

# VMware® VMmark™ V1.1 Results

**(Approved by VMware for Independent Publication)**

**Vendor and Hardware Platform: IBM® System x® 3650 M2**  
**Virtualization Platform: VMware ESX Build 148592**

**VMmark V1.1 Score =**  
**23.89 @ 17 Tiles**

**Tested By: IBM Inc., RTP, NC**

**Test Date: 03/22/2009**

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## Performance

	webserver		javaserver		mailserver		fileserver		database		
<b>TILE_0</b>	Actual	Ratio	Actual	Ratio	Actual	Ratio	Actual	Ratio	Actual	Ratio	GM
<b>p0</b>	1686.30	1.65	17724.03	1.07	1650.72	1.51	16.28	1.27	2310.65	1.55	1.39
<b>p1</b>	1700.08	1.67	18172.45	1.09	1611.65	1.47	16.41	1.28	2316.65	1.55	1.40
<b>p2</b>	1692.45	1.66	18135.20	1.09	1653.45	1.51	16.68	1.30	2320.47	1.55	1.41
<b>TILE_1</b>	Actual	Ratio	Actual	Ratio	Actual	Ratio	Actual	Ratio	Actual	Ratio	GM
<b>p0</b>	1691.58	1.66	18147.22	1.09	1457.50	1.33	17.01	1.33	2338.82	1.57	1.38
<b>p1</b>	1696.75	1.67	17678.45	1.06	1564.75	1.43	17.15	1.34	2343.93	1.57	1.40
<b>p2</b>	1696.38	1.66	18118.42	1.09	1486.85	1.36	17.00	1.32	2362.43	1.58	1.39
<b>TILE_2</b>	Actual	Ratio	Actual	Ratio	Actual	Ratio	Actual	Ratio	Actual	Ratio	GM
<b>p0</b>	1866.55	1.83	18160.90	1.09	1434.20	1.31	16.73	1.30	2342.88	1.57	1.40
<b>p1</b>	1888.10	1.85	17704.22	1.07	1529.38	1.39	16.95	1.32	2347.62	1.57	1.42
<b>p2</b>	1889.40	1.85	18129.22	1.09	1393.12	1.27	16.82	1.31	2345.53	1.57	1.40
<b>TILE_3</b>	Actual	Ratio	Actual	Ratio	Actual	Ratio	Actual	Ratio	Actual	Ratio	GM
<b>p0</b>	1694.88	1.66	18106.85	1.09	1678.45	1.53	16.81	1.31	2347.30	1.57	1.42
<b>p1</b>	1700.90	1.67	17638.35	1.06	1727.38	1.57	17.16	1.34	2348.12	1.57	1.42
<b>p2</b>	1697.38	1.67	18109.35	1.09	1700.72	1.55	17.03	1.33	2346.10	1.57	1.42
<b>TILE_4</b>	Actual	Ratio	Actual	Ratio	Actual	Ratio	Actual	Ratio	Actual	Ratio	GM
<b>p0</b>	1690.30	1.66	18119.10	1.09	1470.28	1.34	16.47	1.28	2370.18	1.59	1.38
<b>p1</b>	1705.90	1.67	18104.15	1.09	1368.42	1.25	16.74	1.30	2373.78	1.59	1.36
<b>p2</b>	1700.53	1.67	17655.22	1.06	1410.53	1.29	16.74	1.30	2368.35	1.59	1.36
<b>TILE_5</b>	Actual	Ratio	Actual	Ratio	Actual	Ratio	Actual	Ratio	Actual	Ratio	GM
<b>p0</b>	1668.92	1.64	18143.70	1.09	1746.08	1.59	16.80	1.31	2363.15	1.58	1.43
<b>p1</b>	1677.75	1.65	18157.78	1.09	1698.62	1.55	17.08	1.33	2369.15	1.59	1.43

<b>p2</b>	1673.62	1.64	17695.15	1.07	1741.70	1.59	17.07	1.33	2372.47	1.59	1.43
<b>TILE_6</b>	Actual	Ratio	Actual	Ratio	Actual	Ratio	Actual	Ratio	Actual	Ratio	GM
<b>p0</b>	1819.15	1.79	18116.38	1.09	1440.50	1.31	15.15	1.18	2352.45	1.58	1.37
<b>p1</b>	1844.72	1.81	18113.80	1.09	1463.20	1.33	15.08	1.18	2357.07	1.58	1.37
<b>p2</b>	1852.50	1.82	18109.12	1.09	1530.10	1.40	15.24	1.19	2362.07	1.58	1.39
<b>TILE_7</b>	Actual	Ratio	Actual	Ratio	Actual	Ratio	Actual	Ratio	Actual	Ratio	GM
<b>p0</b>	1723.58	1.69	18119.03	1.09	1749.60	1.60	17.04	1.33	2357.47	1.58	1.44
<b>p1</b>	1734.50	1.70	18073.83	1.09	1843.88	1.68	17.22	1.34	2366.30	1.59	1.46
<b>p2</b>	1723.60	1.69	18073.33	1.09	1637.20	1.49	17.23	1.34	2361.00	1.58	1.42
<b>TILE_8</b>	Actual	Ratio	Actual	Ratio	Actual	Ratio	Actual	Ratio	Actual	Ratio	GM
<b>p0</b>	1722.80	1.69	18090.45	1.09	1648.95	1.50	17.22	1.34	2358.80	1.58	1.42
<b>p1</b>	1727.10	1.69	18085.40	1.09	1791.97	1.63	17.22	1.34	2364.47	1.58	1.45
<b>p2</b>	1723.20	1.69	18084.78	1.09	1779.38	1.62	17.13	1.34	2364.82	1.58	1.45
<b>TILE_9</b>	Actual	Ratio	Actual	Ratio	Actual	Ratio	Actual	Ratio	Actual	Ratio	GM
<b>p0</b>	1719.40	1.69	18081.05	1.09	1573.97	1.44	16.83	1.31	2351.38	1.58	1.40
<b>p1</b>	1730.65	1.70	18095.33	1.09	1692.05	1.54	16.79	1.31	2368.88	1.59	1.43
<b>p2</b>	1721.50	1.69	18099.28	1.09	1740.67	1.59	17.01	1.33	2361.70	1.58	1.44
<b>TILE_10</b>	Actual	Ratio	Actual	Ratio	Actual	Ratio	Actual	Ratio	Actual	Ratio	GM
<b>p0</b>	1669.58	1.64	18060.22	1.09	1362.10	1.24	16.09	1.25	2375.20	1.59	1.35
<b>p1</b>	1680.88	1.65	18046.15	1.09	1387.62	1.27	16.41	1.28	2383.10	1.60	1.36
<b>p2</b>	1675.40	1.64	18041.30	1.09	1516.47	1.38	16.83	1.31	2386.75	1.60	1.39
<b>TILE_11</b>	Actual	Ratio	Actual	Ratio	Actual	Ratio	Actual	Ratio	Actual	Ratio	GM
<b>p0</b>	1801.90	1.77	17434.45	1.05	1551.58	1.41	17.10	1.33	2330.22	1.56	1.40
<b>p1</b>	1823.20	1.79	17968.72	1.08	1680.40	1.53	17.32	1.35	2331.82	1.56	1.44
<b>p2</b>	1831.83	1.80	18041.05	1.09	1642.72	1.50	17.39	1.36	2332.00	1.56	1.44
<b>TILE_12</b>	Actual	Ratio	Actual	Ratio	Actual	Ratio	Actual	Ratio	Actual	Ratio	GM
<b>p0</b>	1693.10	1.66	18074.65	1.09	1436.28	1.31	16.18	1.26	2357.32	1.58	1.36
<b>p1</b>	1698.65	1.67	17647.38	1.06	1673.92	1.53	16.68	1.30	2363.72	1.58	1.41
<b>p2</b>	1699.28	1.67	18102.42	1.09	1695.45	1.55	16.59	1.29	2367.45	1.59	1.42
<b>TILE_13</b>	Actual	Ratio	Actual	Ratio	Actual	Ratio	Actual	Ratio	Actual	Ratio	GM
<b>p0</b>	1867.42	1.83	17671.55	1.06	1333.58	1.22	16.21	1.26	2354.22	1.58	1.36
<b>p1</b>	1888.12	1.85	18129.20	1.09	1594.38	1.45	16.76	1.31	2350.62	1.58	1.43
<b>p2</b>	1896.62	1.86	18144.45	1.09	1691.15	1.54	16.98	1.32	2362.97	1.58	1.46
<b>TILE_14</b>	Actual	Ratio	Actual	Ratio	Actual	Ratio	Actual	Ratio	Actual	Ratio	GM
<b>p0</b>	1838.92	1.80	18075.30	1.09	1227.70	1.12	16.94	1.32	2264.03	1.52	1.34
<b>p1</b>	1859.17	1.82	18099.72	1.09	1284.70	1.17	17.06	1.33	2267.05	1.52	1.36
<b>p2</b>	1863.62	1.83	18104.67	1.09	1205.08	1.10	17.15	1.34	2261.47	1.52	1.35
<b>TILE_15</b>	Actual	Ratio	Actual	Ratio	Actual	Ratio	Actual	Ratio	Actual	Ratio	GM

<b>p0</b>	1722.30	1.69	17651.83	1.06	1317.35	1.20	17.14	1.34	2351.78	1.58	1.35
<b>p1</b>	1723.28	1.69	18092.42	1.09	1522.80	1.39	17.25	1.34	2352.47	1.58	1.40
<b>p2</b>	1718.88	1.69	18120.15	1.09	1663.17	1.52	17.14	1.34	2352.25	1.58	1.42
<b>TILE_16</b>	Actual	Ratio	Actual	Ratio	Actual	Ratio	Actual	Ratio	Actual	Ratio	GM
<b>p0</b>	1726.40	1.69	17991.17	1.08	1154.58	1.05	16.52	1.29	2357.03	1.58	1.31
<b>p1</b>	1734.33	1.70	18075.17	1.09	1228.00	1.12	16.99	1.32	2354.93	1.58	1.34
<b>p2</b>	1722.20	1.69	18095.75	1.09	1296.92	1.18	17.10	1.33	2353.05	1.58	1.36
<b>p0_score:</b>	23.52										
<b>p1_score:</b>	23.89										
<b>p2_score:</b>	23.94										
<b>Unreviewed_VMmark_Score:</b>	23.89										

## Configuration

<b>Server and Network</b>	
Server Manufacturer and Model	IBM System x3650 M2
Processor Vendor and Model	Intel® Xeon® Processor X5570 2.93GHz/8MB L3 Cache
Processor Speed (GHz)	2.93
Number of Sockets/Cores per Socket/Threads	2 Sockets / 4 Cores per Socket (8 Cores Total)/16 Threads
Primary Cache	32 KB(I) + 32KB(D) on chip, per core
Secondary Cache	256KB per core, 1MB per processor
Other Cache	8MB L3 cache per processor
Memory	96 GB (12 x 8GB Registered DDR3 1066 PC3-8500R)
Disk Subsystem Type	FC SAN (OS + VMs)
Number of Disk Controllers	4
Number of Host Bus Adapters	2
Host Bus Adapter Vendors and Models	2 x QLogic QLA2462
Number of Network Controllers	3 (one is onboard)
Network Controller Vendors and Models	Intel PRO 1000PT Dual Port 1GbE Broadcom Net Extreme II BCM5709 1000-BaseT Dual Port (1 port unused and disabled)
Network Switch	Extreme Networks Summit® 400-48t

Vendors and Models	
Network Speed	Gigabit Ethernet TX
Other Hardware	None
Other Software	None
Hardware Availability Date	06/28/2009
Software Availability Date	04/30/2009

### Virtualization Software

Vendor, Product, Version, and Build	VMware ESX 148592
Virtualization Type	Hardware Virtualization
Supplemental Software	None
Virtualization Software Availability Date	07/07/2009

### Storage

Array Vendor, Model, and Firmware Version	2 x IBM System Storage DS4800, version 07.15.10.01 19 x IBM System Storage EXP 810 storage expansion unit, version B977
Fibre Channel Switch Vendors and Models	None
Disk Space Used	1329 GB
Array Cache Size	IBM System Storage DS4800, 4GB
Number and Size of LUNs	Total of 103 LUNs; Each virtual machine is installed on its own LUN 1 LUN (ESX host): 100GB 17 LUNs (DB VMs): 64GB each LUN 68 LUNs (Mailserver, Javasever, Webserver, Fileserver VMs): 100GB each LUN 17 LUNs: (Standby): 75GB each LUN
RAID Type	ESX LUN: RAID5 DB LUNs: RAID1 All Other LUNs: RAID10
Number of Members per RAID Set	ESX LUN: 16 members DB LUNs: 2 members All Other LUNs: 14 members
Disk Vendor, Model, and Speed	Seagate Technologies Inc., ST373455FC, 15K RPM

### Clients

Number of Clients	17
System Model(s)	IBM eServer xSeries 335
Processor Vendor(s) and Model(s)	Intel Xeon
Processor Speed(s) (GHz)	2.8
Number of Sockets/Cores per Socket	2 Sockets / 1 Cores per Socket (2 Cores Total), Hyper-Threading Enabled
Memory	2 GB
Network Controller Vendor and Model	Broadcom NetXtreme Gigabit Ethernet
Operating System, Version, and Service Pack	Microsoft Windows Server 2003 R2 Enterprise Edition SP2

Other Hardware	None
Other Software	None

## Notes for Workload

### Server and Network Notes

- Onboard SAS removed. (default enabled)
- Intel Turbo Boost Technology up to 3.2GHz (Default BIOS setting)

### Virtualization Software Notes

- VMware ESX Build 148592
  - Five vSwitches: vSwitch0, vSwitch1, vSwitch2, vSwitch3 and vSwitch4
  - All vSwitches are configured with 120 ports (default 56)
  - All vSwitches are configured with speed: 1000 TX, Full Duplex (default Auto negotiate)
  - vSwitch0 was attached to vmnic0
  - vSwitch1 was attached to vmnic2
  - vSwitch2 was attached to vmnic3
  - vSwitch3 was attached to vmnic4
  - vSwitch4 was attached to vmnic5
  - Service console is attached to vSwitch0
  - Webservers 0-7 are attached to vSwitch4
  - Webservers 8-16 are attached to vSwitch2
  - Database/Fileserver/ Java/Mail/Standby 0-7 are attached to vSwitch1
  - Database/Fileserver/ Java/Mail/Standby 8-16 are attached to vSwitch3
  - Network adapter type was set to vmxnet3 for all VMs
  - 2 physical Arrays (1 2-disk RAID1, and 1 14-disk RAID10) are configured for each tile.
1. The database VM is stored on the 2-disk RAID1 array
  2. The remaining VMs (Fileserver, Javaserver, Mailserver, Standby and Webserver) are stored on the 14-disk RAID10 Array
- Each Virtual Machine is stored on its own LUN.
  - ESX boot image was on LUN 0
  - Stopped Firewall and IPTables processes on ESX host prior to run
  - VMFS2 module was unloaded prior to run
  - Disabled ESX logging on all VMs
  - CPU/MMU Virtualization was set to Hardware on all VMs (CPU/MMU)
  - Disk.SchedNumReqOutstanding was set to 128 (default 32)
  - EtherswitchHashSize was set to 4 (default 1)
  - BufferCache.SoftMaxDirty was set to 85 (default 15)

- /adv/VMFS3/MaxHeapSizeMB = "64"
- /vmkernel/module/vmfs3/options = "MaxHeapSizeMB=64"
- QL2xMaxqdepth was set to 64
- MaxPortRxQueueLen was set to 160 (default 80)
- MaxNetifRxQueueLen was set to 300 (default 100)
- MaxNetifTxQueueLen was set to 1000 (default 500)
- IDE and Floppy devices were removed from all VMs (with the exception of the floppy device on Standby9) prior to run (default connected)

## Operating System Notes

- Microsoft Windows Server 2003 R2 Enterprise Edition Service Pack 2 on Windows-based virtual machines
- KB 933360 was applied
- Suse Linux Enterprise Server 10 (64-bit) Service Pack 2 on 64-bit Linux-based virtual machines
- Suse Linux Enterprise Server 10 (32-bit) Service Pack 2 on 32-bit Linux-based virtual machines

## Software Notes

### Client Notes

- Microsoft Windows Server 2003 R2 Enterprise Edition, Service Pack 2
- [KB 933360](#) was applied

### Other Notes

#### IBM System Storage DS4800

- Cache block size 16KB (default 4KB)
- Background media scan disabled (default enabled)
- Write caching with mirroring disabled (default enabled)
- Write caching without batteries disabled (default enabled)

#### QLogic QLA2462

- Loop reset delay 8 (default 5)
- PortDownRetryCount 14 (default 30)
- Operation Mode 5 (default 0)
- Interrupt Delay Timer 10 (default 0)

- Enable Target Reset No (default Yes)
- Link down timeout 60 (default 30)
- Execution Throttle 256 (default 16)
- LUNs per Target 256 (default 128)
- Maximum queue depth 64 (default 32)

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