Fujitsu Publishes the First SAP Three-Tier Benchmark on VMware vSphere™

Fully Virtualized Environment Supports 16,000 Users and Achieves an 87,800 SAPS Rating

Fujitsu engineers designed and tested an SAP three-tier test made up of virtualized systems running on VMware vSphere™ 4.0 using the SAP SD Benchmark. The published results of this test highlight support of an impressive 16,000 users with a SAPS rating of 87,800. This shows that large numbers of SAP users can be supported in a virtual environment spread across many hosts while providing good performance. Using Fujitsu PRIMERGY servers with Intel Xeon 5500 series processors, only minimal vSphere tuning was needed to achieve these excellent benchmark results with a completely virtualized SAP landscape.

This test result breaks new ground with the first three-tier SAP SD Benchmark certified on a virtualized environment. Additionally, the SuSE Enterprise Linux with MaxDB platform configuration shows that Linux can perform very well in a three-tier virtualized SAP environment.

SAP Three-Tier Benchmark

In a two-tier benchmark configuration, the application and database run on the same system and CPU utilization is dominated by the application instances, with only about ten percent of CPU resources being used by the database. A three-tier configuration with the application and database running on separate systems has a very different load profile. The database uses a large shared memory area and has a much higher amount of disk I/O while being able to use all of the CPU resources. This allows for a much larger number of users to be supported by the database. The communication between the application servers and database server creates a large amount of network traffic. These differences in configuration result in a test that stresses not just CPU resources, but also network and disk.

Test Configuration

The diagram in Figure 1 shows the configuration of the three-tier test. The application-tier used seven Fujitsu PRIMERGY BX900 blade servers, each with two Intel Xeon x5560 quad-core 2.8 GHz processors and 36 GB of RAM. The database tier was a Primergy RX300 S5 server with two Intel Xeon x5570 quad-core 2.9 GHz processors and 96 GB of RAM. An EMC CX4-120 storage array with 78 disks was dedicated for the database logs and data. A dual port fibre channel 4-GBit adapter was used to directly connect the database server to the two storage processors on the array. Benchmark clients ran in the presentation layer for this test on a PRIMERGY 4 socket RX600.

The Fujitsu PRIMERGY servers ran VMware vSphere 4.0, which hosted the virtual machines. On each of the blade servers, two application server virtual machines were created. Each virtual machine had 8 vCPUs, 16 GB of memory, and two virtual NICs. A database virtual machine with 8 vCPUs, 80 GB of memory, and 4 virtual NICs was created on the RX300.

All of the virtual machines ran 64-bit SuSE Enterprise Linux 10 SP2 and the database was MaxDB 7.8. The version of SAP used was ERP 6.0 with Enhancement Pack 4. There were two SAP application server instances in each of the fourteen application server virtual machines. The only exception to this was the first application server virtual machine, which also had the central instance that provided the message and enqueue servers.

The network configuration was designed to optimize the throughput between the application and database tiers. Each of the blade servers hosting the application server virtual machines had two physical NICs. One was used for communication with the presentation tier and the other for communication with the database tier. The database server had four physical NICs. Three were used for communication with the application tier and one was used for communication with the presentation tier (not shown in the diagram). The application server virtual machines were divided into three groups and communicated with the database virtual machine through the three NICs on the database server. Two gigabit Ethernet switches were used. One switch was between the presentation tier and application tier and the second switch was dedicated for communication between the application and database tiers.

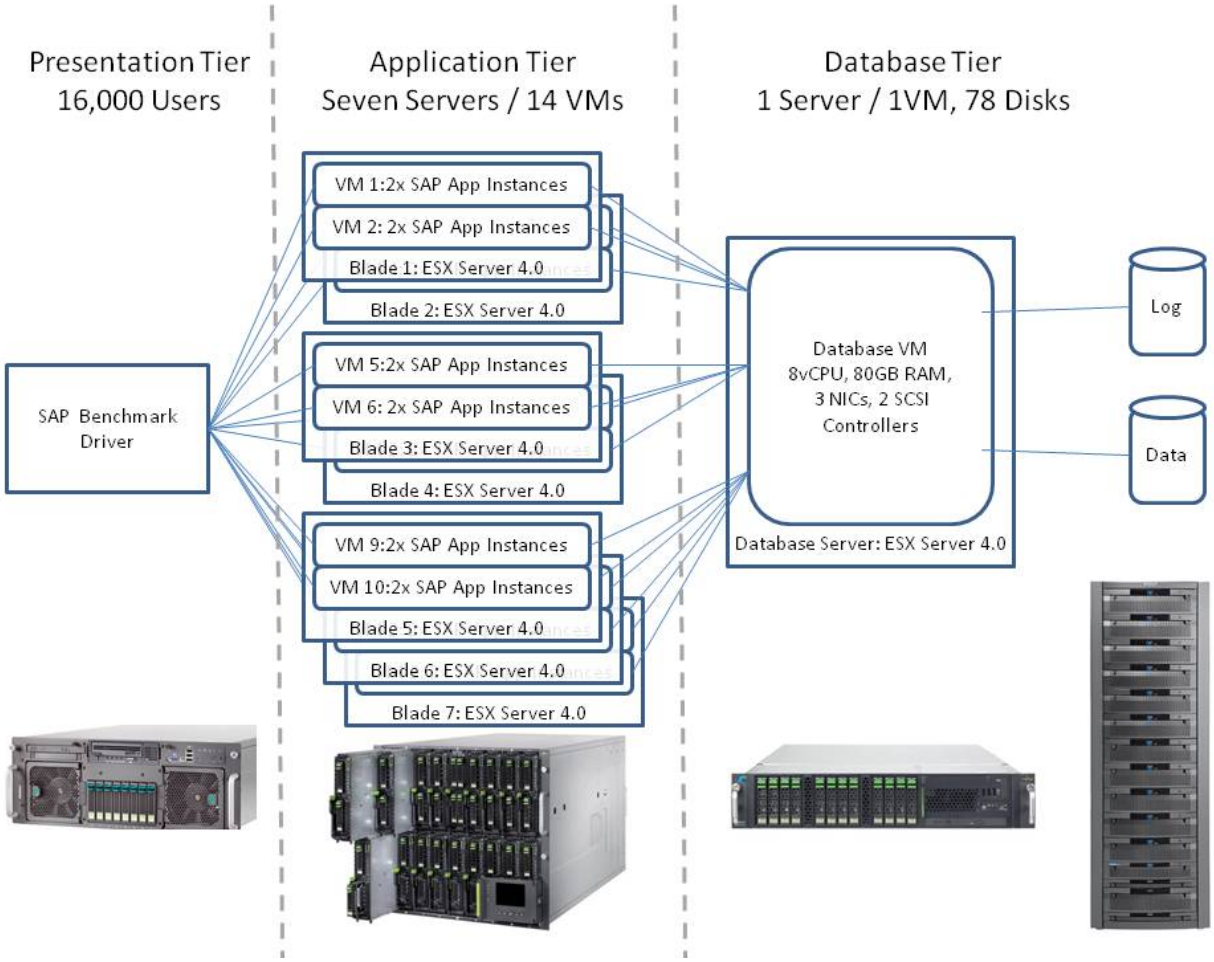

Figure 1. SAP Three-Tier Benchmark Test Configuration

Key Performance Settings and Configuration

In general, the settings used in this virtualized three-tier setup are very similar to those that would be used for the same environment on physical servers. There were a few things that were specific to the virtual configuration. Tuning the SAP application server instances revealed that the number of dialogue update processes needed to be set higher. A second virtual SCSI adapter was added to the database virtual machine, which allowed for one adapter to be used for log LUN and the other for the data LUNs. In physical-only SAP benchmarks, it is common to pin processes to specific CPUs; this was done in the benchmark configuration as well, but was extended to the virtual layer by using CPU affinity settings to keep each application server on a specific socket.

Conclusion

The first fully virtualized SAP three-tier result shows that it is possible to achieve high levels of performance and scalability in virtual infrastructure deployments. Using Fujitsu PRIMERGY servers and VMware vSphere provided a high level of performance to satisfy requirements for the SAP benchmark, which stresses many aspects of resource usage, while requiring that consistent response time criteria be maintained.

The official SAP SD three-tier results referenced in this document are based on certification # 2010016. To see the full certification document and details of the SAP benchmark described in this document, please see http://www.sap.com/benchmark.

BENCHMARK PERFORMANCE HIGHLIGHTS	
SAP SD Users	16,000 (with 0.93 seconds average response time)
SAPS	87,800
Disk I/O:	
DB Log I/O (IOPS)	1,600
DB Log Data Transfer Rate (MByte/second)	26
Peak I/O during Savepoint (IOPS)	3,500
Network:	
Network Benchmark Driver◄► Application Servers	
Packets per second	27,000
Data Transfer Rate (MByte/second)	16
Network Application Servers◄► DB Server	
Packets (1/second)	160,000
Data Transfer Rate (MByte/second)	100

VMware, Inc. 3401 Hillview Avenue Palo Alto CA 94304 USA Tel 877-486-9273 Fax 650-427-5001 www.vmware.com