 Threads
Primary CPU Cache	32 KB I + 48 KB D on chip per core
Secondary CPU Cache	1280 KB I+D on chip per core
Other CPU Cache	60 MB I+D on chip per chip
BIOS Version	U46 v1.40 (04/27/2021)
Memory Size (in GB, Number of DIMMs)	2048, 32
Memory Type and Speed	64 GB 2Rx4 PC4-3200 MHz RDIMM
Disk Subsystem Type	vSAN, FC SAN
Number of Disk Controllers	2
Disk Controller Vendors and Models	HPE Smart Array P408i-p SR Gen10 HPE Smart Array P816i-a SR Gen10
Total Number of Physical Disks for Hypervisor	1
Disk Vendors, Models, Capacities, and Speeds	HPE 32GB microSD RAID 1 USB Boot Drive
Number of Host Bus Adapters	1
Host Bus Adapter Vendors and Models	HPE SN1610Q 32Gb 2p FC HBA
Number of Network Controllers	3
Network Controller Vendors and Models	2 x Marvell QL41232HLCU Ethernet 10/25Gb 2-port SFP28 Adapter for HPE 1 x Intel I350-T4 Ethernet 1Gb 4-port BASE-T OCP3 Adapter for HPE
Other Hardware	None
Other Software	None
Hardware Availability Date (MM-DD-YYYY)	06-24-2021
BIOS Availability Date (MM-DD-YYYY)	06-24-2021

Software Availability Date (MM-DD-YYYY)	05-13-2021
<b>Network</b>	
Network Switch Vendors and Models	HPE FF 5950 48SFP28 8QSFP28 Switch
Network Speed	1 Gb/s for management SUT hosts: 4 x 10 Gb/s for vMotion, vSAN, and VMs Client hosts: 1 x 19 Gb/s and 3 x 20 Gb/s for vMotion and VMs
<b>Primary Storage</b>	
Storage Category	VMware vSAN
Storage Vendors, Models, and Firmware Versions	4 x HPE ProLiant DL380 Gen10 Plus servers in a VMware vSAN 7.0 U2 cluster
Storage Configuration Summary	VMware vSAN <ul style="list-style-type: none"> <li>• 4 x Disk Groups per host</li> <li>• 16 x HPE 800GB SAS 12G Write Intensive SFF SC SS540 SSD for vSAN cache tier</li> <li>• 80 x HPE 1.6TB SAS 12G Mixed Use SFF SC SS540 SSD for vSAN capacity tier</li> </ul>
<b>Datacenter Management Server</b>	
System Model	HPE Synergy 480 Gen10
Processor Vendor and Model	Intel Xeon Gold 6252
Processor Speed (GHz)	2.1
Total Sockets/Total Cores/Total Threads	2 Sockets / 48 Cores / 96 Threads
Memory Size (in GB, Number of DIMMs)	768, 24
Network Controller(s) Vendors and Models	2 x HPE Synergy 3820C 10/20Gb CNA
Operating System, Version, Bitness, and Service Pack	VMware ESXi 7.0 U1, Build 16850804
Virtual Center VM Number of vCPUs	4
Virtual Center VM Virtual Memory (in GB)	19
Virtual Center VM Operating System, Version, Bitness, and Service Pack	VMware vCenter Server 7.0 U2, Build 17694817
Other Hardware	None
Other Software	None
<b>Clients</b>	
Total Number of Virtual Clients / Virtual Client	27 / 5

Hosts	
System Model(s)	HPE Synergy 480 Gen10
Processor Vendor(s) and Model(s)	Intel Xeon Gold 6252
Processor Speed(s) (GHz)	2.1
Total Sockets/Total Cores/Total Threads	10 Sockets / 240 Cores / 480 Threads
Memory per Virtual Client Host	768 GB
Network Controller(s) Vendors and Models	2 x HPE Synergy 3820C 10/20Gb CNA
Virtual Client Networking Notes	1 x vmnic on standard vSwitch for management (1 Gb/s) 4 x vmnic on distributed vSwitch for vMotion and workload (1 x 19 Gb/s, 3 x 20 Gb/s)
Virtual Client Storage Notes	Details in Storage Notes
Other Hardware	Details in Client Notes
Other Software	VMware ESXi 7.0 U1, Build 16850804

#### 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: Thin

### Virtualization Software Notes

- Cluster DRS Automation Level set to Fully Automated
- vSphere DRS Migration Threshold level set to 2
- Logical CPU layout changed for all multi-CPU VMs except for PrimeClient to 1 socket with multiple cores (default single core per socket)
- Logging was disabled for all VMs (default enabled)
- All DS3DB VMs had CPU and memory shares set to High (default Normal)

- All ElasticDB VMs had CPU shares set to High (default Normal)
- All Standby VMs had CPU shares set to Low (default Normal)
- All memory reserved for all DS3DB VMs (default 0)
- sched.mem.pin set to TRUE for all DS3DB VMs (Default FALSE)
- DS3DB0 was configured to not use the third virtual disk before building tiles 1-25.
- sched.mem.lpage.enable1GPage set to TRUE for all DS3DB VMs
- CD and floppy devices were removed from all VMs except for PrimeClient (default installed)

#### Advanced Settings

- 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.MaxNetifTxQueueLen = 1000 (default 2000)
- Net.MaxPortRxQueueLen = 160 (default 80)
- Numa.LTermFairnessInterval = 0 (default 5)
- Numa.MigImbalanceThreshold = 57 (default 10)
- Numa.PageMigEnable = 0 (default 1)
- Numa.RebalancePeriod = 6000 (default 2000)
- Numa.SwapLoadEnable = 0 (default 1)
- Numa.SwapLocalityEnable = 0 (default 1)
- Power.CpuPolicy = High Performance (default Balanced)
- VMFS3.HardwareAcceleratedLocking = 0 (default 1)
- VMkernel.Boot.hyperthreadingMitigation = true (default false)
- UserVars.HostClientCEIPOptIn = 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 Maximum Cooling ( default : Optimal Cooling )
- Sub Numa Clustering set to Disabled ( default : Enabled )
- HW Prefetcher set to Disabled (default: Enabled)
- DCU Stream Prefetcher set to Disabled (default: Enabled)
- DCU IP Prefetcher set to Disabled (default: Enabled)
- LLC Prefetch set to Enabled (default: Disabled)
- LLC Dead Line Allocation set to Disabled (default: Enabled)
- Stale A to S set to Enabled (default: Disabled)
- Enhanced Processor Performance set to Enabled (default: Disabled)



## Networking Notes

### vSwitch Configuration

- standard vSwitch: vSwitch0
  - Uplink: vmnic8 (1 Gb/s)
  - vmk0 for management
- distributed vSwitch: DSwitch-VMmark
  - Uplinks: vmnic0, vmnic1, vmnic2, vmnic3 (10 Gb/s)
  - "VM-network-dswitch" port group for VMs
  - "vmotion" port group for vmk1 and vMotion
  - "VSAN" port group for vmk2 and vSAN
  - MTU set to 9000 for the distributed vSwitch, vmk1, vmk2, and all uplinks
  - Client and SUT hosts configured to use the same distributed vSwitch

## Storage Notes

### OS storage

- VMware ESXi 7.0 U2a was installed on 1 x HPE 32GB microSD RAID 1 USB Boot Drive for each host. On the first LUN on the HPE MSA2050 SAN Storage, a directory was created that had a unique subdirectory for the persistent scratch location for each SUT host by following the instructions found at <https://kb.vmware.com/s/article/1033696>.

### Primary storage: VMware vSAN storage

- VMware vSAN 7.0 U2
  - Capacity: 116.44 TB
  - Cache: 12.8 TB
  - Hardware Configuration
    - Each host had 4 disk groups. Each disk group had:
      - Cache Tier: HPE 800GB SAS 12G Write Intensive SFF SC SS540 SSD
      - Capacity Tier: 5 x HPE 1.6TB SAS 12G Mixed Use SFF SC SS540 SSD
  - 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.
    - The "Automatic rebalance" setting was enabled on the vSAN cluster.

### Secondary storage: fiber channel storage

- HPE MSA2050 SAN Dual Controller SFF Storage
- Physical Configuration:
  - 2 controllers each with 4 x 16 Gb FC ports
  - 24 x HPE MSA 300 GB 12G 15K SFF HDDs
- Software Configuration:
  - Two storage pools were created.
    - Each storage pool had 11 disks in a RAID5 configuration with 1 additional disk for online spare.
    - Each storage pool had a single volume using all available space in the storage pool and was exported as a LUN. Both LUNs exported to all hosts (vCenter, SUT, client).
- LUNs
  - Path policy set to Round Robin (default Most Recently Used) for both LUNs on all hosts (vCenter, SUT, client).
  - 1 LUN (3294 GB)
    - SUT hosts:
      - target LUN for deploy, svMotion, xvMotion

- persistent scratch location
- Client hosts:
  - Client1, Client3, Client5, Client7, Client9, Client11, Client13, Client15, Client17, Client19, Client21, Client23, Client25, PrimeClient
- 1 LUN (3294 GB)
  - SUT hosts:
    - target LUN for deploy, svMotion, xvMotion
    - Path policy set to Round Robin (default Most Recently Used)
  - Client hosts:
    - Client0, Client2, Client4, Client6, Client8, Client10, Client12, Client14, Client16, Client18, Client20, Client22, Client24
  - vCenter host
    - vCenter appliance VM

## **Datacenter Management Server Notes**

VMware vCenter Server Appliance 7.0 U2 Build 17694817 was hosted on a HPE Synergy 480 Gen10 system that was not part of the client or SUT clusters.

## **Operating System Notes**

SUT 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.

Client hosts used VMware ESXi 7.0 U1 (Build 16850804) base install image from VMware for initial OS installation. HPE specific drivers and software were installed and are available from the following locations:

- <http://vibsdepot.hpe.com/hpe/jan2021/esxi-700-devicedrivers/>
- <http://vibsdepot.hpe.com/hpe/jan2021/esxi-700-bundles/>

## **Software Notes**

None

## **Client Notes**

VMware ESXi 7.0 U1 was installed on a RAID1 volume created from 2 x 600 GB 12G SAS SFF SC HDD.

Client cluster configuration:

- Cluster DRS Automation Level set to Fully Automated
- vSphere DRS Migration Threshold level set to 2

Advanced ESXi Settings:

- Power.CpuPolicy = High Performance (default Balanced)
- UserVars.HostClientCEIPOptIn = 2 (default 0) on one client host
- UserVars.HostClientCEIPOptIn = 1 (default 0) on one client host

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: Client5, Client10, Client15, Client20, Client25
- Client Host 2: Client1, Client6, Client11, Client16, Client21
- Client Host 3: Client0, Client2, Client7, Client17, Client22
- Client Host 4: Client3, Client8, Client12, Client13, Client18, Client23
- Client Host 5: Client4, Client9, Client14, Client19, Client24, PrimeClient

The PrimeClient virtual machine was modified as follows:

- 2 virtual NICs
  - 1 virtual NIC connected to "VM Network" port group on the standard vSwitch for access from management network
  - 1 virtual NIC connected to "VM-network-dswitch" port group on the distributed vSwitch for communication with VMmark 3.1.1 VMs
- Second virtual disk
  - Size: 800 GB (default 200 GB)

Client hosts's networking configuration:

VMware ESXi 7.0 U1									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	management	1 Gb/s	Mezzanine 2 Port 1-a	1 Gb/s	1 Gb/s	1 Gb/s
DSwitch-VMmark	distributed vSwitch	9000	vmnic2	9000	vmk1	"VM-network-dswitch" port group for VMs		20 Gb/s	Mezzanine 2 Port 1-b	19 Gb/s	19 Gb/s	20 Gb/s
DSwitch-VMmark	distributed vSwitch	9000	vmnic1	9000				20 Gb/s	Mezzanine 2 Port 2-a	20 Gb/s	20 Gb/s	20 Gb/s
DSwitch-VMmark	distributed vSwitch	9000	vmnic3	9000				20 Gb/s	Mezzanine 3 Port 1-a	20 Gb/s	20 Gb/s	20 Gb/s
DSwitch-VMmark	distributed vSwitch	9000	vmnic4	9000				20 Gb/s	Mezzanine 3 Port 2-a	20 Gb/s	20 Gb/s	20 Gb/s

Client storage for VMs

- Used the same HPE MSA 2050 SAN Storage that SUT hosts used for secondary storage and is described in the Storage Notes section.

The client hosts used a single HPE Synergy 12000 frame with the following:

- 1 x HPE Synergy Composer Module
  - HPE OneView 5.60
- Interconnect Modules
  - 2 x Brocade 16 Gb FC SAN Switch Module for HPE Synergy
  - 4 x HPE Virtual Connect SE 40 Gb F8 Module for HPE Synergy
- Compute Modules
  - 5 x HPE Synergy 480 Gen10 Compute Modules for client hosts
  - 1 x HPE Synergy 480 Gen10 Compute Module for vCenter host
- 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 3830C16Gb FC HBA
- 2 x HPE Synergy 3820C 10/20Gb CNA

## Other Notes

VMmark3.properties file modifications:

- ScrubConfigFile was set to true (default false)
- TileDelay was set to 10 (default 60)
- Deploy/DeploySetupTimeOut was set to 1500 (default 900)
- VCscratchDir was set to /root/VMmark3/results/scratch/ (default /root/VMmark3/samples/)

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