# White Paper
# FUJITSU Server PRIMERGY
# Performance Report PRIMERGY RX2520 M5

This document contains a summary of the benchmarks executed for the FUJITSU Server PRIMERGY RX2520 M5.

The PRIMERGY RX2520 M5 performance data are compared with the data of other PRIMERGY models and discussed. In addition to the benchmark results, an explanation has been included for each benchmark and for the benchmark environment.

**Version**
1.0
2019/07/26

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# Document history

### *Version 1.0 (2019/07/26)*

New:

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  Calculated with 2nd Generation Intel® Xeon® Processor Scalable Family

# Technical data

**PRIMERGY RX2520 M5**
PY RX2520 M5 12 x 3.5'

**PRIMERGY RX2520 M5**
PY RX2520 M5 8x 2.5' expandable

Decimal prefixes according to the SI standard are used for measurement units in this white paper (e.g. 1 GB = $10^9$ bytes). In contrast, these prefixes should be interpreted as binary prefixes (e.g. 1 GB = $2^{30}$ bytes) for the capacities of caches and memory modules. Separate reference will be made to any further exceptions where applicable.

| Model | PRIMERGY RX2540 M4 |
|---|---|
| Model versions | RX2520 M5 / 4x3.5”<br>RX2520 M5 / 12x3.5”<br>RX2520 M5 / 8x2.5”<br>RX2520 M5 / 16x2.5”<br>RX2520 M5 / 24x2.5”<br>RX2520 M5 / PCIe-SSD |
| Form factor | Rack server |
| Chipset | Intel® C624 |
| Number of sockets | 2 |
| Number of processors orderable | 1 or 2 |
| Processor type | 2nd Generation Intel® Xeon® Scalable Processors Family |
| Number of memory slots | 12 (6 per processor) |
| Maximum memory configuration | 768 GB |
| Onboard HDD controller | Controller with RAID 0, RAID 1 or RAID 10 for up to 8 SATA HDDs |
| PCI slots | 1 × PCI-Express 3.0 x8<br>3 × PCI-Express 3.0 x16 |
| Max. number of internal hard disks | RX2520 M5 / 4x 3.5” : 8<br>RX2520 M5 / 12x 3.5” : 12<br>RX2520 M5 / 8x 2.5” : 24<br>RX2520 M5 / 16x2.5” : 16<br>RX2520 M5 / 24x2.5” : 24<br>RX2520 M5 / PCIe-SSD : 8x2.5” SAS/SATA + 4xPCIe-SSD (2.5”) |

| Processors (since system release) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Processor | Cores | Threads | Cache [MB] | UPI Speed [GT/s] | Rated Frequency [Ghz] | Max. Turbo Frequency [Ghz] | Max. Memory Frequency [MHz] | TDP [Watt] |
| Xeon Gold 5222 | 4 | 8 | 16.5 | 10.4 | 3.8 | 3.9 | 2666 | 105 |
| Xeon Gold 5220 | 18 | 36 | 24.8 | 10.4 | 2.2 | 3.9 | 2666 | 125 |
| Xeon Gold 5218 | 16 | 32 | 22.0 | 10.4 | 2.3 | 3.9 | 2666 | 125 |
| Xeon Gold 5217 | 8 | 16 | 11.0 | 10.4 | 3.0 | 3.7 | 2666 | 115 |
| Xeon Gold 5215 | 10 | 20 | 13.8 | 10.4 | 2.5 | 3.4 | 2666 | 85 |
| Xeon Silver 4216 | 16 | 32 | 22.0 | 9.6 | 2.1 | 3.2 | 2400 | 100 |
| Xeon Silver 4215 | 8 | 16 | 11.0 | 9.6 | 2.5 | 3.5 | 2400 | 85 |
| Xeon Silver 4214Y | 12 | 24 | 16.5 | 9.6 | 2.2 | 3.2 | 2400 | 85 |
| | 10 | 20 | | | | | | |
| | 8 | 16 | | | | | | |
| Xeon Silver 4214 | 12 | 24 | 16.5 | 9.6 | 2.2 | 3.2 | 2400 | 85 |
| Xeon Silver 4210 | 10 | 20 | 13.8 | 9.6 | 2.2 | 3.2 | 2400 | 85 |
| Xeon Silver 4208 | 8 | 16 | 11.0 | 9.6 | 2.1 | 3.2 | 2400 | 85 |
| Xeon Bronze 3204 | 6 | 6 | 8.3 | 9.6 | 1.9 | | 2133 | 85 |

All the processors that can be ordered with the PRIMERGY RX2520 M5, apart from Xeon Bronze 3204, support Intel® Turbo Boost Technology 2.0. This technology allows you to operate the processor with higher frequencies than the nominal frequency. Listed in the processor table is "Max. Turbo Frequency" for the theoretical maximum frequency with only one active core per processor. The maximum frequency that can actually be achieved depends on the number of active cores, the current consumption, electrical power consumption, and the temperature of the processor.
As a matter of principle, Intel does not guarantee that the maximum turbo frequency can be reached. This is related to manufacturing tolerances, which result in a variance regarding the performance of various examples of a processor model. The range of the variance covers the entire scope between the nominal frequency and the maximum turbo frequency.
The turbo functionality can be set via BIOS option. Fujitsu generally recommends leaving the "Turbo Mode" option set at the standard setting of "Enabled", as performance is substantially increased by the higher frequencies. However, since the higher frequencies depend on general conditions and are not always guaranteed, it can be advantageous to disable the "Turbo Mode" option for application scenarios with intensive use of AVX instructions and a high number of instructions per clock unit, as well as for those that require constant performance or lower electrical power consumption.

## Suffix of Processor number shows additional feature of Xeon Processor.

The processors with M/L suffix support larger memory capacity of 2TB/socket(M-suffix) or 4.5TB/socket(L-suffix) whereas normal processors support 1TB/socket memory capacity.
The processors with S suffix are specifically designed to offer consistent performance for search workloads.
The processors with U suffix are only capable of single socket but the prices are lower than comparable normal processors with the same core count and frequency.
The processors with V suffix are specifically designed to help maximize $/VM
The processors with Y suffix support Intel Speed Select Technology. It enables to provide 3 distinct configurations( number of active cores and frequencies) which customer can choose in BIOS option.
Specifications of Xeon Gold 5218B and Xeon Gold 5218 including core count and frequencies are the same. The difference is minor electrical specifications only.

| Suffix | Additional feature |
|---|---|
| M | Support up to 2TB/socket memory |
| L | Support up to 4.5TB/socket memory |
| S | Search Optimized |
| U | Single Socket |
| V | VM Density Optimized |
| Y | Speed Select |

| Memory modules (since system release) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Memory module | Capacity [GB] | Ranks | Bit width of the memory chips | Frequency [MHz] | Load Reduced | Registered | NVDIMM | ECC |
| 8 GB (1x8 GB) 1Rx8 DDR4-2933 R ECC | 8 | 1 | 8 | 2933 | | ✓ | | ✓ |
| 16 GB (1x16 GB) 2Rx8 DDR4-2933 R ECC | 16 | 2 | 8 | 2933 | | ✓ | | ✓ |
| 16 GB (1x16 GB) 1Rx4 DDR4-2933 R ECC | 16 | 1 | 4 | 2933 | | ✓ | | ✓ |
| 32 GB (1x32 GB) 2Rx4 DDR4-2933 R ECC | 32 | 2 | 4 | 2933 | | ✓ | | ✓ |
| 64 GB (1x64 GB) 2Rx4 DDR4-2933 R ECC | 64 | 2 | 4 | 2933 | | ✓ | | ✓ |

| Power supplies (since system release) | Max. number |
|---|---|
| Modular PSU 450 W platinum hp | 2 |
| Modular PSU 800 W platinum hp | 2 |
| Modular PSU 800 W titanium hp | 2 |

Some components may not be available in all countries or sales regions.
Detailed technical information is available in the data sheet PRIMERGY RX2520 M5.

# SPECcpu2017

## Benchmark description

SPECcpu2017 is a benchmark which measures the system efficiency with integer and floating-point operations. It consists of an integer test suite (SPECrate 2017 Integer, SPECspeed 2017 Integer) containing 10 applications and a floating-point test suite (SPECrate 2017 Floating Point, SPECspeed 2017 Floating Point) containing 14 applications. Both test suites are extremely computing-intensive and concentrate on the CPU and the memory. Other components, such as Disk I/O and network, are not measured by this benchmark.

SPECcpu2017 is not tied to a special operating system. The benchmark is available as source code and is compiled before the actual measurement. The used compiler version and their optimization settings also affect the measurement result.

SPECcpu2017 contains two different performance measurement methods: The first method (SPECspeed 2017 Integer or SPECspeed 2017 Floating Point) determines the time which is required to process a single task. The second method (SPECrate 2017 Integer or SPECrate 2017 Floating Point) determines the throughput, i.e. the number of tasks that can be handled in parallel. Both methods are also divided into two measurement runs, “base” and “peak”, which differ in the use of compiler optimization. When publishing the results, the base values are always used and the peak values are optional.

| Benchmark | Number of single benchmarks | Arithmetics | Type | Compiler optimization | Measurement result |
|---|---|---|---|---|---|
| SPECspeed2017_int_peak | 10 | integer | peak | aggressive | Speed |
| SPECspeed2017_int_base | 10 | integer | base | conservative | |
| SPECrate2017_int_peak | 10 | integer | peak | aggressive | Throughput |
| SPECrate2017_int_ base | 10 | integer | base | conservative | |
| SPECspeed2017_fp_peak | 10 | floating point | peak | aggressive | Speed |
| SPECspeed2017_fp_base | 10 | floating point | base | conservative | |
| SPECrate2017_fp_peak | 13 | floating point | peak | aggressive | Throughput |
| SPECrate2017_fp_base | 13 | floating point | base | conservative | |

The measurement results are the geometric average from normalized ratio values which have been determined for individual benchmarks. The geometric average - in contrast to the arithmetic average - means that there is a weighting in favor of the lower individual results. Normalized means that the measurement is how fast is the test system compared to a reference system. Value “1” was defined for the SPECspeed2017_int_base, SPECrate2017_int_base, SPECspeed2017_fp_base, and SPECrate2017_fp_base results of the reference system. For example, a SPECspeed2017_int_base value of 2 means that the measuring system has handled this benchmark twice as fast as the reference system. A SPECrate2017_fp_base value of 4 means that the measuring system has handled this benchmark some 4/[# base copies] times faster than the reference system. “# base copies” specifies how many parallel instances of the benchmark have been executed.

Not every SPECcpu2017 measurement is submitted by us for publication at SPEC. This is why the SPEC web pages do not have every result. As we archive the log files for all measurements, we can prove the correct implementation of the measurements at any time.

# Benchmark environment

| System Under Test (SUT) | |
|---|---|
| **Hardware** | |
| Model | PRIMERGY RX2520 M5 |
| Processor | 2nd Generation Intel® Xeon® Scalable Processors Family |
| Memory | 12 × 32 GB (1x32 GB) 2Rx4 PC4-2933Y-R |
| **Software** | |
| BIOS settings | Xeon Gold 5220:<br>SPECrate2017_int:<br>Patrol Scrub = Disabled<br>DCU Ip Prefetcher = Disabled<br>DCU Streamer Prefetcher = Disabled<br>Fan Control = Full<br>Stale AtoS = Enable<br>WR CRC feature Control = Disabled<br><br>SPECrate2017_fp<br>Patrol Scrub = Disabled<br>WR CRC feature Control = Disabled<br>Fan Control = Full |
| Operating system | SUSE Linux Enterprise Server 15 4.12.14-25.28-default |
| Operating system settings | SPECrate2017_int:<br>Stack size set to unlimited using "ulimit -s unlimited"<br>Kernel Boot Parameter set with : nohz_full=1-71<br>echo 10000000 > /proc/sys/kernel/sched_min_granularity_ns<br><br>SPECrate2017_fp:<br>Stack size set to unlimited using "ulimit -s unlimited"<br>Kernel Boot Parameter set with : nohz_full=1-71 |
| Compiler | SPECrate2017_int:<br>C/C++: Version 19.0.1.144 of Intel C/C++ Compiler for Linux;<br>Fortran: Version 19.0.1.144 of Intel Fortran Compiler for Linux<br><br>SPECrate2017_fp:<br>C/C++: Version 19.0.0.117 of Intel C/C++ Compiler for Linux;<br>Fortran: Version 19.0.0.117 of Intel Fortran Compiler for Linux |

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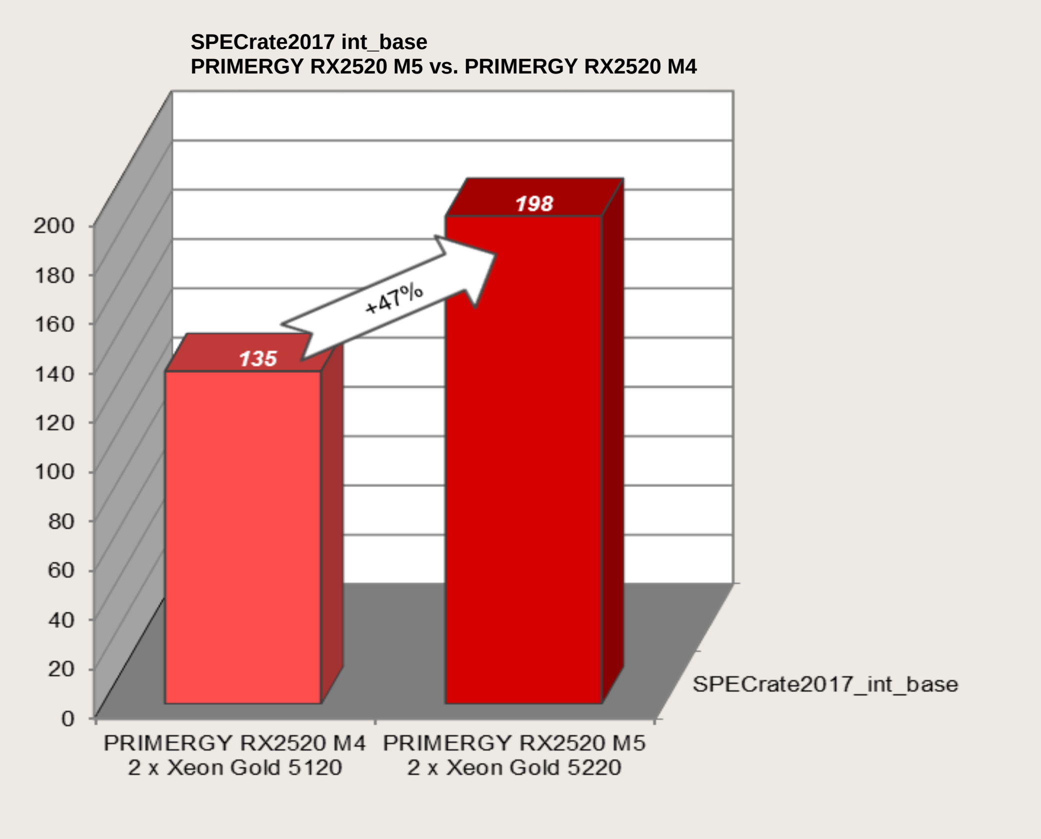
## Benchmark results

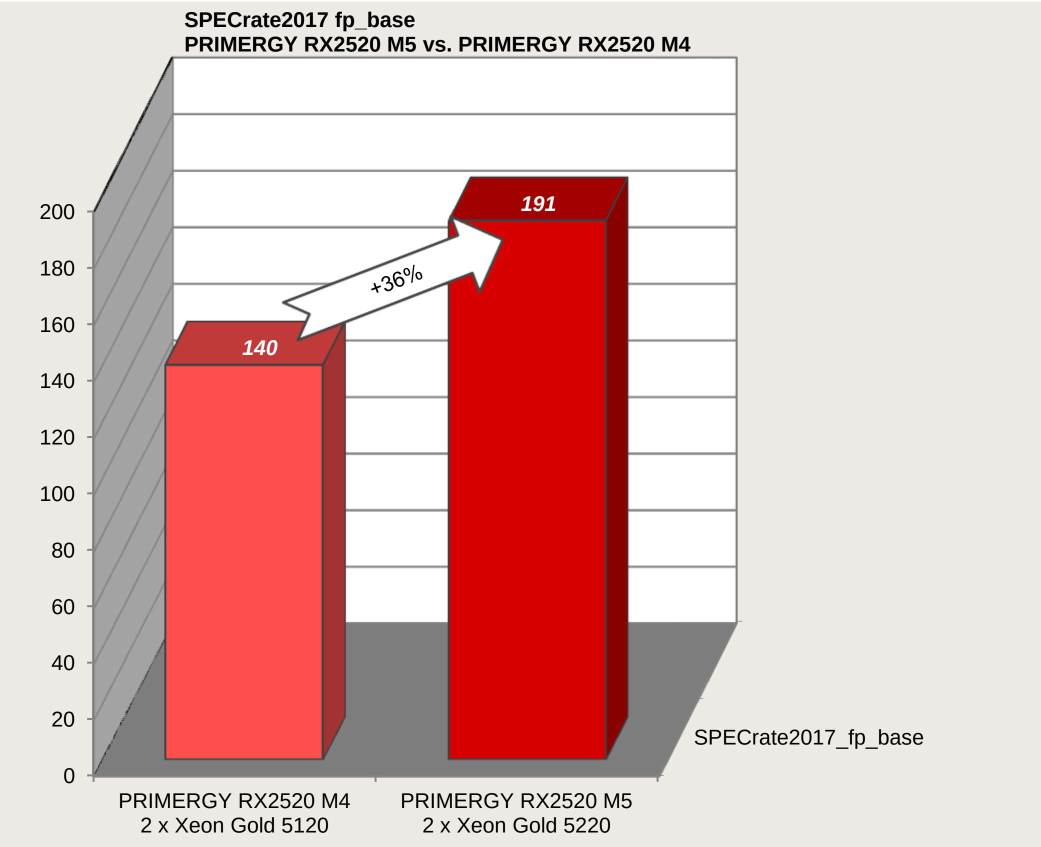
In terms of processors, the benchmark result depends primarily on the size of the processor cache, the support for Hyper-Threading, the number of processor cores, and the processor frequency. In the case of processors with Turbo mode, the number of cores, which are loaded by the benchmark, determines the maximum processor frequency that can be achieved. In the case of single-threaded benchmarks, which largely load one core only, the maximum processor frequency that can be achieved is higher than with multi-threaded benchmarks.

The result with "est." are the estimated values.

| SPECrate2017 | | | | |
|---|---|---|---|---|
| **Processor** | **Cores** | **Number of Processors** | **SPECrate2017 int_base** | **SPECrate2017 fp_base** |
| Xeon Gold 5222 | 4 | 2 | 63.0(est.) | 76.9(est.) |
| Xeon Gold 5220 | 18 | 2 | 198 | 191 |
| Xeon Gold 5218 | 16 | 2 | 181(est.) | 179(est.) |
| Xeon Gold 5217 | 8 | 2 | 106(est.) | 117(est.) |
| Xeon Gold 5215 | 10 | 2 | 120(est.) | 127(est.) |
| Xeon Silver 4216 | 16 | 2 | 175(est.) | 170(est.) |
| Xeon Silver 4215 | 8 | 2 | 95.9(est.) | 107(est.) |
| Xeon Silver 4214Y | 12 | 2 | 132(est.) | 139(est.) |
| | 10 | 2 | tbd | tbd |
| | 8 | 2 | tbd | tbd |
| Xeon Silver 4214 | 12 | 2 | 132(est.) | 138(est.) |
| Xeon Silver 4210 | 10 | 2 | 109(est.) | 118(est.) |
| Xeon Silver 4208 | 8 | 2 | 81.8est.) | 92.5(est.) |
| Xeon Bronze 3204 | 6 | 2 | 39.0(est) | 54.5(est.) |

The following two diagrams illustrate the throughput of the PRIMERGY RX2520 M5 in comparison to its predecessor PRIMERGY RX2520 M4, in their respective most performant configuration.



# OLTP-2

## Benchmark description

OLTP stands for Online Transaction Processing. The OLTP-2 benchmark is based on the typical application scenario of a database solution. In OLTP-2 database access is simulated and the number of transactions achieved per second (tps) determined as the unit of measurement for the system.

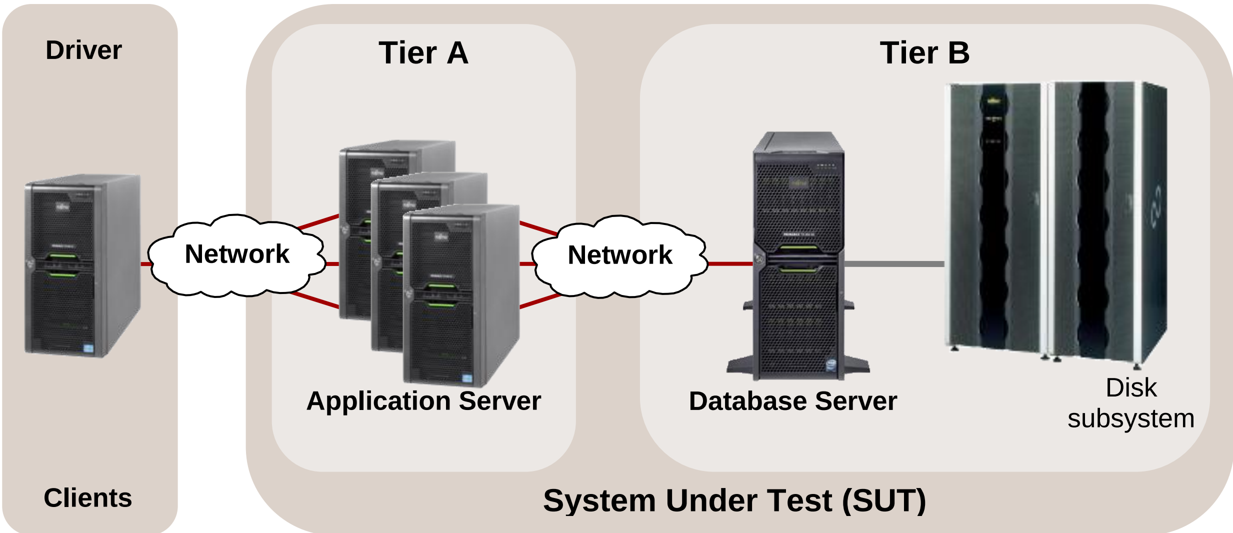
In contrast to benchmarks such as SPECint and TPC-E, which were standardized by independent bodies and for which adherence to the respective rules and regulations are monitored, OLTP-2 is an internal benchmark of Fujitsu. OLTP-2 is based on the well-known database benchmark TPC-E. OLTP-2 was designed in such a way that a wide range of configurations can be measured to present the scaling of a system with regard to the CPU and memory configuration.

Even if the two benchmarks OLTP-2 and TPC-E simulate similar application scenarios using the same load profiles, the results cannot be compared or even treated as equal, as the two benchmarks use different methods to simulate user load. OLTP-2 values are typically similar to TPC-E values. A direct comparison, or even referring to the OLTP-2 result as TPC-E, is not permitted, especially because there is no price-performance calculation.

Further information can be found in the document Benchmark Overview OLTP-2.

## Benchmark environment

The typical measurement set-up is illustrated below:




All OLTP-2 results were Calculated based on the configuration of the next following pages of PRIMERGY RX2540 M5.

| Database Server (Tier B) | |
|---|---|
| **Hardware** | |
| Model | PRIMERGY RX2540 M5 |
| Processor | 2nd Generation Intel® Xeon® Scalable Processors Family |
| Memory | 1 processor: 12 ×64 GB (1x64 GB) 2Rx4 DDR4-2933 ECC<br>2 processors: 24 ×64 GB (1x64 GB) 2Rx4 DDR4-2933 ECC |
| Network interface | 1 × Dual port onboard LAN 10 Gb/s |
| Disk subsystem | RX2540 M5: Onboard RAID controller PRAID EP420i<br>2 × 300 GB 10k rpm SAS Drive, RAID 1 (OS),<br>6 × 1.6 TB SSD, RAID 10 (LOG)<br>4 × 1.6 TB SSD, RAID 10 (temp)<br>5 × PRAID EP540e<br>5 × JX40 S2 : 9 × 1.6 TB SSD Drive each, RAID5 (data) |
| **Software** | |
| BIOS | Version R1.2.0 |
| Operating system | Microsoft Windows Server 2016 Standard + KB4462928 |
| Database | Microsoft SQL Server 2017 Enterprise + KB4341265 |

| Application Server (Tier A) | |
|---|---|
| **Hardware** | |
| Model | 1 × PRIMERGY RX2530 M4 |
| Processor | 2 × Xeon Platinum 8180 |
| Memory | 192 GB, 2666 MHz Registered ECC DDR4 |
| Network interface | 1 × Dual Port onboard LAN 10 Gb/s<br>1 × Dual Port LAN 1 Gb/s |
| Disk subsystem | 2 × 300 GB 10k rpm SAS Drive |
| **Software** | |
| Operating system | Microsoft Windows Server 2016 Standard |

| Client | |
|---|---|
| **Hardware** | |
| Model | 1 × PRIMERGY RX2530 M2 |
| Processor | 2 × Xeon E5-2667 v4 |
| Memory | 128 GB, 2400 MHz registered ECC DDR4 |
| Network interface | 1 × onboard Quad Port LAN 1 Gb/s |
| Disk subsystem | 1 × 300 GB 10k rpm SAS Drive |
| **Software** | |
| Operating system | Microsoft Windows Server 2012 R2 Standard |
| Benchmark | OLTP-2 Software EGen version 1.14.0 |

Some components may not be available in all countries / sales regions.

## Benchmark results

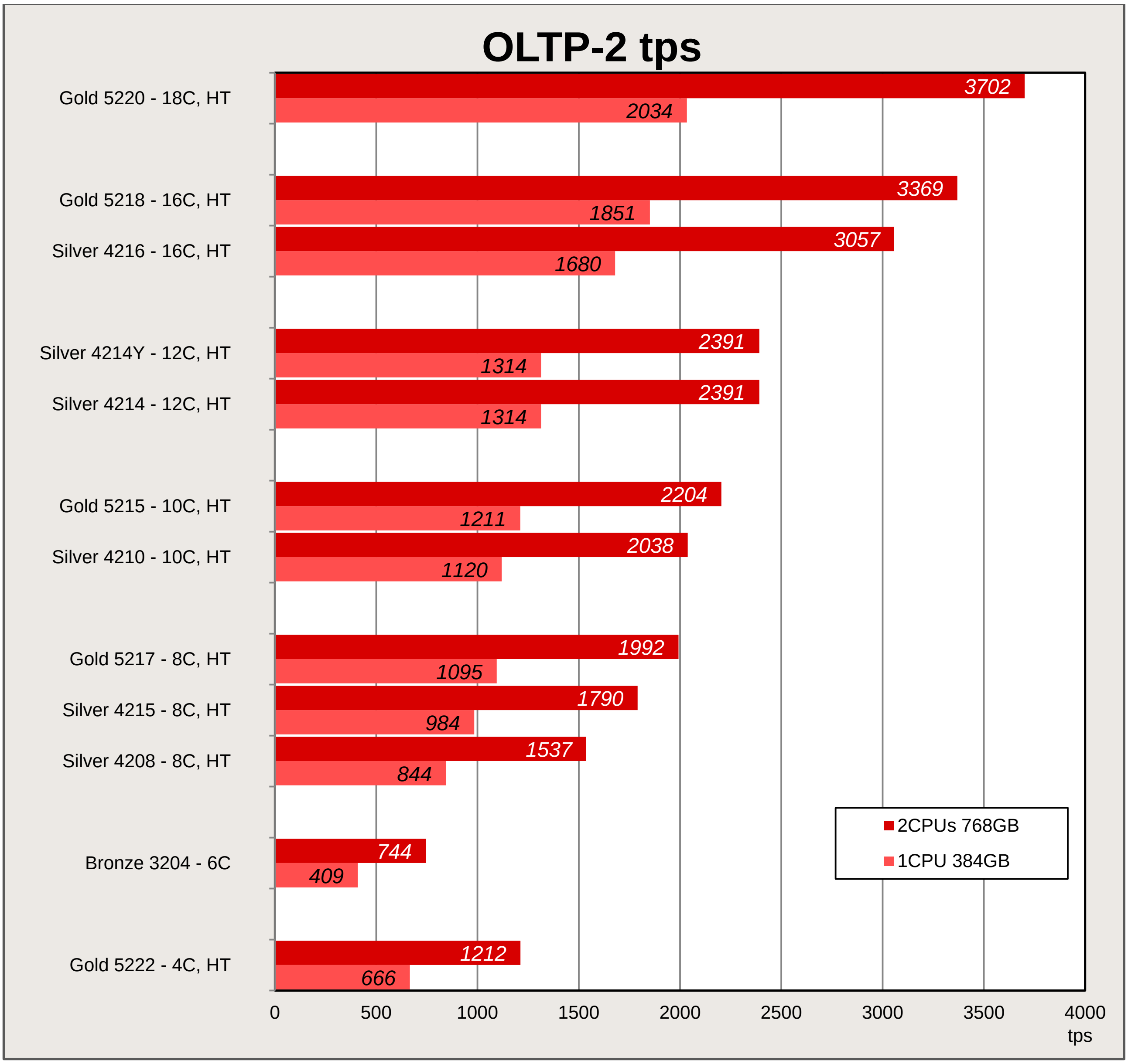
Database performance greatly depends on the configuration options with CPU, memory and on the connectivity of an adequate disk subsystem for the database. In the following scaling considerations for the processors we assume that both the memory and the disk subsystem has been adequately chosen and is not a bottleneck.

A guideline in the database environment for selecting main memory is that sufficient quantity is more important than the speed of the memory accesses. This why a configuration with a total memory of 768 GB was considered for the measurements with two processors and a configuration with a total memory of 384 GB for the measurements with one processor. Both memory configurations have memory access of 2933 MHz.

The result with "est." are the estimated values.

| Processor | Cores | Threads | 2CPU Score | 1CPU Score |
|---|---|---|---|---|
| Xeon Gold 5222 | 4 | 8 | 1,212(est.) | 666(est.) |
| Xeon Gold 5220 | 18 | 36 | 3,702(est.) | 2,034(est.) |
| Xeon Gold 5218 | 16 | 32 | 3,369(est.) | 1,851(est.) |
| Xeon Gold 5217 | 8 | 16 | 1,992(est.) | 1,095(est.) |
| Xeon Gold 5215 | 10 | 20 | 2,204(est.) | 1,211(est.) |
| | | | | |
| Xeon Silver 4216 | 16 | 32 | 3,057(est.) | 1,680(est.) |
| Xeon Silver 4215 | 8 | 16 | 1,790(est.) | 984(est.) |
| Xeon Silver 4214Y | 12 | 24 | 2,391(est.) | 1,314(est.) |
| | 10 | 20 | tbd | tbd |
| | 8 | 16 | tbd | tbd |
| Xeon Silver 4214 | 12 | 24 | 2,391(est.) | 1,314(est.) |
| Xeon Silver 4210 | 10 | 20 | 2,038(est.) | 1,120(est.) |
| Xeon Silver 4208 | 8 | 16 | 1,537(est.) | 844(est.) |
| | | | | |
| Xeon Bronze 3204 | 6 | 6 | 744(est.) | 409(est.) |

The following diagram shows the OLTP-2 transaction rates that can be achieved with one and two processors of the 2nd Generation Intel® Xeon® Processor Scalable Family.




It is evident that a wide performance range is covered by the variety of released processors. If you compare the OLTP-2 value of the processor with the lowest performance (Xeon Bronze 3204) with the value of the processor with the highest performance (Xeon Platinum 8280), the result is an 5-fold increase in performance.

The features of the processors are summarized in the section “Technical data”.

The relatively large performance differences between the processors can be explained by their features. The values scale on the basis of the number of cores, the size of the L3 cache and the CPU clock frequency and as a result of the features of Hyper-Threading and turbo mode, which are available in most processor types. Furthermore, the data transfer rate between processors (“UPI Speed”) also determines the performance.

Within a group of processors with the same number of cores, scaling can be seen via the CPU clock frequency.

# vServCon

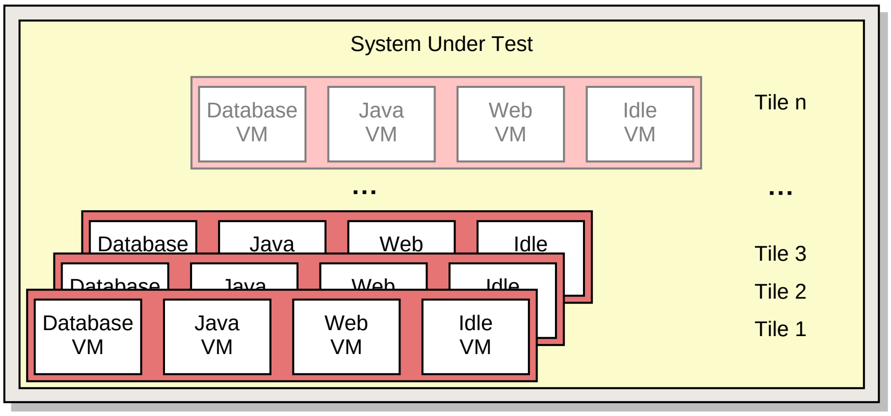
## Benchmark description

vServCon is a benchmark used by Fujitsu to compare server configurations with hypervisor with regard to their suitability for server consolidation. This allows both the comparison of systems, processors and I/O technologies as well as the comparison of hypervisors, virtualization forms, and additional drivers for virtual machines.

vServCon is not a new benchmark in the true sense of the word. It is more a framework that combines already established benchmarks (or in modified form) as workloads in order to reproduce the load of a consolidated and virtualized server environment. Three proven benchmarks are used which cover the application scenarios database, application server, and web server.

| Application scenario | Benchmark | No. of logical CPU cores | Memory |
|---|---|---|---|
| Database | Sysbench (adapted) | 2 | 1.5 GB |
| Java application server | SPECjbb (adapted, with 50% - 60% load) | 2 | 2 GB |
| Web server | WebBench | 1 | 1.5 GB |

Each of the three application scenarios is allocated to a dedicated virtual machine (VM). A fourth machine, the so-called idle VM, is added to these. These four VMs make up a “tile”. Depending on the performance capability of the underlying server hardware, you may as part of a measurement also have to start several identical tiles in parallel in order to achieve a maximum performance score.




Each of the three vServCon application scenarios provides a specific benchmark result in the form of application-specific transaction rates for the respective VM. In order to derive a normalized score, the individual benchmark result for one tile is put in relation to the respective result of a reference system. The resulting relative performance value is then suitably weighted and finally added up for all VMs and tiles. The outcome is a score for this tile number.

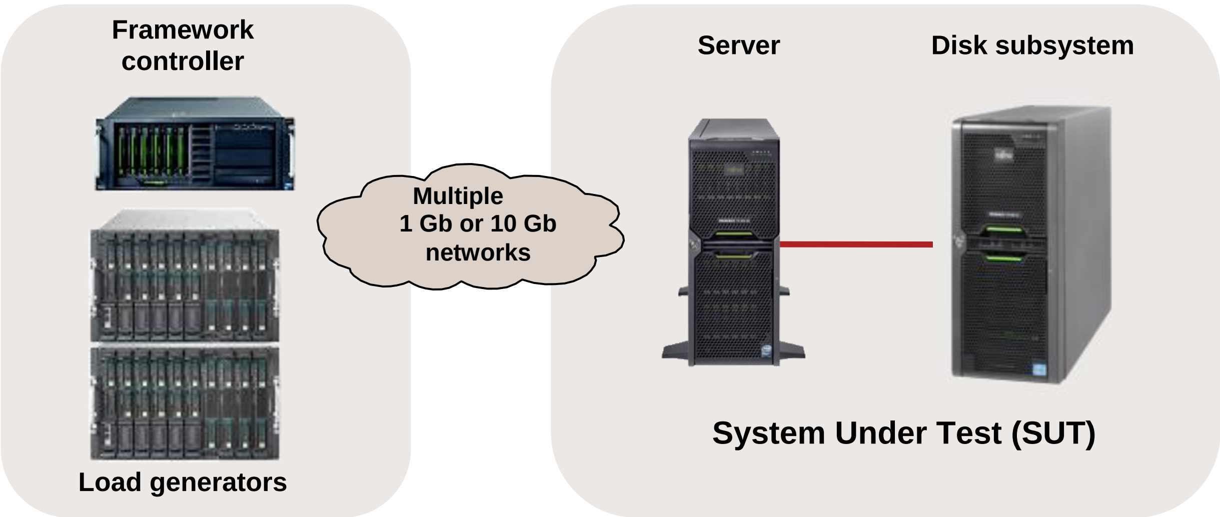
As a general rule, start with one tile, and this procedure is performed for an increasing number of tiles until no further significant increase in this vServCon score occurs. The final vServCon score is then the maximum of the vServCon scores for all tile numbers. This score thus reflects the maximum total throughput that can be achieved by running the mix defined in vServCon that consists of numerous VMs up to the possible full utilization of CPU resources. This is why the measurement environment for vServCon measurements is designed in such a way that only the CPU is the limiting factor and that no limitations occur as a result of other resources.

The progression of the vServCon scores for the tile numbers provides useful information about the scaling behavior of the “System under Test”.

A detailed description of vServCon is in the document: Benchmark Overview vServCon.

## Benchmark environment

The typical measurement set-up is illustrated below:




All vServCon results were Calculated based on the configuration of the next following pages of PRIMERGY RX2540 M5.

| System Under Test (SUT) | |
|---|---|
| **Hardware** | |
| Processor | 2nd Generation Intel® Xeon® Scalable Processors Family |
| Memory | 24 × 32 GB (1x32 GB) 2Rx4 DDR4-2933 R ECC |
| Network interface | 2 × Intel® Ethnet Controller X710 for 10GbE SFP+ |
| Disk subsystem | 1 ×dual-channel FC controller Emulex LPe160021<br>LINUX/LIO based flash storage system |
| **Software** | |
| Operating system | VMware ESXi 6.7 EP06 Build 11675023 |

| Load generator (incl. Framework controller) | |
|---|---|
| **Hardware (Shared)** | |
| Enclosure | 5 × PRIMERGY RX2530 M2 |
| **Hardware** | |
| Processor | 2 × XeonE5-2683 v4 |
| Memory | 128 GB |
| Network interface | 3 × 1 Gbit LAN |
| **Software** | |
| Operating system | VMware ESXi 6.0.0 U1b Build 3380124 |

| **Load generator VM (on various servers)** | |
|---|---|
| **Hardware** | |
| Processor | 1 × logical CPU |
| Memory | 4048 MB |
| Network interface | 2 × 1 Gbit/s LAN |
| **Software** | |
| Operating system | Microsoft Windows Server 2008 Standard Edition 32 bit |

Some components may not be available in all countries or sales regions.

## Benchmark results

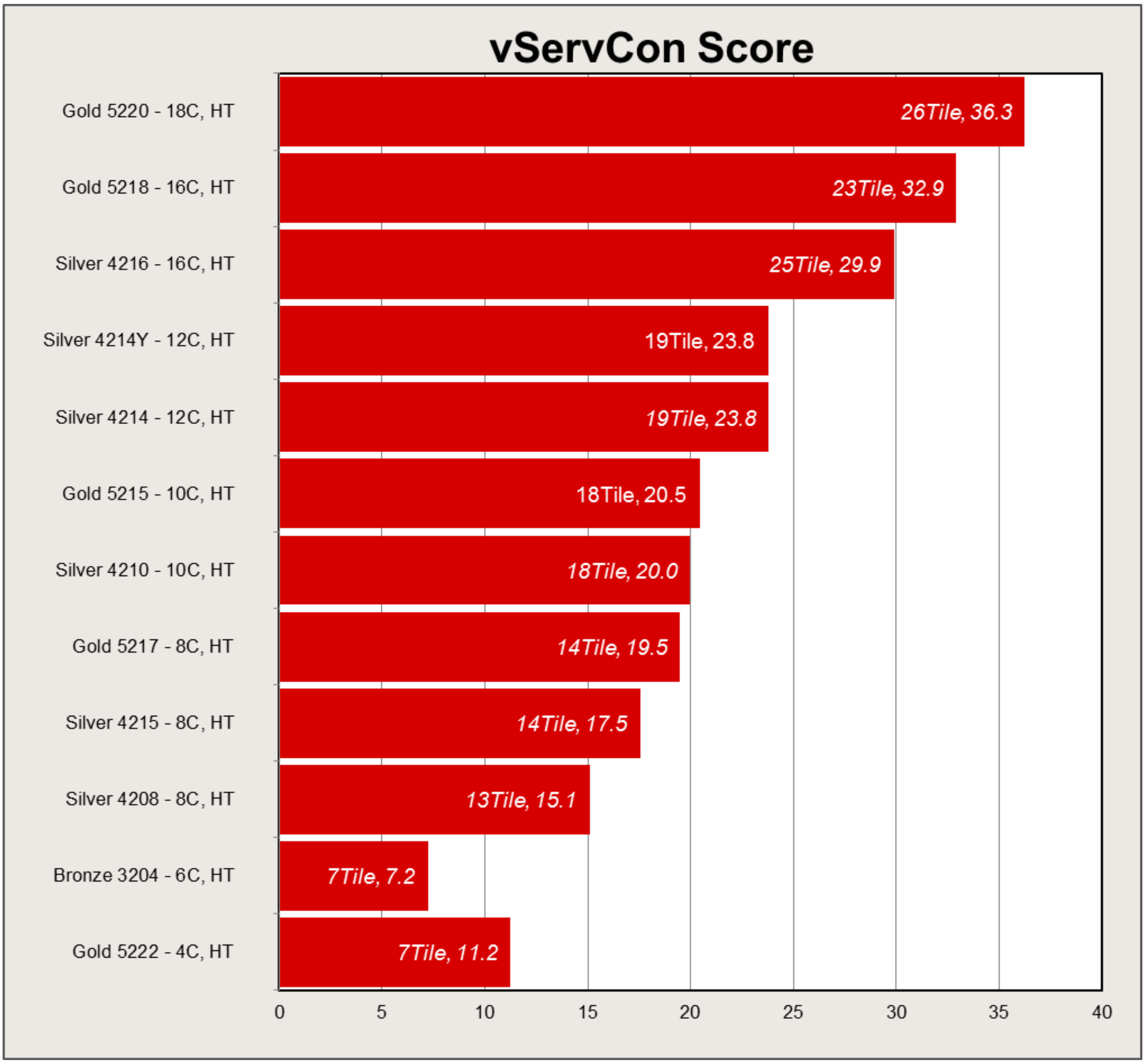
The PRIMERGY dual-socket rack and tower systems dealt with here are based on processors of the 2nd Generation Intel® Xeon® Processor. The features of the processors are summarized in the section “Technical data”.

The available processors of these systems with their results can be seen in the following table.

The result with "est." are the estimated values.

| Processor | Cores | Threads | Number of Processors | #Tiles | Score |
|---|---|---|---|---|---|
| Xeon Gold 5222 | 4 | 8 | 2 | 7(est.) | 11.2(est.) |
| Xeon Gold 5220 | 18 | 36 | 2 | 26(est.) | 36.3(est.) |
| Xeon Gold 5218 | 16 | 32 | 2 | 23(est.) | 32.9(est.) |
| Xeon Gold 5217 | 8 | 16 | 2 | 14(est.) | 19.5(est.) |
| Xeon Gold 5215 | 10 | 20 | 2 | 18(est.) | 20.5(est.) |
| Xeon Silver 4216 | 16 | 32 | 2 | 25(est.) | 29.9(est.) |
| Xeon Silver 4215 | 8 | 16 | 2 | 14(est.) | 17.5(est.) |
| Xeon Silver 4214Y | 12 | 24 | 2 | 19(est.) | 23.8(est.) |
| | 10 | 20 | 2 | tbd | tbd |
| | 8 | 16 | 2 | tbd | tbd |
| Xeon Silver 4214 | 12 | 24 | 2 | 19(est.) | 23.8(est.) |
| Xeon Silver 4210 | 10 | 20 | 2 | 18(est.) | 20.0(est.) |
| Xeon Silver 4208 | 8 | 16 | 2 | 13(est.) | 15.1(est.) |
| Xeon Bronze 3204 | 6 | 6 | 2 | 7(est.) | 7.2(est.) |

The following diagram compares the virtualization performance values that can be achieved with the processors reviewed here.




The relatively large performance differences between the processors can be explained by their features. The values scale on the basis of the number of cores, the size of the L3 cache and the CPU clock frequency and as a result of the features of Hyper-Threading and turbo mode, which are available in most processor types. Furthermore, the data transfer rate between processors ("UPI Speed") also determines performance.

Within a group of processors with the same number of cores scaling can be seen via the CPU clock frequency.

A low performance can be seen in the Xeon Bronze 3204 processor, as they have to manage without Hyper-Threading (HT) and turbo mode (TM). In principle, these weakest processors are only to a limited extent suitable for the virtualization environment.

As a matter of principle, the memory access speed also influences performance. A guideline in the virtualization environment for selecting main memory is that sufficient quantity is more important than the speed of the memory accesses. The vServCon scaling measurements presented here were all performed with a memory access speed – depending on the processor type – of at most 2933 MHz.

# Literature

**PRIMERGY Servers**

http://primergy.com/

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This White Paper:

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