VMmark® 3.1 Results

Server Vendor & Model: Lenovo ThinkSystem SR655 **Storage Vendor & Model: Lenovo ThinkSystem DM7000F Storage** **Hypervisor: VMware ESXi 6.7 U3 build 14320388** **Datacenter Management Software: VMware vCenter 6.7 U3 Build 14351034 RTM**	**VMmark 3.1 Score = 9.10 @ 10 Tiles**

Number of Hosts: 2	**Uniform Hosts [yes/no]: yes**	**Total sockets/cores/threads in test: 2/128/256**
Tested By: Lenovo	**Test Date: 08-24-2019**	

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	3575.56	0.99	0.44 | 0.02	572.14	1.00	0.94 | 0.79	888.62	1.21	1062.62	581.30	1.16	1263.12	397.30	1.15	1518.14	1.10
p1	3554.22	0.99	0.35 | 0.00	568.87	0.99	1.02 | 0.68	876.58	1.19	1080.13	614.67	1.23	1292.93	436.60	1.26	1503.07	1.13
p2	3541.17	0.98	0.36 | 0.01	563.63	0.99	0.68 | 0.31	920.95	1.25	932.27	627.25	1.25	1143.33	423.02	1.22	1324.87	1.13
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	3579.23	0.99	0.51 | 0.01	565.69	0.99	0.54 | 0.32	857.88	1.17	1092.43	573.05	1.14	1350.47	387.65	1.12	1536.60	1.08
p1	3566.51	0.99	0.38 | 0.01	560.76	0.98	0.37 | 0.32	852.25	1.16	1087.83	603.23	1.21	1271.40	438.35	1.26	1437.83	1.11
p2	3555.03	0.99	0.36 | 0.00	558.24	0.98	0.67 | 0.24	872.60	1.19	1021.28	595.80	1.19	1221.03	382.57	1.10	1416.35	1.09
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	3574.41	0.99	0.33 | 0.00	562.40	0.98	0.66 | 0.32	905.77	1.23	1015.63	608.75	1.22	1238.47	403.48	1.16	1489.77	1.11
p1	3544.90	0.99	0.33 | 0.00	561.98	0.98	0.54 | 0.24	868.98	1.18	1111.58	608.00	1.21	1321.54	412.25	1.19	1525.46	1.11
p2	3527.47	0.98	0.47 | 0.00	560.27	0.98	0.47 | 0.37	891.25	1.21	1051.63	596.15	1.19	1301.01	393.77	1.14	1555.80	1.10
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	3571.50	0.99	0.37 | 0.00	564.55	0.99	0.92 | 0.48	857.27	1.17	1091.67	607.12	1.21	1294.11	412.85	1.19	1496.28	1.11
p1	3557.41	0.99	0.37 | 0.00	556.52	0.97	0.60 | 0.41	830.25	1.13	1199.05	554.30	1.11	1466.60	391.02	1.13	1673.43	1.06
p2	3537.60	0.98	0.38 | 0.02	557.03	0.97	0.77 | 0.22	838.48	1.14	1175.00	558.95	1.12	1421.56	375.82	1.08	1649.85	1.06
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	3579.99	1.00	0.32 | 0.00	568.44	0.99	0.42 | 0.22	897.20	1.22	1020.38	630.58	1.26	1221.33	425.20	1.23	1426.54	1.13
p1	3570.62	0.99	0.74 | 0.04	566.10	0.99	0.63 | 0.31	895.10	1.22	1024.87	603.80	1.21	1259.19	423.48	1.22	1453.54	1.12
p2	3553.23	0.99	1.55 | 0.75	559.62	0.98	0.36 | 0.17	922.58	1.26	941.55	627.55	1.25	1143.15	420.98	1.21	1332.73	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	3574.09	0.99	1.29 | 0.70	568.77	0.99	0.99 | 0.66	897.55	1.22	943.33	642.83	1.28	1091.27	444.20	1.28	1244.36	1.15
p1	3554.69	0.99	0.60 | 0.01	570.79	1.00	0.92 | 0.67	895.25	1.22	935.55	611.23	1.22	1133.52	418.52	1.21	1293.52	1.12
p2	3542.14	0.98	0.44 | 0.31	567.27	0.99	0.82 | 0.47	889.70	1.21	967.86	615.77	1.23	1147.32	430.93	1.24	1339.93	1.13
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	3584.65	1.00	0.30 | 0.00	560.26	0.98	0.60 | 0.38	878.70	1.20	1065.28	618.65	1.24	1263.95	435.77	1.26	1488.07	1.13
p1	3568.97	0.99	0.35 | 0.00	557.48	0.97	0.63 | 0.34	928.23	1.26	910.47	607.83	1.21	1111.86	428.60	1.24	1286.21	1.13
p2	3558.09	0.99	0.34 | 0.01	555.18	0.97	0.50 | 0.15	902.50	1.23	988.40	635.58	1.27	1189.78	432.80	1.25	1387.72	1.13
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	3578.26	0.99	0.40 | 0.00	564.45	0.99	0.47 | 0.25	862.83	1.17	1050.01	616.25	1.23	1238.75	441.95	1.27	1411.60	1.13
p1	3566.16	0.99	0.50 | 0.02	565.01	0.99	0.57 | 0.32	864.92	1.18	1053.10	585.23	1.17	1281.04	389.02	1.12	1519.00	1.09
p2	3551.18	0.99	0.36 | 0.00	565.78	0.99	0.44 | 0.30	836.05	1.14	1160.54	584.70	1.17	1376.06	396.25	1.14	1617.65	1.08
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	3582.39	1.00	0.30 | 0.00	569.04	0.99	0.54 | 0.18	873.48	1.19	1105.60	606.98	1.21	1323.46	431.48	1.24	1539.08	1.12
p1	3567.99	0.99	0.31 | 0.00	566.64	0.99	0.53 | 0.22	897.25	1.22	1043.52	603.02	1.20	1287.35	381.68	1.10	1526.70	1.10
p2	3551.44	0.99	0.35 | 0.01	563.24	0.98	0.59 | 0.24	893.65	1.22	1022.55	629.62	1.26	1238.15	445.62	1.28	1446.76	1.14
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	3564.98	0.99	0.44 | 0.02	569.45	1.00	0.81 | 0.41	872.83	1.19	1014.90	598.62	1.20	1200.77	424.82	1.22	1375.30	1.11
p1	3554.62	0.99	0.39 | 0.00	563.65	0.99	0.73 | 0.62	883.80	1.20	971.00	603.83	1.21	1175.46	411.05	1.19	1349.70	1.11
p2	3529.80	0.98	0.37 | 0.02	555.71	0.97	0.41 | 0.17	842.50	1.15	1126.69	593.35	1.19	1336.72	422.00	1.22	1556.53	1.10

p0_score:	11.16
p1_score:	11.07
p2_score:	11.08

Infrastructure_Operations_Scores:	vMotion	SVMotion	XVMotion	Deploy
Completed_Ops_PerHour	28.50	26.00	20.00	9.00
Avg_Seconds_To_Complete	5.78	85.69	111.02	346.63
Failures	0.00	0.00	0.00	0.00
Ratio	1.10	1.44	1.11	1.12
Number_Of_Threads	1	1	1	1

Summary	Run_Is_Compliant	Turbo_Setting:0
	Number_Of_Compliance_Issues(0)*	Median_Phase(p2)
Unreviewed_VMmark3_Applications_Score	11.08	
Unreviewed_VMmark3_Infrastructure_Score	1.19	
Unreviewed_VMmark3_Score	9.10	

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Configuration

Virtualization Software	
Hypervisor Vendor, Product, Version, and Build / Availability Date (MM-DD-YYYY)	VMware ESXi 6.7 U3 build 14320388 / 8-20-2019
Datacenter Management Software Vendor, Product, Version, and Build / Availability Date (MM-DD-YYYY)	VMware vCenter 6.7 U3 Build 14351034 RTM / 8-20-2019
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	Lenovo ThinkSystem SR655
Processor Vendor and Model	AMD EPYC 7742
Processor Speed (GHz) / Turbo Boost Speed (GHz)	2.25 / 3.4
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, 16 MB shared / 4 cores
BIOS Version	V1.00 (BUILD ID:CFE103I)
Memory Size (in GB, Number of DIMMs)	1024, 16
Memory Type and Speed	64 GB 2Rx4 PC4-2933 MHz RDIMM
Disk Subsystem Type	FC SAN
Number of Disk Controllers	None
Disk Controller Vendors and Models	N/A
Total Number of Physical Disks for Hypervisor	Details in Storage notes
Disk Vendors, Models, Capacities, and Speeds	Details in Storage notes
Number of Host Bus Adapters	1

Host Bus Adapter Vendors and Models	ThinkSystem QLogic QLE2742 PCIe 32Gb 2-Port SFP+ Fibre Channel Adapter
Number of Network Controllers	1
Network Controller Vendors and Models	ThinkSystem Broadcom 57414 10/25GbE SFP28 2-port OCP Ethernet Adapter
Other Hardware	None
Other Software	None
Hardware Availability Date (MM-DD-YYYY)	12-15-2019
BIOS Availability Date (MM-DD-YYYY)	9-6-2019
Software Availability Date (MM-DD-YYYY)	8-28-2019
Network	
Network Switch Vendors and Models	ThinkSystem NE2572 RackSwitch
Network Speed	25 Gbps
Primary Storage	
Storage Category	FC SAN Storage
Storage Vendors, Models, and Firmware Versions	Lenovo ThinkSystem DM7000F Storage

Storage Configuration Summary	• Lenovo DB620S 32GB FC Switch
	• Lenovo ThinkSystem DM7000F Storage
	  ◦ 2 x Lenovo ThinkSystem DM Series DM7000 Controllers
	  ◦ 2 x Lenovo DM Expansion 240S 2U24 SFF
	  ◦ 6 x Lenovo ThinkSystem 5.8TB (6x 960GB, 2.5", SSD) Drive Pack for DM7000F
	  ◦ 23 x LUNs

Datacenter Management Server	
System Model	Lenovo ThinkSystem SR655
Processor Vendor and Model	AMD EPYC 7742
Processor Speed (GHz)	2.25 GHz
Total Sockets/Total Cores/Total Threads	1 Socket / 64 Cores / 128 Threads
Memory Size (in GB, Number of DIMMs)	256 GB
Network Controller(s) Vendors and Models	1 x Broadcom 57414 10/25GbE SFP28 2-port OCP Ethernet Adapter
Operating System, Version, Bitness, and Service Pack	VMware ESXi 6.7 U3 build 14320388

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 6.7 U3 Build 14351034 RTM
Other Hardware	Details in Notes
Other Software	None

Clients	
Total Number of Virtual Clients / Virtual Client Hosts	11 / 2
System Model(s)	Lenovo ThinkSystem SR650
Processor Vendor(s) and Model(s)	Intel Xeon Platinum 8280
Processor Speed(s) (GHz)	2.7 GHz
Total Sockets/Total Cores/Total Threads	2 Socket / 56 Cores / 112 Threads
Memory per Virtual Client Host	768 GB
Network Controller(s) Vendors and Models	1 x Lenovo ThinkSystem Mellanox ConnectX-4 Lx PCIe 25Gb 2-Port SFP28 Ethernet Adapter
Virtual Client Networking Notes	Details in Other Notes
Virtual Client Storage Notes	Details in Client Notes
Other Hardware	• 1 x Lenovo ThinkSystem RAID 530-8i PCIe 12Gb Adapter • 3 x Lenovo 960 GB SATA SFF SSD
Other Software	VMware ESXi 6.7 U3 build 14320388

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: Think Provision Eager Zeroed

Virtualization Software Notes

- vSphere DRS Migration Threshold level set to 1
- vSphere DRS Advanced Option AggressiveCPUActive set to 1
- Logical CPU configuration changed for all multi-cpu VMs to 1 socket with multiple cores (Default: Single core per socket)
- Logging was disabled for all SUT VMs, client VMs, and the primeclient (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)
- All Memory Reserved for DS3DB VMs (Default is Not reserved)
- sched.mem.pin set to TRUE for all DS3DB VMs (Default FALSE)
- 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:

- Numa.LocalityWeightActionAffinity = 0 (default 130)
- Numa.PreferHT = 1 (default 0)
- Mem.ShareScanGHz = 0 (default 4)
- Cpu.HTWholeCoreThreshold = 0 (default 800)
- UserVars.SuppressShellWarning = 1 (default 0)

Server Notes

Server BIOS Settings

- Memory Speed set to Auto
- Memory Operating Mode set to Maximum Performance
- EfficiencyModeEn set to Auto
- NUMA Per Socket set to 4
- LLCasNUMA set to enabled

Networking Notes

vSwitch Configuration

- vSwitch0 on vmnic0 for Managemnt Network, vMotion, and Standby and Deploy VMs
  - MTU 9000 configured on vSwitch0, vmnic0, and vmk0
- vSwitch1 on vmnic 1 for all Auction, DS3, and Elastic VMs
  - Auction, DS3, and Elastic VMs all had an exclusive portgroup
- Each physical NIC is connected to the switch at 25 Gbps

Storage Notes

Lenovo ThinkSystem DM7000F Storage

- Physical Configuration
  - Lenovo Data ONTAP Release 9.4P7
  - 2 x DM7000F Nodes
  - 2 x DM7000F Transform 2-port 32GB Fibre Channel Target Cards
  - 2 x 4096GB Flash Cache was enabled across both Nodes for Reads only
  - Compression and deduplication was disabled across the entire array except for infrastructure operations
    - Compression and deduplications was enabled for LUNs that had Standby, DS3WebA, and Deploy VMs, both source and destination
  - Each LUN was configured with RAID-DP
  - All LUNs were configured with Round Robin Path Policy (default Most Recently Used)
  - The Lenovo ThinkSystem DM7000F Storage System is VAAI capable and enabled
- Virtual Configuration
  - All LUNs deployed on 6 Aggregates
  - First Aggregate
    - 6 x 894GB SSDs
    - 2 x 32GB Boot LUNs exclusive for each ESXi host striped across disk aggregate
    - Each Boot LUN was exposed to both FC ports
  - Second Aggregate
    - 18 x 894GB SSDs
    - 1 x 2TB LUN striped across disk aggregate for all even DS3DB VMs
    - 1 x 300GB LUN striped across disk aggregate for all even AuctionDB VMs
    - 1 x 200GB LUN striped across disk aggregate for all even ElasticDB VMs
    - Each LUN in this aggregate was exposed to the second port on each FC Target Card
  - Third Aggregate
    - 18 x 894GB SSDs
    - 1 x 2TB LUN striped across disk aggregate for all odd DS3DB VMs
    - 1 x 300GB LUN striped across disk aggregate for all odd AuctionDB VMs
    - 1 x 200GB LUN striped across disk aggregate for all odd ElasticDB VMs
    - Each LUN in this aggregate was exposed to the first port on each FC Target Card
  - Fourth Aggregate
    - 6 x 894GB SSDs
    - Compression and deduplication was enabled for all LUNs on the fourth aggregate
    - 1 x 250GB LUN striped across disk aggregate for Standby VMs
    - 1 x 300GB LUN striped across disk aggregate for DS3WebA VMs
    - 1 x 50GB LUN striped across disk aggregate for Deploy Template VM
    - 3 x 200GB LUNs striped across disk aggregate, each dedicated to Standby, DS3WebA, and Deploy VM Infrastructure Operations
    - Each LUN in this aggregate was exposed to the first port on each FC Target Card
  - Fifth Aggregate
    - 6 x 894GB SSDs
    - 1 x 2TB LUN striped across disk aggregate for AuctionNoSQL VMs
    - Each LUN in this aggregate was exposed to the first port on each FC Target Card
  - Sixth Aggreate
    - 6 x 894GB SSDs
    - 1 x 800GB LUN striped across disk aggregate for AuctionApp VMs
    - 1 x 300GB LUN striped across disk aggregate for AuctionLB VMs
    - 1 x 300GB LUN striped across disk aggregate for AuctionMSQ VMs
    - 1 x 600GB LUN striped across disk aggregate for AuctionWeb VMs

- 1 x 500GB LUN striped across disk aggregate for DS3WebB and DS3WebC VMs
- 1 x 600GB LUN striped across disk aggregate for ElasticApp VMs
- 1 x 600GB LUN striped across disk aggregate for ElasticLB VMs
- 1 x 500GB LUN striped across disk aggregate for ElasticWeb VMs
- Each LUN in this aggregate was exposed to the first port on each FC Target Card

Datacenter Management Server Notes

VMware vCenter Appliance 6.7 Update 3 was hosted on a Lenovo ThinkSystem SR655 system that was not part of the client or SUT clusters.

Operating System Notes

All Client and SUT hosts were installed with the VMware ESXi 6.7 Update 3 Lenovo Custom ISO
available at https://my.vmware.com/web/vmware/details?downloadGroup=OEM-ESXI67U3-LENOVO&productId=742

Software Notes

None

Client Notes

Client Host Storage

- VMware ESXi 6.7 U3 was installed on 3 x 894GB SSDs in RAID0 on the Lenovo ThinkSystem RAID 530-8i PCIe 12Gb Adapter on each client host
- All Client VMs including the Prime Client were stored on this local boot drive default datastore

The client VMs were modified as follows:

- Total memory set to 32 GB (default 20 GB)
- Total vCPUs set to16 (default 12)

Client VM Distribution:

- Client Host 1: All even Client VMs
- Client Host 2: All odd Client VMS and the Prime Client

Client hosts vSwitch configuration

- All client VMs were connected tot he same VM Network Portgroup on vSwitch0
- Both 25Gbps ports were connected to vSwitch0 as redundant uplinks
- The management interface was connected to vSwitch0

Advanced Settings

- UserVars.SuppressShellWarning = 1 (default 0)

Other Notes

Changes to VMmark3.properties file:

- TileDelay was set to 20 (default 60)

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