

## VMmark® 3.1.1 Results

**Server Vendor & Model: Fujitsu Server PRIMERGY RX4770 M6**  
**Storage Vendor & Model: 5 x Fujitsu Server PRIMERGY RX2540 M4**  
**2 x Fujitsu Server PRIMERGY RX2540 M5**  
**Hypervisor: VMware ESXi 7.0 U1 Build 16850804**  
**Datacenter Management Software: VMware vCenter Server Appliance 7.0 U1 Build 16860138**

**VMmark 3.1.1 Score =**  
**19.72 @ 20 Tiles**

Number of Hosts: 2	Uniform Hosts [yes/no]: yes	Total sockets/cores/threads in test: 8/224/448
Tested By: Fujitsu		Test Date: 09-30-2020
<a href="#">Performance Section</a> <a href="#">Performance</a>	<a href="#">Configuration Section</a> <a href="#">Configuration</a>	<a href="#">Notes Section</a> <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	3576.72	0.99	0.77   0.01	566.50	0.99	0.62   0.17	934.48	1.27	854.61	619.60	1.24	1031.71	414.38	1.19	1203.16	1.13
p1	3552.32	0.99	0.86   0.00	562.40	0.98	0.69   0.20	933.15	1.27	859.73	689.92	1.38	1012.52	477.25	1.38	1173.58	1.19
p2	3539.46	0.98	0.81   0.01	560.88	0.98	0.72   0.24	958.40	1.31	788.07	638.45	1.28	952.80	451.10	1.30	1102.58	1.16
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	3573.88	0.99	0.98   0.01	557.94	0.98	0.81   0.42	1007.25	1.37	651.31	727.23	1.45	729.17	505.98	1.46	830.02	1.23
p1	3562.07	0.99	0.80   0.00	555.05	0.97	0.61   0.11	1004.95	1.37	653.12	745.30	1.49	744.11	525.88	1.52	845.73	1.24
p2	3544.53	0.99	0.73   0.01	554.09	0.97	0.68   0.16	1011.48	1.38	651.70	726.25	1.45	735.07	502.52	1.45	849.34	1.23
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	3565.95	0.99	1.10   0.00	571.68	1.00	1.39   0.92	941.48	1.28	825.40	689.23	1.38	933.75	475.50	1.37	1087.90	1.19
p1	3548.00	0.99	0.98   0.01	572.29	1.00	1.21   0.71	969.10	1.32	755.06	668.00	1.33	922.05	463.55	1.34	1034.27	1.18
p2	3529.71	0.98	0.94   0.00	569.02	0.99	1.39   0.77	957.90	1.30	785.95	672.17	1.34	907.29	481.43	1.39	1053.96	1.19
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	3567.37	0.99	0.92   0.01	559.83	0.98	0.70   0.33	1064.15	1.45	527.90	793.52	1.59	602.46	591.17	1.70	678.25	1.31
p1	3546.65	0.99	0.84   0.00	559.91	0.98	0.81   0.39	1037.22	1.41	595.79	745.77	1.49	693.17	513.98	1.48	800.08	1.25
p2	3535.71	0.98	0.73   0.00	557.38	0.97	0.59   0.16	1022.20	1.39	625.22	761.58	1.52	705.63	534.12	1.54	807.70	1.26
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	3580.20	1.00	1.16   0.01	568.85	0.99	1.23   0.71	909.92	1.24	935.48	622.35	1.24	1137.52	435.93	1.26	1330.03	1.14
p1	3555.50	0.99	0.97   0.00	568.39	0.99	1.19   0.64	943.15	1.28	825.78	659.60	1.32	966.23	449.45	1.30	1115.35	1.17
p2	3545.32	0.99	0.87   0.01	567.37	0.99	1.16   0.65	908.77	1.24	934.60	643.52	1.29	1119.10	440.40	1.27	1304.86	1.15

<b>TILE_5</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>	3570.96	0.99	1.04   0.01	566.14	0.99	0.67   0.27	1038.25	1.41	590.38	738.80	1.48	697.02	511.77	1.48	801.40	1.25
<b>p1</b>	3556.62	0.99	0.88   0.00	565.44	0.99	0.80   0.35	1017.98	1.39	645.41	747.98	1.49	746.76	523.20	1.51	858.64	1.25
<b>p2</b>	3549.28	0.99	0.79   0.00	565.41	0.99	0.74   0.30	1029.72	1.40	607.84	728.35	1.46	728.87	506.68	1.46	828.84	1.24
<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>	3574.19	0.99	0.82   0.00	563.62	0.99	0.97   0.61	956.33	1.30	788.52	673.30	1.35	915.28	462.00	1.33	1057.13	1.18
<b>p1</b>	3557.86	0.99	0.85   0.00	560.12	0.98	0.79   0.30	967.12	1.32	756.44	695.12	1.39	898.81	509.10	1.47	1007.16	1.21
<b>p2</b>	3530.21	0.98	0.88   0.00	554.53	0.97	0.67   0.24	974.10	1.33	732.00	687.20	1.37	878.51	471.23	1.36	993.52	1.19
<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>	3565.42	0.99	0.69   0.00	564.43	0.99	0.58   0.30	989.25	1.35	720.03	725.12	1.45	836.20	493.25	1.42	993.88	1.22
<b>p1</b>	3541.97	0.98	0.62   0.00	561.09	0.98	0.52   0.20	1021.55	1.39	647.44	713.55	1.43	778.93	512.02	1.48	899.73	1.23
<b>p2</b>	3527.21	0.98	0.59   0.00	556.54	0.97	0.79   0.37	1013.95	1.38	667.51	714.88	1.43	785.28	484.12	1.40	931.23	1.21
<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>	3566.69	0.99	0.80   0.01	562.40	0.98	0.61   0.28	948.05	1.29	803.16	685.65	1.37	939.50	496.68	1.43	1084.11	1.20
<b>p1</b>	3553.43	0.99	0.91   0.00	558.38	0.98	0.90   0.48	972.48	1.32	752.75	673.10	1.34	913.38	459.70	1.33	1058.70	1.18
<b>p2</b>	3554.77	0.99	0.88   0.00	557.65	0.97	0.67   0.25	943.20	1.28	817.61	687.88	1.37	938.77	470.95	1.36	1106.01	1.18
<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>	3574.60	0.99	0.65   0.00	563.70	0.99	0.63   0.25	1008.58	1.37	656.45	722.33	1.44	742.88	530.48	1.53	837.27	1.24
<b>p1</b>	3548.38	0.99	0.60   0.00	559.57	0.98	0.73   0.37	1016.40	1.38	645.27	724.95	1.45	740.48	502.60	1.45	846.32	1.23
<b>p2</b>	3534.27	0.98	0.54   0.00	559.78	0.98	0.77   0.32	1003.30	1.37	665.15	747.45	1.49	746.39	548.12	1.58	838.17	1.25
<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>	3572.08	0.99	0.99   0.00	567.13	0.99	0.73   0.36	949.30	1.29	812.86	656.12	1.31	986.42	443.88	1.28	1151.23	1.16
<b>p1</b>	3560.76	0.99	0.86   0.00	562.54	0.98	0.65   0.17	937.67	1.28	842.20	676.85	1.35	982.67	465.35	1.34	1150.19	1.18
<b>p2</b>	3551.73	0.99	0.90   0.00	559.79	0.98	0.65   0.21	936.00	1.27	853.65	643.20	1.29	1033.88	456.45	1.32	1192.97	1.16
<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>	3571.63	0.99	0.69   0.00	565.69	0.99	0.47   0.17	1006.73	1.37	675.48	705.38	1.41	801.35	483.38	1.39	927.67	1.21
<b>p1</b>	3561.42	0.99	0.64   0.00	560.35	0.98	0.44   0.17	1015.35	1.38	646.11	741.60	1.48	753.00	545.08	1.57	853.01	1.26
<b>p2</b>	3554.90	0.99	0.57   0.00	560.44	0.98	0.51   0.26	1030.17	1.40	620.20	726.08	1.45	727.49	502.32	1.45	840.11	1.23
<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>	3566.18	0.99	0.97   0.00	564.93	0.99	0.65   0.28	974.90	1.33	742.37	705.27	1.41	869.47	489.38	1.41	1006.51	1.21
<b>p1</b>	3551.53	0.99	0.92   0.00	561.82	0.98	0.86   0.45	958.65	1.31	789.65	658.88	1.32	959.46	474.57	1.37	1092.95	1.18
<b>p2</b>	3536.51	0.98	0.90   0.00	557.46	0.97	0.83   0.51	969.30	1.32	766.75	672.02	1.34	921.44	459.05	1.32	1063.67	1.18
<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>	3578.13	0.99	0.51   0.00	565.96	0.99	0.86   0.51	1069.83	1.46	530.76	793.25	1.58	608.67	591.45	1.71	679.49	1.31

<b>p1</b>	3566.12	0.99	0.59   0.00	562.94	0.98	0.59   0.29	1071.12	1.46	524.26	768.05	1.53	609.91	541.40	1.56	680.18	1.28
<b>p2</b>	3545.11	0.99	0.55   0.00	558.08	0.98	0.38   0.16	1059.03	1.44	541.70	786.92	1.57	617.91	564.50	1.63	690.95	1.29
<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>	3568.83	0.99	0.94   0.00	567.68	0.99	1.27   0.83	969.48	1.32	751.81	681.98	1.36	877.37	490.73	1.42	1012.78	1.20
<b>p1</b>	3554.52	0.99	1.00   0.00	561.71	0.98	0.90   0.46	951.95	1.30	798.34	663.12	1.32	949.26	453.38	1.31	1099.01	1.17
<b>p2</b>	3534.53	0.98	0.91   0.00	556.63	0.97	0.70   0.31	959.95	1.31	784.59	694.27	1.39	918.51	479.02	1.38	1070.11	1.19
<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>	3578.37	0.99	0.42   0.00	565.26	0.99	0.48   0.16	1077.17	1.47	522.92	740.95	1.48	611.52	537.15	1.55	698.27	1.27
<b>p1</b>	3563.90	0.99	0.40   0.00	563.38	0.98	0.49   0.11	1065.70	1.45	535.07	790.92	1.58	615.91	564.67	1.63	695.87	1.29
<b>p2</b>	3549.92	0.99	0.43   0.00	558.21	0.98	0.49   0.16	1070.03	1.46	531.95	763.33	1.53	619.33	561.10	1.62	698.22	1.28
<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>	3564.77	0.99	1.22   0.01	569.80	1.00	1.12   0.69	929.48	1.27	885.32	629.12	1.26	1088.51	426.93	1.23	1254.22	1.14
<b>p1</b>	3546.14	0.99	1.03   0.01	567.06	0.99	1.08   0.52	922.67	1.26	880.98	658.50	1.32	1044.85	477.15	1.38	1194.18	1.17
<b>p2</b>	3530.64	0.98	0.92   0.00	561.63	0.98	0.64   0.26	936.40	1.28	838.46	647.88	1.29	1000.37	441.93	1.27	1169.98	1.15
<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>	3578.82	0.99	0.46   0.00	571.63	1.00	0.84   0.46	1033.35	1.41	599.45	754.90	1.51	704.52	537.00	1.55	800.34	1.27
<b>p1</b>	3557.41	0.99	0.46   0.00	572.40	1.00	0.77   0.35	1036.03	1.41	588.50	736.35	1.47	694.68	537.45	1.55	789.73	1.26
<b>p2</b>	3535.81	0.98	0.44   0.00	569.93	1.00	0.82   0.41	1044.55	1.42	579.72	737.25	1.47	689.04	514.00	1.48	789.52	1.25
<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>	3577.23	0.99	0.90   0.00	572.67	1.00	1.08   0.50	942.75	1.28	827.70	706.40	1.41	947.88	493.38	1.42	1093.74	1.21
<b>p1</b>	3556.69	0.99	0.88   0.00	566.55	0.99	0.74   0.31	965.45	1.31	775.39	644.30	1.29	928.75	455.98	1.31	1070.44	1.17
<b>p2</b>	3538.34	0.98	0.99   0.00	565.10	0.99	0.52   0.20	940.12	1.28	827.85	682.00	1.36	964.35	471.45	1.36	1108.65	1.18
<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>	3581.55	1.00	0.58   0.00	573.71	1.00	0.94   0.53	1013.67	1.38	654.83	732.20	1.46	780.56	518.10	1.49	885.08	1.25
<b>p1</b>	3563.43	0.99	0.60   0.00	568.84	0.99	0.84   0.48	1021.98	1.39	629.65	700.55	1.40	732.87	501.80	1.45	848.10	1.23
<b>p2</b>	3553.56	0.99	0.61   0.00	564.37	0.99	0.66   0.31	1013.67	1.38	655.92	765.55	1.53	763.33	542.17	1.56	873.35	1.26
<b>p0_score:</b>	24.32															
<b>p1_score:</b>	24.30															
<b>p2_score:</b>	24.22															

<b>Infrastructure_Operations_Scores:</b>	vMotion	SVMotion	XVMotion	Deploy
<b>Completed_Ops_PerHour</b>	28.50	28.00	23.00	12.50
<b>Avg_Seconds_To_Complete</b>	5.84	72.94	91.33	248.48
<b>Failures</b>	0.00	0.00	0.00	0.00

<b>Ratio</b>	1.10	1.56	1.28	1.56
<b>Number_Of_Threads</b>	1	1	1	1
<b>Summary</b>	Run_Is_Compliant			Turbo_Setting:0
	Number_Of_Compliance_Issues(0)*			Median_Phase(p1)
<b>Unreviewed_VMmark3_Applications_Score</b>	24.30			
<b>Unreviewed_VMmark3_Infrastructure_Score</b>	1.36			
<b>Unreviewed_VMmark3_Score</b>	19.72			

## Configuration

Virtualization Software	
Hypervisor Vendor, Product, Version, and Build / Availability Date (MM-DD-YYYY)	VMware ESXi 7.0 U1, Build 16850804 / 10-06-2020
Datacenter Management Software Vendor, Product, Version, and Build / Availability Date (MM-DD-YYYY)	VMware vCenter Server Appliance 7.0 Update 1, Build 16860138 / 10-06-2020
Supplemental Software	None
Servers	
Number of Servers in System Under Test (all subsequent fields in this section are per server)	2
Server Manufacturer and Model	Fujitsu Server PRIMERGY RX4770 M6
Processor Vendor and Model	Intel Xeon Platinum 8380HL
Processor Speed (GHz) / Turbo Boost Speed (GHz)	2.9 / 4.3
Total Sockets/Total Cores/Total Threads	4 Sockets / 112 Cores / 224 Threads
Primary CPU Cache	32KB I+32KB D on chip per core
Secondary CPU Cache	1MB I+D on chip per core
Other CPU Cache	38.5MB I+D on chip per chip
BIOS Version	V1.0.0.0 R1.1.0 for D3892-A1x

Memory Size (in GB, Number of DIMMs)	3072, 48
Memory Type and Speed	64GB 2Rx4 DDR4 3200MHz RDIMM
Disk Subsystem Type	FC SAN
Number of Disk Controllers	Fujitsu PRAID EP540i
Disk Controller Vendors and Models	1
Total Number of Physical Disks for Hypervisor	1
Disk Vendors, Models, Capacities, and Speeds	Micron MTFDDAK480TDS 480GB SATA-SSD 6GB/s
Number of Host Bus Adapters	2
Host Bus Adapter Vendors and Models	Qlogic QLE2772 dual port 32Gb PCIe Adapter
Number of Network Controllers	3
Network Controller Vendors and Models	2 x Mellanox MCX4121A-ACAT dual port 25Gb SFP28 PCIe Adapters 1 x Intel I350-T2 1Gb quad port OCPv3
Other Hardware	None
Other Software	None
Hardware Availability Date (MM-DD-YYYY)	11-16-2020
BIOS Availability Date (MM-DD-YYYY)	11-16-2020
Software Availability Date (MM-DD-YYYY)	11-06-2020
<b>Network</b>	
Network Switch Vendors and Models	1 x Fujitsu SR-X340TR1 1 x Extreme Networks SLX 9150-48Y
Network Speed	1 x 1Gbps for SUT management, 1 x 25Gbps for vMotion, 3 x 25Gbps for Client and VMs
<b>Primary Storage</b>	
Storage Category	SCSI Target
Storage Vendors, Models, and Firmware Versions	5 x Fujitsu Server PRIMERGY RX2540 M4, Firmware V5.0.0.12 R1.22.0 for D3384-A1x 2 x Fujitsu Server PRIMERGY RX2540 M5, Firmware V5.0.0.14 R1.15.0 for D3384-B1x
Storage Configuration Summary	FC switches: <ul style="list-style-type: none"> <li>• 1 x Brocade G620 32Gb 48 port</li> </ul> Storage Servers: <ul style="list-style-type: none"> <li>• for OS storage</li> </ul>

- 9 x Micron MTFDDAK480TDC 480GB SATA SSD
- 2 x Samsung MZ7KH480HAHQ 480GB SATA SSD
- for Workload storage
  - 20 x Intel P4800X 750GB PCIe SSD
  - 1 x Intel P4600 2TB PCIe SSD
  - 4 x Intel P4600 4TB PCIe SSD
  - 5 x Intel P4610 3.2TB PCIe SSD

**Datacenter Management Server**

System Model	Fujitsu Server PRIMERGY RX2540 M2
Processor Vendor and Model	Intel Xeon E5-2698 v4
Processor Speed (GHz)	2.2
Total Sockets/Total Cores/Total Threads	1 Sockets / 20 Cores / 40 Threads
Memory Size (in GB, Number of DIMMs)	Hypervisor: 64 GB, 8
Network Controller(s) Vendors and Models	Emulex OneConnect OCe14000 1GbE dual port Adapter
Operating System, Version, Bitness, and Service Pack	Hypervisor: VMware ESXi 6.7 EP 02a Build 9214924
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 Appliance 7.0 U1 Build 16860138
Other Hardware	None
Other Software	None

**Clients**

Total Number of Virtual Clients / Virtual Client Hosts	20 / 6
System Model(s)	Fujitsu Server PRIMERGY RX2530 M2
Processor Vendor(s) and Model(s)	Intel Xeon E5-2699 v4 (for Client Host 1-3 and 6) Intel Xeon E5-2699A v4 (for Client Host 4 and 5)
Processor Speed(s) (GHz)	2.2 (Intel Xeon E5-2699 v4) 2.4 (Intel Xeon E5-2699A v4)
Total Sockets/Total Cores/Total Threads	2 Sockets / 44 Cores / 88 Threads
Memory per Virtual Client Host	256 GB

Network Controller(s) Vendors and Models	1 x Emulex OneConnect OCe14000 1Gb dual port 1 x Emulex OneConnect OCe14000 10Gb dual port
Virtual Client Networking Notes	1 virtual adapter for management, 2 virtual adapters for workload traffic
Virtual Client Storage Notes	1 x 300GB SAS 10K TOSHIBA AL14SEB03EN HDD with RAID0 for Client Host OS 2 x 400GB SAS 12G TOSHIBA PX02SMF040 SSD with RAID0 for Client VMs
Other Hardware	None
Other Software	VMware ESXi 6.7 EP 08 Build 13473784

#### 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 Lazy

### Virtualization Software Notes

- Logical CPU configuration changed for multi-cpu VMs to 1 socket with multiple cores (except PrimeClient VM, default: single core per socket)
- CPU and Memory shares set to high for all DS3DB VMs (default normal)
- All memory reserved for DS3DB VMs (default non-reserved)
- Add sched.mem.lpage.enable1GPage to TRUE for all DS3DB VMs (default normal)
- sched.mem.pin set to TRUE for all DS3DB VMs (default FALSE)
- CPU shares set to low for all Standby VMs (default normal)
- vSphere DRS Migration Threshold set to Fully Automated level 2

Changed in esx.conf:

- /adv/Cpu/CreditAgePeriod = 1000 (default 3000)
- /adv/Cpu/HTWholeCoreThreshold = 0 (default 800)
- /adv/DataMover/HardwareAcceleratedInit = 0 (default 1)
- /adv/DataMover/HardwareAcceleratedMove = 0 (default 1)
- /adv/Mem/CtlMaxPercent = 0 (default 65)
- /adv/Mem/ShareScanGHz = 0 (default 4)

- /adv/Numa/LTermFairnessInterval = 0 (default 5)
- /adv/Numa/MigImbalanceThreshold = 57 (default 10)
- /adv/Numa/PageMigEnable = 0 (default 1)
- /adv/Numa/RebalancePeriod = 60000 (default 2000)
- /adv/Numa/SwapLoadEnable = 0 (default 1)
- /adv/Numa/SwapLocalityEnable = 0 (default 1)
- /adv/Disk/ReqCallThreshold = 1 (default 8)
- /adv/Disk/IdleCredit = 64 (default 32)
- /adv/Power/CpuPolicy = High Performance (default balanced)
- /adv/VMFS3/HardwareAcceleratedLocking = 0 (default 1)
- /adv/UserVars/HostClientCEIPOptIn = 1 (default 0, SUT2 only)
- /vmkernel/hyperthreadingMitigation = TRUE (default FALSE)

## Server Notes

Server BIOS settings:

- Turbo Boost Technology = Enabled (Intel Turbo Boost up to 4.3GHz, default: Enabled)
- Stale AtoS = Enabled (default Disabled)
- LLC Dead Line Alloc = Disabled (default: Enabled)
- IODC Configuration = Disabled (default: Auto)
- L2 RFO Prefetch = Disabled (default: Enabled)
- SNC = Enabled (default: Disabled)
- Fan Control = Full (default Auto)

## Networking Notes

vSwitch Configuration:

- vSwitch0 for Service Console on vmnic0 at 1Gb/s
- vSwitch1 for all workloads on vmnic4, vmnic4 and vmnic6 at 25Gb/s
- vSwitch2 for vMotion connection on vmnic7 at 25Gb/s
  - MTU 9000 (default 1500)

## Storage Notes

First Fujitsu Server (PRIMERGY RX2540 M4) configured as a Fibre Channel Target:

- Hardware details:
  - 2 x Intel Xeon Gold 6134M@3.2GHz processors
  - 64 GB RAM (2 x 32GB 2Rx4 2666MHz DDR4 RDIMMs)
  - 2 x QLogic QLE2742 dual port 32Gb FC HBA used as FC target controller
  - 2 x 480GB SATA SSD Micron MTFDDAK480TDC
  - 1 x Intel P4600 4TB PCIe SSD
  - 3 x Intel P4800X 750GB PCIe SSD
- Software details:
  - Operating System: SUSE Linux Enterprise Server 12 SP3 - 4.4.162-94.72-default (64-bit)
  - Fibre Channel Target SW: LIO (part of SUSE Linux Enterprise Server 12 SP3)



- RAID configuration:
  - SATA-SSD 1, 2 (RAID1):
    - LUN 1 : Storage system OS (480GB, this LUN is not counted in the Storage section)
  - First PCIe-SSD (4TB):
    - LUN 1 : AuctionNoSQL, ElasticDB for tile 0 (300GB)
    - LUN 2 : Deploy LUN (300GB)
    - LUN 3 : AuctionNoSQL, ElasticDB for tile 2 (300GB)
    - LUN 4 : AuctionNoSQL, ElasticDB for tile 3 (300GB)
    - LUN 5 : AuctionDB, ElasticLB for tile 0 (300GB)
    - LUN 6 : AuctionDB, ElasticLB for tile 1 (300GB)
    - LUN 7 : AuctionDB, ElasticLB for tile 2 (300GB)
    - LUN 8 : AuctionDB, ElasticLB for tile 3 (300GB)
    - LUN 9 : AuctionWebA, AuctionWebB, AuctionAppA, AuctionAppB, AuctionLB, AuctionMSQ, ElasticWebA, ElasticWebB, ElasticAppA, ElasticAppB, Standby for tile 0 (300GB)
    - LUN 10 : AuctionWebA, AuctionWebB, AuctionAppA, AuctionAppB, AuctionLB, AuctionMSQ, ElasticWebA, ElasticWebB, ElasticAppA, ElasticAppB, Standby for tile 1 (300GB)
    - LUN 11 : AuctionWebA, AuctionWebB, AuctionAppA, AuctionAppB, AuctionLB, AuctionMSQ, ElasticWebA, ElasticWebB, ElasticAppA, ElasticAppB, Standby for tile 2 (300GB)
    - LUN 12 : AuctionWebA, AuctionWebB, AuctionAppA, AuctionAppB, AuctionLB, AuctionMSQ, ElasticWebA, ElasticWebB, ElasticAppA, ElasticAppB, Standby for tile 3 (300GB)
  - Second PCIe-SSD (750GB):
    - LUN 1 : DS3DB, DS3WebA, DS3WebB, DS3WebC for tile 0 (600GB)
  - Third PCIe-SSD (750GB):
    - LUN 1 : DS3DB, DS3WebA, DS3WebB, DS3WebC for tile 1 (600GB)
  - Fourth PCIe-SSD (750GB):
    - LUN 1 : DS3DB, DS3WebA, DS3WebB, DS3WebC for tile 2 (600GB)

Second Fujitsu Server (PRIMERGY RX2540 M4) configured as a Fibre Channel Target:

- Hardware details:
  - 2 x Intel Xeon Gold 6134M@3.2GHz processors
  - 64 GB RAM (2 x 32GB 2Rx4 2666MHz DDR4 RDIMMs)
  - 2 x QLogic QLE2742 dual port 32Gb FC HBA used as FC target controller
  - 2 x 480GB SATA SSD Micron MTFDDAK480TDC
  - 1 x Intel P4600 4TB PCIe SSD
  - 3 x Intel P4800X 750GB PCIe SSD
- Software details:
  - Operating System: SUSE Linux Enterprise Server 12 SP3 - 4.4.162-94.72-default (64-bit)
  - Fibre Channel Target SW: LIO (part of SUSE Linux Enterprise Server 12 SP3)
- RAID configuration:
  - SATA-SSD 1, 2 (RAID1):
    - LUN 1 : Storage system OS (480GB, this LUN is not counted in the Storage section)
  - First PCIe-SSD (4TB):
    - LUN 1 : AuctionNoSQL, ElasticDB for tile 4 (300GB)
    - LUN 2 : AuctionNoSQL, ElasticDB for tile 5 (300GB)
    - LUN 3 : AuctionNoSQL, ElasticDB for tile 6 (300GB)
    - LUN 4 : AuctionNoSQL, ElasticDB for tile 7 (300GB)
    - LUN 5 : AuctionDB, ElasticLB for tile 4 (300GB)
    - LUN 6 : AuctionDB, ElasticLB for tile 5 (300GB)
    - LUN 7 : AuctionDB, ElasticLB for tile 6 (300GB)
    - LUN 8 : AuctionDB, ElasticLB for tile 7 (300GB)
    - LUN 9 : AuctionWebA, AuctionWebB, AuctionAppA, AuctionAppB, AuctionLB, AuctionMSQ, ElasticWebA, ElasticWebB, ElasticAppA, ElasticAppB, Standby for tile 4 (300GB)

- LUN 10 : AuctionWebA, AuctionWebB, AuctionAppA, AuctionAppB, AuctionLB, AuctionMSQ, ElasticWebA, ElasticWebB, ElasticAppA, ElasticAppB, Standby for tile 5 (300GB)
- LUN 11 : AuctionWebA, AuctionWebB, AuctionAppA, AuctionAppB, AuctionLB, AuctionMSQ, ElasticWebA, ElasticWebB, ElasticAppA, ElasticAppB, Standby for tile 6 (300GB)
- LUN 12 : AuctionWebA, AuctionWebB, AuctionAppA, AuctionAppB, AuctionLB, AuctionMSQ, ElasticWebA, ElasticWebB, ElasticAppA, ElasticAppB, Standby for tile 7 (300GB)
- Second PCIe-SSD (750GB):
  - LUN 1 : DS3DB, DS3WebA, DS3WebB, DS3WebC for tile 3 (600GB)
- Third PCIe-SSD (750GB):
  - LUN 1 : DS3DB, DS3WebA, DS3WebB, DS3WebC for tile 4 (600GB)
- Fourth PCIe-SSD (750GB):
  - LUN 1 : DS3DB, DS3WebA, DS3WebB, DS3WebC for tile 5 (600GB)

Third Fujitsu Server (PRIMERGY RX2540 M4) configured as a Fibre Channel Target:

- Hardware details:
  - 2 x Intel Xeon Gold 6134M@3.2GHz processors
  - 64 GB RAM (2 x 32GB 2Rx4 2666MHz DDR4 RDIMMs)
  - 2 x QLogic QLE2742 dual port 32Gb FC HBA used as FC target controller
  - 2 x 480GB SATA SSD Micron MTFDDAK480TDC
  - 1 x Intel P4600 4TB PCIe SSD
  - 3 x Intel P4800X 750GB PCIe SSD
- Software details:
  - Operating System: SUSE Linux Enterprise Server 12 SP3 - 4.4.162-94.72-default (64-bit)
  - Fibre Channel Target SW: LIO (part of SUSE Linux Enterprise Server 12 SP3)
- RAID configuration:
  - SATA-SSD 1, 2 (RAID1):
    - LUN 1 : Storage system OS (480GB, this LUN is not counted in the Storage section)
  - First PCIe-SSD (4TB):
    - LUN 1 : AuctionNoSQL, ElasticDB for tile 8 (300GB)
    - LUN 2 : AuctionNoSQL, ElasticDB for tile 9 (300GB)
    - LUN 3 : AuctionNoSQL, ElasticDB for tile 10 (300GB)
    - LUN 4 : AuctionNoSQL, ElasticDB for tile 11 (300GB)
    - LUN 5 : AuctionDB, ElasticLB for tile 8 (300GB)
    - LUN 6 : AuctionDB, ElasticLB for tile 9 (300GB)
    - LUN 7 : AuctionDB, ElasticLB for tile 10 (300GB)
    - LUN 8 : AuctionDB, ElasticLB for tile 11 (300GB)
    - LUN 9 : AuctionWebA, AuctionWebB, AuctionAppA, AuctionAppB, AuctionLB, AuctionMSQ, ElasticWebA, ElasticWebB, ElasticAppA, ElasticAppB, Standby for tile 8 (300GB)
    - LUN 10 : AuctionWebA, AuctionWebB, AuctionAppA, AuctionAppB, AuctionLB, AuctionMSQ, ElasticWebA, ElasticWebB, ElasticAppA, ElasticAppB, Standby for tile 9 (300GB)
    - LUN 11 : AuctionWebA, AuctionWebB, AuctionAppA, AuctionAppB, AuctionLB, AuctionMSQ, ElasticWebA, ElasticWebB, ElasticAppA, ElasticAppB, Standby for tile 10 (300GB)
    - LUN 12 : AuctionWebA, AuctionWebB, AuctionAppA, AuctionAppB, AuctionLB, AuctionMSQ, ElasticWebA, ElasticWebB, ElasticAppA, ElasticAppB, Standby for tile 11 (300GB)
  - Second PCIe-SSD (750GB):
    - LUN 1 : DS3DB, DS3WebA, DS3WebB, DS3WebC for tile 6 (600GB)
  - Third PCIe-SSD (750GB):
    - LUN 1 : DS3DB, DS3WebA, DS3WebB, DS3WebC for tile 7 (600GB)
  - Fourth PCIe-SSD (750GB):
    - LUN 1 : DS3DB, DS3WebA, DS3WebB, DS3WebC for tile 8 (600GB)

Fourth Fujitsu Server PRIMERGY RX2540 M4 configured as a Fibre Channel Target:

- Hardware details:
  - 2 x Intel Xeon Gold 6134M@3.2GHz processors

- 64 GB RAM (2 x 32GB 2Rx4 2666MHz DDR4 RDIMMs)
  - 2 x QLogic QLE2742 dual port 32Gb FC HBA used as FC target controller
  - 2 x 480GB SATA SSD Micron MTFDDAK480TDC
  - 1 x Intel P4600 4TB PCIe SSD
  - 3 x Intel P4800X 750GB PCIe SSD
- Software details:
    - Operating System: SUSE Linux Enterprise Server 12 SP3 - 4.4.162-94.72-default (64-bit)
    - Fibre Channel Target SW: LIO (part of SUSE Linux Enterprise Server 12 SP3)
- RAID configuration:
    - SATA-SSD 1, 2 (RAID1):
      - LUN 1 : Storage system OS (480GB, this LUN is not counted in the Storage section)
    - First PCIe-SSD (4TB):
      - LUN 1 : AuctionNoSQL, ElasticDB for tile 12 (300GB)
      - LUN 2 : AuctionNoSQL, ElasticDB for tile 13 (300GB)
      - LUN 3 : AuctionNoSQL, ElasticDB for tile 14 (300GB)
      - LUN 4 : AuctionNoSQL, ElasticDB for tile 15 (300GB)
      - LUN 5 : AuctionDB, ElasticLB for tile 12 (300GB)
      - LUN 6 : AuctionDB, ElasticLB for tile 13 (300GB)
      - LUN 7 : AuctionDB, ElasticLB for tile 14 (300GB)
      - LUN 8 : AuctionDB, ElasticLB for tile 15 (300GB)
      - LUN 9 : AuctionWebA, AuctionWebB, AuctionAppA, AuctionAppB, AuctionLB, AuctionMSQ, ElasticWebA, ElasticWebB, ElasticAppA, ElasticAppB, Standby for tile 12 (300GB)
      - LUN 10 : AuctionWebA, AuctionWebB, AuctionAppA, AuctionAppB, AuctionLB, AuctionMSQ, ElasticWebA, ElasticWebB, ElasticAppA, ElasticAppB, Standby for tile 13 (300GB)
      - LUN 11 : AuctionWebA, AuctionWebB, AuctionAppA, AuctionAppB, AuctionLB, AuctionMSQ, ElasticWebA, ElasticWebB, ElasticAppA, ElasticAppB, Standby for tile 14 (300GB)
      - LUN 12 : AuctionWebA, AuctionWebB, AuctionAppA, AuctionAppB, AuctionLB, AuctionMSQ, ElasticWebA, ElasticWebB, ElasticAppA, ElasticAppB, Standby for tile 15 (300GB)
    - Second PCIe-SSD (750GB):
      - LUN 1 : DS3DB, DS3WebA, DS3WebB, DS3WebC for tile 9 (600GB)
    - Third PCIe-SSD (750GB):
      - LUN 1 : DS3DB, DS3WebA, DS3WebB, DS3WebC for tile 10 (600GB)
    - Fourth PCIe-SSD (750GB):
      - LUN 1 : DS3DB, DS3WebA, DS3WebB, DS3WebC for tile 11 (600GB)

Fifth Fujitsu Server (PRIMERGY RX2540 M4) configured as a Fibre Channel Target:

- Hardware details:
  - 2 x Intel Xeon Gold 6134M@3.2GHz processors
  - 64 GB RAM (2 x 32GB 2Rx4 2666MHz DDR4 RDIMMs)
  - 2 x QLogic QLE2742 dual port 32Gb FC HBA used as FC target controller
  - 1 x 480GB SATA SSD Micron MTFDDAK480TDC
  - 1 x Intel P4600 2TB PCIe SSD
  - 3 x Intel P4800X 750GB PCIe SSD
- Software details:
  - Operating System: SUSE Linux Enterprise Server 12 SP3 - 4.4.162-94.72-default (64-bit)
  - Fibre Channel Target SW: LIO (part of SUSE Linux Enterprise Server 12 SP3)
- RAID configuration:
  - SATA-SSD 1 (RAID0):
    - LUN 1 : Storage system OS (480GB, this LUN is not counted in the Storage section)
  - First PCIe-SSD (2TB):

- LUN 1 : AuctionNoSQL, ElasticDB for tile 16 (300GB)
- LUN 2 : AuctionNoSQL, ElasticDB for tile 17 (300GB)
- LUN 3 : AuctionDB, ElasticLB for tile 16 (300GB)
- LUN 4 : AuctionDB, ElasticLB for tile 17 (300GB)
- LUN 5 : AuctionWebA, AuctionWebB, AuctionAppA, AuctionAppB, AuctionLB, AuctionMSQ, ElasticWebA, ElasticWebB, ElasticAppA, ElasticAppB, Standby for tile 16 (300GB)
- LUN 6 : AuctionWebA, AuctionWebB, AuctionAppA, AuctionAppB, AuctionLB, AuctionMSQ, ElasticWebA, ElasticWebB, ElasticAppA, ElasticAppB, Standby for tile 17 (300GB)
- Second PCIe-SSD (750GB):
  - LUN 1 : DS3DB, DS3WebA, DS3WebB, DS3WebC for tile 12 (600GB)
- Third PCIe-SSD (750GB):
  - LUN 1 : DS3DB, DS3WebA, DS3WebB, DS3WebC for tile 13 (600GB)
- Fourth PCIe-SSD (750GB):
  - LUN 1 : DS3DB, DS3WebA, DS3WebB, DS3WebC for tile 14 (600GB)

Sixth Fujitsu Server (PRIMERGY RX2540 M5) configured as a Fibre Channel Target:

- Hardware details:
  - 2 x Intel Xeon Gold 6234@3.3GHz processors
  - 128 GB RAM (4 x 32GB 2Rx4 2933MHz DDR4 RDIMMs)
  - 2 x QLogic QLE2742 dual port 32Gb FC HBA used as FC target controller
  - 1 x 480GB SATA SSD Samsung MZ7KH480HAHQ
  - 3 x Intel P4610 3.2TB PCIe SSD
  - 3 x Intel P4800X 750GB PCIe SSD
- Software details:
  - Operating System: SUSE Linux Enterprise Server 15 SP1 - 4.12.14-195-default (64-bit)
  - Fibre Channel Target SW: LIO (part of SUSE Linux Enterprise Server 15 SP1)
- RAID configuration:
  - SATA-SSD 1 (RAID0):
    - LUN 1 : Storage system OS (480GB, this LUN is not counted in the Storage section)
  - First PCIe-SSD (3.2TB):
    - LUN 1 : AuctionNoSQL, ElasticDB for tile 18 (300GB)
    - LUN 2 : AuctionNoSQL, ElasticDB for tile 19 (300GB)
    - LUN 4 : AuctionDB, ElasticLB for tile 18 (300GB)
    - LUN 5 : AuctionDB, ElasticLB for tile 19 (300GB)
    - LUN 7 : AuctionWebA, AuctionWebB, AuctionAppA, AuctionAppB, AuctionLB, AuctionMSQ, ElasticWebA, ElasticWebB, ElasticAppA, ElasticAppB, Standby for tile 18 (300GB)
    - LUN 8 : AuctionWebA, AuctionWebB, AuctionAppA, AuctionAppB, AuctionLB, AuctionMSQ, ElasticWebA, ElasticWebB, ElasticAppA, ElasticAppB, Standby for tile 19 (300GB)
  - Second PCIe-SSD (3.2TB):
    - LUN 1 : SvMotion Target LUN (300GB)
    - LUN 2 : AuctionNoSQL, ElasticDB for tile 1 (300GB)
  - Third PCIe-SSD (750GB):
    - LUN 1 : DS3DB, DS3WebA, DS3WebB, DS3WebC for tile 15 (600GB)
  - Fourth PCIe-SSD (750GB):
    - LUN 1 : DS3DB, DS3WebA, DS3WebB, DS3WebC for tile 16 (600GB)
  - Fifth PCIe-SSD (3.2TB):
    - LUN 1 : XvMotion Target LUN (300GB)
  - Sixth PCIe-SSD (750GB):
    - LUN 1 : DS3DB, DS3WebA, DS3WebB, DS3WebC for tile 17 (600GB)

Seventh Fujitsu Server (PRIMERGY RX2540 M5) configured as a Fibre Channel Target:

- Hardware details:
  - 2 x Intel Xeon Gold 6234@3.3GHz processors
  - 128 GB RAM (4 x 32GB 2Rx4 2933MHz DDR4 RDIMMs)
  - 2 x QLogic QLE2742 dual port 32Gb FC HBA used as FC target controller
  - 1 x 480GB SATA SSD Samsung MZ7KH480HAHQ
  - 2 x Intel P4800X 750GB PCIe SSD
  - 2 x Intel P4600 4TB PCIe SSD
- Software details:
  - Operating System: SUSE Linux Enterprise Server 15 SP1 - 4.12.14-195-default (64-bit)
  - Fibre Channel Target SW: LIO (part of SUSE Linux Enterprise Server 15 SP1)
- RAID configuration:
  - SATA-SSD 1 (RAID0):
    - LUN 1 : Storage system OS (480GB, this LUN is not counted in the Storage section)
  - First PCIe-SSD (3.2TB):
    - LUN 1 : vmmark3.1.1-template-031420 (300GB)
  - Second PCIe-SSD (750GB):
    - LUN 1 : DS3DB, DS3WebA, DS3WebB, DS3WebC for tile 18 (600GB)
  - Third PCIe-SSD (3.2TB):
    - LUN 1 : DS3DB backup (600GB, this LUN is not counted in the Storage section)
  - Fourth PCIe-SSD (750GB):
    - LUN 1 : DS3DB, DS3WebA, DS3WebB, DS3WebC for tile 19 (600GB)

All LUNs were configured as block devices; no system memory was used for caching.

### **Datacenter Management Server Notes**

- Virtual Center realized as a VM running on a dedicated Hypervisor system:
  - Number of vCPUs: 4 (Four vSocket)
  - Size of vRAM: 19GB
- The host operating system VMware ESXi 6.7.0 EP 02a Build 9214924 was installed using 'Fujitsu Custom Image for VMware ESXi 6.7.0 EP 02a' named VMware-ESXi-6.7.0-9214924-Fujitsu-v451-1.iso

### **Operating System Notes**

- VMware ESXi 7.0 U1 Build 16850804 was installed using 'VMware Image for VMware ESXi 7.0 U1' named VMware-VMvisor-Installer-7.0U1-16850804.x86\_64.iso
- The drivers which will be provided with 'Fujitsu Custom Image for VMware ESXi 7.0U1 (v510-1)' were also installed. This customized image will be available on 11-06-2020.

### **Software Notes**

None

### **Client Notes**

The location of Client VMs:

- Client Host 1: Client0, Client6, Client12, Client18
- Client Host 2: Client1, Client7, Client13,
- Client Host 3: Client2, Client8, Client14, Client19
- Client Host 4: Client3, Client9, Client15

- Client Host 5: Client4, Client10, Client16
- Client Host 6: Client5, Client11, Client17, PrimeClient

Changes in esx.conf:

- /adv/Power/CpuPolicy = High Performance (default balanced)
- /adv/UserVars/HostClientCEIPOptIn = 1 (default 0)

## Other Notes

Changes in VMmark3.properties files:

- VCscratchDir = /root/VMmark3/results/scratch (default: /root/VMmark3/samples/)

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