White Paper
FUJITSU Server PRIMERGY
Performance Report PRIMERGY CX2550 M5/ CX2560 M5/ CX2570 M5

This document contains a summary of the benchmarks executed for the FUJITSU Server PRIMERGY CX2550 M5/ CX2560 M5/ CX2570 M5.

The PRIMERGY CX2550 M5/ CX2560 M5/ CX2570 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
1.4
2021/07/28

Contents

Document history

Version 1.0 (2019/05/21)

New:

- Technical data
- SPECcpu2017
  Measurements with 2nd Generation Intel Xeon Processor Scalable Family
- SPECpower_ssj2008
  Measurements with Intel Xeon Processor Gold 6252
- OLTP-2
  Calculated with 2nd Generation Intel Xeon Processor Scalable Family
- vServCon
  Calculated with 2nd Generation Intel Xeon Processor Scalable Family

Version 1.1 (2019/10/04)

New:

- STREAM, LINPACK
  Measured with 2nd Generation Intel Xeon Processor Scalable Family

Updated:

- SPECcpu2017
  Measured additionally with 2nd Generation Intel Xeon Processor Scalable Family

Version 1.2 (2020/04/24)

Update:

- Technical data
  Added 2nd Generation Intel Xeon Processor Scalable Family
- SPECcpu2017, OLTP-2 , vServCon, STREAM, LINPACK
  Measured or calculated additionally with 2nd Generation Intel Xeon Processor Scalable Family

Version 1.3 (2020/05/29)

Update:

- Technical data, STREAM, LINPACK
  Fixed typo in processor specifications

Version 1.4 (2021/07/28)

Update:

- Contact information and URLs
  Updated to the latest one
- Minor correction

Technical data

PRIMERGY CX2550 M5/ CX2560 M5

PRIMERGY CX2570 M5

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 CX2550 M5		PRIMERGY CX2560M5	PRIMERGY CX2570 M5
cooling method	air cooling	liquid cooling	air cooling	liquid cooling
Form factor	Server node			
Chipset	Intel C624			
Number of sockets	2			
Number of processors orderable	1 - 2			
Processor type	2nd Generation Intel Xeon Scalable Processors Family			
Number of memory slots	16 (8 per processor)			
Maximum memory configuration	2048 GB			
Storage Controller	Onboad SATA Controller			
SATA Interface (Onboad)	SATA × 2 port		SATA × 6 port	
PCI slots	2 × PCI-Express 3.0 x16			1 × PCI-Express 3.0 x16

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]
April 2019 released								
Xeon Platinum 8280M	28	56	38.5	10.4	2.7	4.0	2933	205
Xeon Platinum 8280	28	56	38.5	10.4	2.7	4.0	2933	205
Xeon Platinum 8276M	28	56	38.5	10.4	2.2	4.0	2933	165
Xeon Platinum 8276	28	56	38.5	10.4	2.2	4.0	2933	165
Xeon Platinum 8270	26	52	35.8	10.4	2.7	4.0	2933	205
Xeon Platinum 8268	24	48	35.8	10.4	2.9	3.9	2933	205
Xeon Platinum 8260M	24	48	35.8	10.4	2.4	3.9	2933	165
Xeon Platinum 8260Y	24	48	35.8	10.4	2.4	3.9	2933	165
	20	40						
	16	32						
Xeon Platinum 8260	24	48	35.8	10.4	2.4	3.9	2933	165
Xeon Gold 6262V	24	48	33.0	10.4	1.9	3.6	2933	135
Xeon Gold 6254	18	36	24.8	10.4	3.1	4.0	2933	200
Xeon Gold 6252	24	48	35.8	10.4	2.1	3.7	2933	150
Xeon Gold 6248	20	40	27.5	10.4	2.5	3.9	2933	150
Xeon Gold 6246	12	24	24.8	10.4	3.3	4.2	2933	165
Xeon Gold 6244	8	16	24.8	10.4	3.6	4.4	2933	150
Xeon Gold 6242	16	32	22.0	10.4	2.8	3.9	2933	150
Xeon Gold 6240M	18	36	24.8	10.4	2.6	3.9	2933	150
Xeon Gold 6240Y	18	36	24.8	10.4	2.6	3.9	2933	150
	14	28						
	8	16						
Xeon Gold 6240	18	36	24.8	10.4	2.6	3.9	2933	150
Xeon Gold 6238M	22	44	30.3	10.4	2.1	3.7	2933	140
Xeon Gold 6238	22	44	30.3	10.4	2.1	3.7	2933	140
Xeon Gold 6234	8	16	24.8	10.4	3.3	4.0	2933	130
Xeon Gold 6230	20	40	27.5	10.4	2.1	3.9	2933	125
Xeon Gold 6226	12	24	19.3	10.4	2.7	3.7	2933	125
Xeon Gold 6222V	20	40	27.5	10.4	1.8	3.6	2400	115
Xeon Gold 5222	4	8	16.5	10.4	3.8	3.9	2933	105
Xeon Gold 5220S	18	36	24.8	10.4	2.7	3.9	2666	125
Xeon Gold 5220	18	36	24.8	10.4	2.2	3.9	2666	125
Xeon Gold 5218B	16	32	22.0	10.4	2.3	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 5215M	10	20	13.8	10.4	2.5	3.4	2666	85
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
March 2020 released								
Xeon Gold 6258R	28	56	38.5	10.4	2.7	4.0	2933	205
Xeon Gold 6256	12	24	33.0	10.4	3.6	4.5	2933	205
Xeon Gold 6250	8	16	35.8	10.4	3.9	4.5	2933	185
Xeon Gold 6248R	24	48	35.8	10.4	3.0	4.0	2933	205
Xeon Gold 6246R	16	32	35.8	10.4	3.4	4.1	2933	205
Xeon Gold 6242R	20	40	35.8	10.4	3.1	4.1	2933	205
Xeon Gold 6240R	24	48	35.8	10.4	2.4	4.0	2933	165
Xeon Gold 6238R	28	56	38.5	10.4	2.2	4.0	2933	165
Xeon Gold 6230R	26	52	35.8	10.4	2.1	4.0	2933	150
Xeon Gold 6226R	16	32	22.0	10.4	2.9	3.9	2933	150
Xeon Gold 5220R	24	48	35.8	10.4	2.2.	4.0	2666	150
Xeon Gold 5218R	20	40	27.5	10.4	2.1	4.0	2666	125
Xeon Silver 4215R	8	16	11.0	9.6	3.2	4.0	2400	130
Xeon Silver 4214R	12	24	16.5	9.6	2.4	3.5	2400	100
Xeon Silver 4210R	10	20	13.8	9.6	2.4	3.2	2400	100
Xeon Bronze 3206R	8	8	11.0	9.6	1.9		2133	85

Model	CX2550 M5(air cooling)	CX2550 M5 (liquid cooling)	CX2560M5	CX2570 M5
April 2019 released				
Supported Processors	Xeon Platinum 8276M Xeon Platinum 8276 Xeon Platinum 8260M Xeon Platinum 8260Y Xeon Platinum 8260 Xeon Gold 6262V Xeon Gold 6252 Xeon Gold 6248 Xeon Gold 6246 Xeon Gold 6242 Xeon Gold 6240M Xeon Gold 6240Y Xeon Gold 6240 Xeon Gold 6238M Xeon Gold 6238 Xeon Gold 6234 Xeon Gold 6230 Xeon Gold 6226 Xeon Gold 6222V Xeon Gold 5222 Xeon Gold 5220S Xeon Gold 5220 Xeon Gold 5218B	Xeon Platinum 8280M Xeon Platinum 8280 Xeon Platinum 8276M Xeon Platinum 8276 Xeon Platinum 8270 Xeon Platinum 8268 Xeon Platinum 8260M Xeon Platinum 8260Y Xeon Platinum 8260 Xeon Gold 6262V Xeon Gold 6254 Xeon Gold 6252 Xeon Gold 6248 Xeon Gold 6246 Xeon Gold 6244 Xeon Gold 6242 Xeon Gold 6240M Xeon Gold 6240Y Xeon Gold 6240 Xeon Gold 6238M Xeon Gold 6238 Xeon Gold 6234 Xeon Gold 6230	Xeon Gold 6262V Xeon Gold 6252 Xeon Gold 6248 Xeon Gold 6242 Xeon Gold 6240M Xeon Gold 6240 Xeon Gold 6238M Xeon Gold 6238 Xeon Gold 6234 Xeon Gold 6230 Xeon Gold 6226 Xeon Gold 6222V Xeon Gold 5222 Xeon Gold 5220S Xeon Gold 5220 Xeon Gold 5218B Xeon Gold 5218 Xeon Gold 5217 Xeon Gold 5215M Xeon Gold 5215 Xeon Silver 4216 Xeon Silver 4215 Xeon Silver 4214Y	Xeon Platinum 8280M Xeon Platinum 8280 Xeon Platinum 8276M Xeon Platinum 8276 Xeon Platinum 8270 Xeon Platinum 8268 Xeon Platinum 8260M Xeon Platinum 8260Y Xeon Platinum 8260 Xeon Gold 6262V Xeon Gold 6254 Xeon Gold 6252 Xeon Gold 6248 Xeon Gold 6246 Xeon Gold 6244 Xeon Gold 6242 Xeon Gold 6240M Xeon Gold 6240Y Xeon Gold 6240 Xeon Gold 6238M Xeon Gold 6238 Xeon Gold 6234 Xeon Gold 6230

	Xeon Gold 5218 Xeon Gold 5217 Xeon Gold 5215M Xeon Gold 5215	Xeon Gold 6226 Xeon Gold 6222V Xeon Gold 5222 Xeon Gold 5220S Xeon Gold 5220 Xeon Gold 5218B Xeon Gold 5218 Xeon Gold 5217 Xeon Gold 5215M Xeon Gold 5215	Xeon Silver 4214 Xeon Silver 4210 Xeon Silver 4208 Xeon Bronze 3204	Xeon Gold 6226 Xeon Gold 6222V Xeon Gold 5222 Xeon Gold 5220S Xeon Gold 5220 Xeon Gold 5218B Xeon Gold 5218 Xeon Gold 5217 Xeon Gold 5215M Xeon Gold 5215 Xeon Silver 4216 Xeon Silver 4215 Xeon Silver 4214Y Xeon Silver 4214 Xeon Silver 4210 Xeon Silver 4208 Xeon Bronze 3204
March 2020 released				
Supported Processors	Xeon Gold 6240R Xeon Gold 6238R Xeon Gold 6230R Xeon Gold 6226R Xeon Gold 5220R Xeon Gold 5218R	Xeon Gold 6258R Xeon Gold 6256 Xeon Gold 6250 Xeon Gold 6248R Xeon Gold 6246R Xeon Gold 6242R Xeon Gold 6240R Xeon Gold 6238R Xeon Gold 6230R Xeon Gold 6226R Xeon Gold 5220R Xeon Gold 5218R	Xeon Gold 6230R Xeon Gold 6226R Xeon Gold 5220R Xeon Gold 5218R Xeon Silver 4215R Xeon Silver 4214R Xeon Silver 4210R Xeon Bronze 3206R	Xeon Gold 6258R Xeon Gold 6256 Xeon Gold 6250 Xeon Gold 6248R Xeon Gold 6246R Xeon Gold 6242R Xeon Gold 6240R Xeon Gold 6238R Xeon Gold 6230R Xeon Gold 6226R Xeon Gold 5220R Xeon Gold 5218R Xeon Silver 4215R Xeon Silver 4214R Xeon Silver 4210R Xeon Bronze 3206R

All the processors that can be ordered with the PRIMERGY CX2550 M5/ CX2560 M5/ CX2570 M5, apart from Xeon Bronze 3204 and Xeon Bronze 3206R, 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 suffix support larger memory capacity of 2TB/socket(M-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 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
S	Search Optimized
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) 4Rx4 DDR4-2933 LR ECC	64	4	4	2933	✓	✓		✓
128GB (1x128 GB) 4Rx4 DDR4-2933LR ECC	128	4	4	2933	✓	✓		✓
128GB (1x128GB) DCPMM-2666	128			2666			✓	✓
256GB (1x256GB) DCPMM-2666	256			2666			✓	✓
512GB (1x512GB) DCPMM-2666	512			2666			✓	✓

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

Detailed technical information is available in the data sheet PRIMERGY CX2550 M5/ CX2560 M5/ CX2570 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 CX2550 M5/ CX2560 M5/ CX2570 M5
Processor	2nd Generation Intel Xeon Scalable Processors Family
Memory	12 × 32 GB (1x32 GB) 2Rx4 DDR4-2933 R ECC
Software	
BIOS settings	SPECspeed2017_int: Hyper-Threading = Disabled Power Technology = Custom Override OS Energy Performance = Enabled Patrol Scrub = Disabled Uncore Frequency Scaling = Disabled Sub NUMA Clustering = Disabled WR CRC feature Control = Disabled SPECspeed2017_fp: Hyper-Threading = Disabled Adjacent Cache Line Prefetch = Disabled Power Technology = Custom Override OS Energy Performance = Enabled Patrol Scrub = Disabled Sub NUMA Clustering = Disabled WR CRC feature Control = Disabled UPI Link L0p Enable = Disable UPI Link L1 Enable = Disable SPECrate2017_int: Adjacent Cache Line Prefetch = Disabled DCU Ip Prefetcher = Disabled DCU Streamer Prefetcher = Disabled Power Technology = Custom Energy Performance = Balanced Performance Uncore Frequency Scaling = Disabled Sub NUMA Clustering = Disabled*1 Stale AtoS = Enable LLC Prefetch = Enabled Hyper-Threading = Disabled*2 SPECrate2017_fp Power Technology = Custom Energy Performance = Balanced Performance Uncore Frequency Scaling = Disabled Sub NUMA Clustering = Disabled*1 LLC Prefetch = Enabled Hyper-Threading = Disabled*2 *1: Xeon Gold 5217, Xeon Gold 5215, Xeon Silver 4215, Xeon Silver 4210, Xeon Silver 4208, Xeon Bronze 3204, Xeon Bronze 3206R, Xeon Silver 4210R, Xeon Silver 4215R *2: Xeon Bronze 3204, Xeon Bronze 3206R
Operating system	SPECspeed2017: SUSE Linux Enterprise Server 15 4.12.14-25.28-default SPECrate2017: SUSE Linux Enterprise Server 15 4.12.14-25.28-default
Operating system settings	Stack size set to unlimited using "ulimit -s unlimited" SPECrate2017: Kernel Boot Parameter set with : nohz_full=1-X (X: logical core number -1) echo 10000000 > /proc/sys/kernel/sched_min_granularity_ns

Compiler	SPECspeed2017_int, SPECrate2017_int: CPU released in April 2019 C/C++: Version 19.0.1.144 of Intel C/C++ Compiler for Linux Fortran: Version 19.0.1.144 of Intel Fortran Compiler for Linux CPU released in March 2020 C/C++: Version 19.0.4.227 of Intel C/C++ Compiler for Linux Fortran: Version 19.0.4.227 of Intel Fortran Compiler for Linux SPECspeed2017_fp C/C++: Version 19.0.2.187 of Intel C/C++ Compiler Build 20190117 for Linux Fortran: Version 19.0.2.187 of Intel Fortran Compiler Build 20190117 for Linux SPECrate2017_fp: CPU released in April 2019 C/C++: Version 19.0.0.117 of Intel C/C++ Compiler for Linux Fortran: Version 19.0.0.117 of Intel Fortran Compiler for Linux CPU released in March 2020 C/C++: Version 19.0.4.227 of Intel C/C++ Compiler for Linux Fortran: Version 19.0.4.227 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.

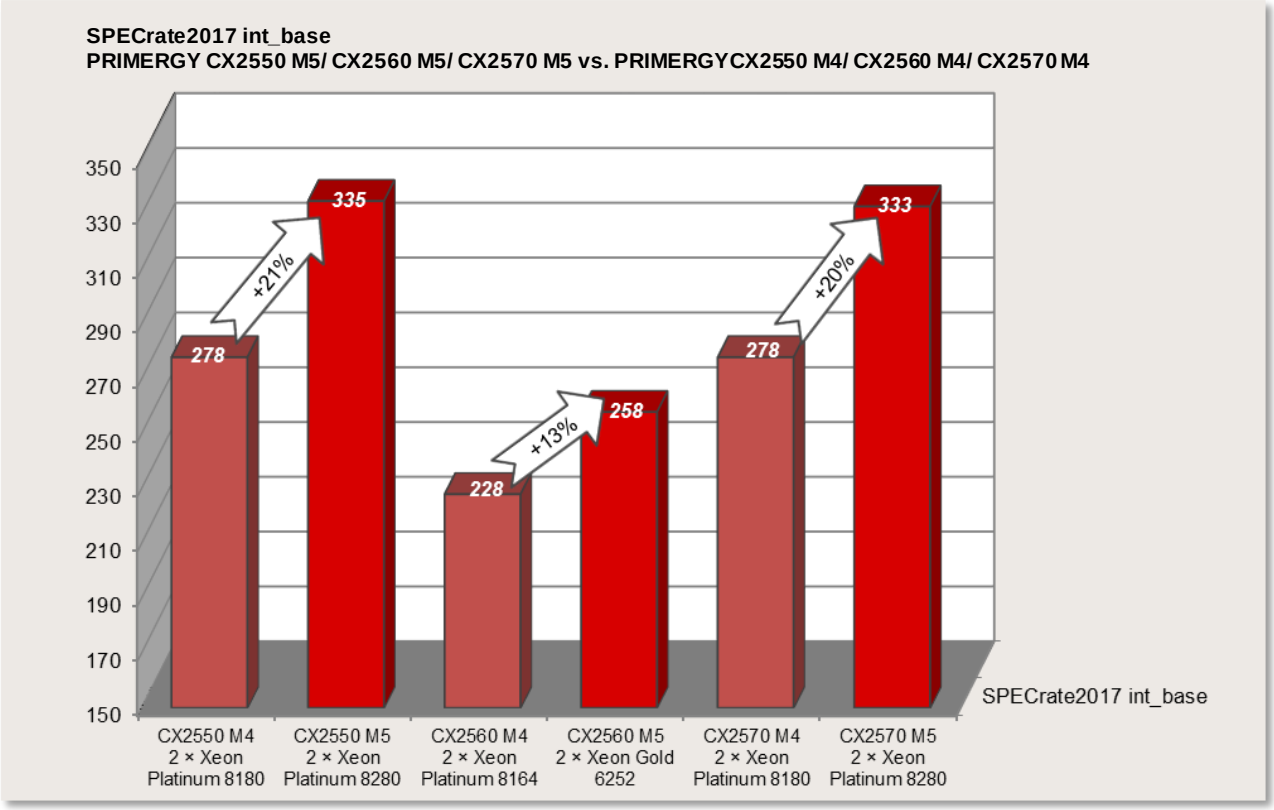
The result with "est." are the estimated values.

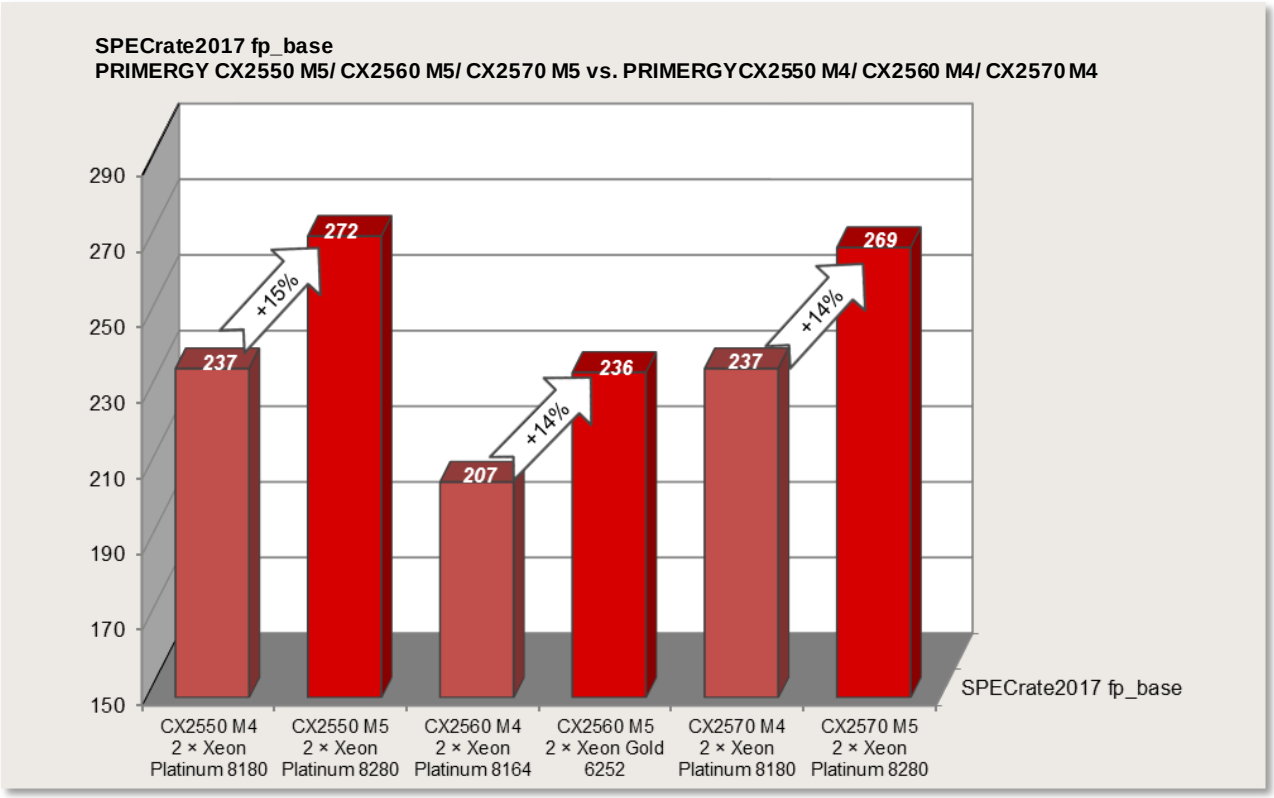
SPECrate2017										
Processor	Cores	CX2550M5			CX2560M5			CX2570M5		
		Number of processors	SPECrate2017 int_base	SPECrate2017 fp_base	Number of processors	SPECrate2017 int_base	SPECrate2017 fp_base	Number of processors	SPECrate2017 int_base	SPECrate2017 fp_base
April 2019 released										
Xeon Platinum 8280M	28	2	335(est.)	272(est.)				2	333(est.)	269(est.)
Xeon Platinum 8280	28	2	**335**	**272**				2	333(est.)	269(est.)
Xeon Platinum 8276M	28	2	299(est.)	253(est.)				2	293(est.)	249(est.)
Xeon Platinum 8276	28	2	299(est.)	253(est.)				2	293(est.)	249(est.)
Xeon Platinum 8270	26	2	**313**	**259**				2	311(est.)	256(est.)
Xeon Platinum 8268	24	2	**302**	**254**				2	300(est.)	251(est.)
Xeon Platinum 8260M	24	2	278 (est.)	241(est.)				2	272(est.)	236(est.)
Xeon Platinum 8260Y	24	2	278 (est.)	241(est.)				2	272(est.)	236(est.)
	20	2	244(est.)	225(est.)				2	238(est.)	221(est.)
	16	2	211(est.)	207(est.)				2	207(est.)	204(est.)
Xeon Platinum 8260	24	2	278(est.)	241(est.)				2	272(est.)	236(est.)
Xeon Gold 6262V	24	2	233(est.)	201(est.)		229(est.)	199(est.)	2	228(est.)	198(est.)
Xeon Gold 6254	18	2	**248**	**221**				2	247(est.)	219(est.)
Xeon Gold 6252	24	2	**262**	**233**	2	**258**	**230**	2	257(est.)	229(est.)
Xeon Gold 6248	20	2	**239**	**219**	2	235(est.)	216(est.)	2	234(est.)	215(est.)
Xeon Gold 6246	12	2	**176**	**180**				2	173(est.)	177(est.)
Xeon Gold 6244	8	2	**130**	**146**				2	128(est.)	144(est.)
Xeon Gold 6242	16	2	**211**	**195**	2	207(est.)	193(est.)	2	206(est.)	192(est.)
Xeon Gold 6240M	18	2	220(est.)	205(est.)	2	216(est.)	202(est.)	2	215(est.)	201(est.)
Xeon Gold 6240Y	18	2	220(est.)	205(est.)				2	215(est.)	201(est.)
	14	2	181(est.)	184(est.)				2	177(est.)	180(est.)
	8	2	113(est.)	133(est.)				2	111(est.)	131(est.)
Xeon Gold 6240	18	2	**220**	**205**	2	216(est.)	202(est.)	2	215(est.)	201(est.)
Xeon Gold 6238M	22	2	242(est.)	220(est.)	2	238(est.)	217(est.)	2	237(est.)	216(est.)
Xeon Gold 6238	18	2	**242**	**220**	2	238(est.)	217(est.)	2	237(est.)	216(est.)
Xeon Gold 6234	22	2	123(est.)	136(est.)	2	121(est.)	134(est.)	2	120(est.)	133(est.)
Xeon Gold 6230	20	2	**217**	**202**	2	213(est.)	200(est.)	2	212(est.)	199(est.)
Xeon Gold 6226	12	2	161(est.)	168(est.)	2	159(est.)	166(est.)	2	158(est.)	165(est.)

Xeon Gold 6222V	20	2	195(est.)	182(est.)	2	192(est.)	179(est.)	2	191(est.)	179(est.)
Xeon Gold 5222	4	2	**62.1**	**76.3**	2	61.0(est.)	75.3(est.)	2	60.8(est.)	74.9(est.)
Xeon Gold 5220S	18	2	196(est.)	188(est.)	2	195(est.)	187(est.)	2	196(est.)	188(est.)
Xeon Gold 5220	18	2	**196**	**188**	2	**195**	**187**	2	196(est.)	188(est.)
Xeon Gold 5218B	16	2	178(est.)	173(est.)	2	175(est.)	171(est.)	2	174(est.)	170(est.)
Xeon Gold 5218	16	2	**178**	**173**	2	175(est.)	171(est.)	2	174(est.)	170(est.)
Xeon Gold 5217	8	2	**104**	**111**	2	102(est.)	109(est.)	2	102(est.)	109(est.)
Xeon Gold 5215M	10	2	118(est.)	124(est.)	2	116(est.)	122(est.)	2	115(est.)	121(est.)
Xeon Gold 5215	10	2	**118**	**124**	2	116(est.)	122(est.)	2	115(est.)	121(est.)
Xeon Silver 4216	16				2	**168**	**162**	2	166(est.)	160(est.)
Xeon Silver 4215	8				2	**94.4**	**102**	2	91.5(est.)	101(est.)
Xeon Silver 4214Y	12				2	129(est.)	132(est.)	2	126(est.)	130(est.)
	10				2	106(est.)	117(est.)	2	105(est.)	116(est.)
	8				2	91.2(est.)	106(est.)	2	90.8(est.)	105(est.)
Xeon Silver 4214	12				2	**129**	**132**	2	126(est.)	130(est.)
Xeon Silver 4210	10				2	**107**	**113**	2	110(est.)	111(est.)
Xeon Silver 4208	8				2	**80.5**	**88.3**	2	78.0(est.)	87.1 (est.)
Xeon Bronze 3204	6				2	**38.5**	**51.4**	2	37.2(est.)	51.3(est.)
March 2020 released										
Xeon Gold 6258R	28	2	**327**	**265**				2	**324**	**263**
Xeon Gold 6256	12	2	191(est.)	193(est.)				2	190(est.)	192(est.)
Xeon Gold 6250	8	2	135(est.)	150(est.)				2	134(est.)	149(est.)
Xeon Gold 6248R	24	2	300(est.)	252(est.)				2	297(est.)	251(est.)
Xeon Gold 6246R	16	2	234(est.)	222(est.)				2	231(est.)	220(est.)
Xeon Gold 6242R	20	2	270(est.)	239(est.)				2	268(est.)	238(est.)
Xeon Gold 6240R	24	2	269(est.)	232(est.)				2	269(est.)	233(est.)
Xeon Gold 6238R	28	2	**288**	**242**				2	289(est.)	243(est.)
Xeon Gold 6230R	26	2	**268**	**229**	2	**263**	**227**	2	268(est.)	230(est.)
Xeon Gold 6226R	16	2	202(est.)	192(est.)	2	199(est.)	190(est.)	2	203(est.)	193(est.)
Xeon Gold 5220R	24	2	252(est.)	218(est.)	2	248(est.)	216(est.)	2	253(est.)	219(est.)
Xeon Gold 5218R	20	2	212(est.)	192(est.)	2	209(est.)	190(est.)	2	213(est.)	193(est.)
Xeon Silver 4215R					2	96.3(est.)	104(est.)	2	98.2(est.)	105(est.)
Xeon Silver 4214R					2	128(est.)	137(est.)	2	130(est.)	139(est.)
Xeon Silver 4210R					2	104(est.)	115(est.)	2	106(est.)	117(est.)
Xeon Bronze 3206R						48.6(est.)	69.0(est.)	2	49.5(est.)	70.0(est.)

SPECspeed2017				
CX2550M5				
Processor	**Cores**	**Number of Processors**	**SPECspeed2017 int_base**	**SPECspeed2017 fp_base**
April 2019 released				
Xeon Platinum 8280	28	2		**15**
Xeon Gold 6244	28	2	**10.7**	

The following two diagrams illustrate the throughput of the PRIMERGY CX2550 M5/ CX2560 M5/ CX2570 M5 in comparison to its predecessor PRIMERGY CX2550 M4/ CX2560 M4/ CX2570 M4, in their respective most performant configuration.





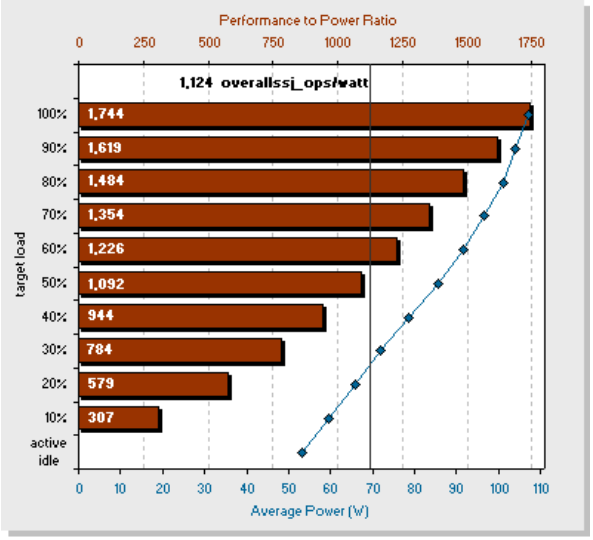
SPECpower_ssj2008

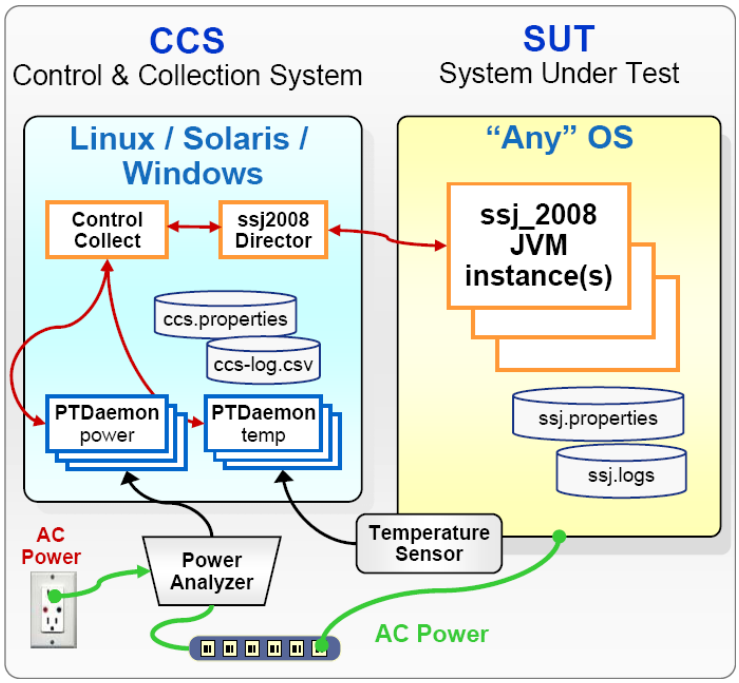
Benchmark description

SPECpower_ssj2008 is the first industry-standard SPEC benchmark that evaluates the power and performance characteristics of a server. With SPECpower_ssj2008 SPEC has defined standards for server power measurements in the same way they have done for performance.

The benchmark workload represents typical server-side Java business applications. The workload is scalable, multi-threaded, portable across a wide range of platforms, and easy to run. The benchmark tests CPUs, caches, the memory hierarchy, and scalability of symmetric multiprocessor systems (SMPs), as well as the implementation of Java Virtual Machine (JVM), Just In Time (JIT) compilers, garbage collection, threads, and some aspects of the operating system.

SPECpower_ssj2008 reports power consumption for servers at different performance levels — from 100% to "active idle" in 10% segments — over a set period of time. The graduated workload recognizes the fact that processing loads and power consumption on servers vary substantially over the course of days or weeks. To compute a power-performance metric across all levels, measured transaction throughputs for each segment are added together and then divided by the sum of the average power consumed for each segment. The result is a figure of merit called "overall ssj_ops/watt". This ratio provides information about the energy efficiency of the measured server. The defined measurement standard enables customers to compare it with other configurations and servers measured with SPECpower_ssj2008. The diagram shows a typical graph of a SPECpower_ssj2008 result.





The benchmark runs on a wide variety of operating systems and hardware architectures, and does not require extensive client or storage infrastructure. The minimum equipment for SPEC-compliant testing is two networked computers, plus a power analyzer and a temperature sensor. One computer is the System Under Test (SUT) which runs one of the supported operating systems and the JVM. The JVM provides the environment required to run the SPECpower_ssj2008 workload which is implemented in Java. The other computer is a "Control & Collection System" (CCS) which controls the operation of the benchmark and captures the power, performance, and temperature readings for reporting. The diagram provides an overview of the basic structure of the benchmark configuration and the various components.

Benchmark environment

System Under Test (SUT)	
Hardware	
Enclosure	PRIMERGY CX400 M4
Enclosure version	PRIMERGY CX400 M4 chassis for CX2560 M5 2U Chassis
Power Supply Unit	1 × Fujitsu Technology Solutions S26113-F615-E10 2400W
Hardware	
Number of servers	4
Model	PRIMERGY CX2560 M5
Processor	Intel Xeon Gold 6252
Memory	12 ×16 GB (1x16 GB) 2Rx8 PC4-2933Y-R
Network interface	1 x Intel I250 Gigabit Network Connection (onboard)
Disk subsystem	1 x SSD M.2 SATA 6Gbps 128GB N H-P, S26361-F5658-L128
Software	
BIOS	R1.6.0
BIOS settings	HWPM = Native Mode. ASPM Support = L1 Only. SATA Controller = Disable. USB Port Control = Disable all ports. Network Stack = Disabled. Hardware Prefetcher = Disabled. Adjacent Cache Line Prefetcher = Disabled. Intel Virtualization Technology = Disabled. Power Technology = Custom. Turbo Mode = Disabled. Energy Performance = Energy Efficient. Override OS Energy Performance = Enabled. P-State Coordination = SW_ANY. Package C State Limit = C6. UPI Link Frequency Select = 9.6GT/s. Uncore Frequency Scaling = Disabled. Sub NUMA Clustering = Enabled. DDR Performance = Energy optimized.
Firmware	2.41P
Operating system	SUSE Linux Enterprise Server 12 SP4 4.12.14-94.41-default
Operating system settings	kernal parameter:pcie_aspm=force pcie_aspm.policy=powersave intel_pstate=disable rcu_nocbs=1-95 nohz=off isolcpus=1-95 modprobe cpufreq_conservative cpupower frequency-set --governor conservative echo -n 98 > /sys/devices/system/cpu/cpufreq/conservative/up_threshold echo -n 1 > /sys/devices/system/cpu/cpufreq/conservative/freq_step echo -n 1000000 > /sys/devices/system/cpu/cpufreq/conservative/sampling_rate echo -n 0 > /sys/devices/system/cpu/cpufreq/conservative/ignore_nice_load sysctl -w kernel.sched_migration_cost_ns=6000 echo -n 97 > /sys/devices/system/cpu/cpufreq/conservative/down_threshold echo -n 1 > /sys/devices/system/cpu/cpufreq/conservative/sampling_down_factor sysctl -w kernel.sched_min_granularity_ns=10000000 echo always > /sys/kernel/mm/transparent_hugepage/enabled powertop --auto-tune echo 0 > /proc/sys/kernel/nmi_watchdog sysctl -w vm.swappiness=50 sysctl -w vm.laptop_mode=5

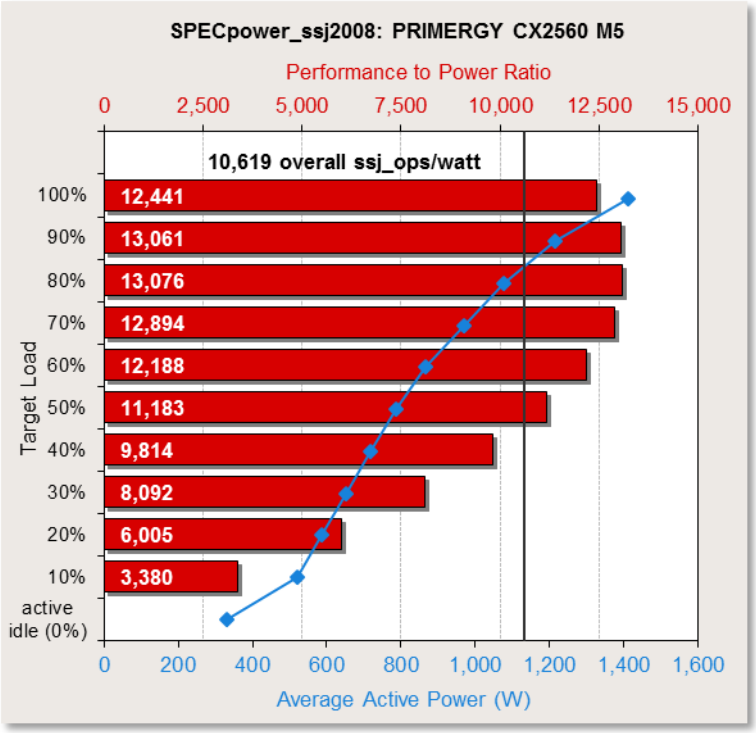
	<Yes>: The test sponsor attests, as of date of publication, that CVE-2017-5754 (Meltdown) is mitigated in the system as tested and documented. <Yes>: The test sponsor attests, as of date of publication, that CVE-2017-5753 (Spectre variant 1) is mitigated in the system as tested and documented. <Yes>: The test sponsor attests, as of date of publication, that CVE-2017-5715 (Spectre variant 2) is mitigated in the system as tested and documented.
JVM	Oracle Java HotSpot 64-Bit Server VM (build 24.80-b11, mixed mode), version 1.7.0_80
JVM settings	server -Xmn1700m -Xms1950m -Xmx1950m -XX:SurvivorRatio=1 -XX:TargetSurvivorRatio=99 -XX:AllocatePrefetchDistance=256 -XX:AllocatePrefetchLines=4 -XX:LoopUnrollLimit=45 -XX:InitialTenuringThreshold=12 -XX:MaxTenuringThreshold=15 -XX:ParallelGCThreads=8 -XX:InlineSmallCode=3900 -XX:MaxInlineSize=270 -XX:FreqInlineSize=2500 -XX:+AggressiveOpts -XX:+UseLargePages -XX:+UseParallelOldGC -XX:+UseHugeTLBFS -XX:+UseTransparentHugePages

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

Benchmark results

The PRIMERGY CX2560 M5 achieved the following result:

SPECpower_ssj2008 = 10,619 overall ssj_ops/watt



The adjoining diagram shows the result of the configuration described above. The red horizontal bars show the performance to power ratio in ssj_ops/watt (upper x-axis) for each target load level tagged on the y-axis of the diagram. The blue line shows the run of the curve for the average power consumption (bottom x-axis) at each target load level marked with a small rhomb. The black vertical line shows the benchmark result of 10,619 overall ssj_ops/watt for the PRIMERGY CX2560 M5. This is the quotient of the sum of the transaction throughputs for each load level and the sum of the average power consumed for each measurement interval.

The following table shows the benchmark results for the throughput in ssj_ops, the power consumption in watts and the resulting energy efficiency for each load level.

Performance		Power	Energy Efficiency
Target Load	ssj_ops	Average Power (W)	ssj_ops/watt
100%	17,566,126	1,412	12,441
90%	15,861,908	1,214	13,061
80%	14,094,424	1,078	13,076
70%	12,493,145	969	12,894
60%	10,566,162	867	12,188
50%	8,798,423	787	11,183
40%	7,042,265	718	9,814
30%	5,279,188	652	8,092
20%	3,523,498	587	6,005
10%	1,758,976	520	3,380
Active Idle	0	329	0
			∑ssj_ops / ∑power = 10,619

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.

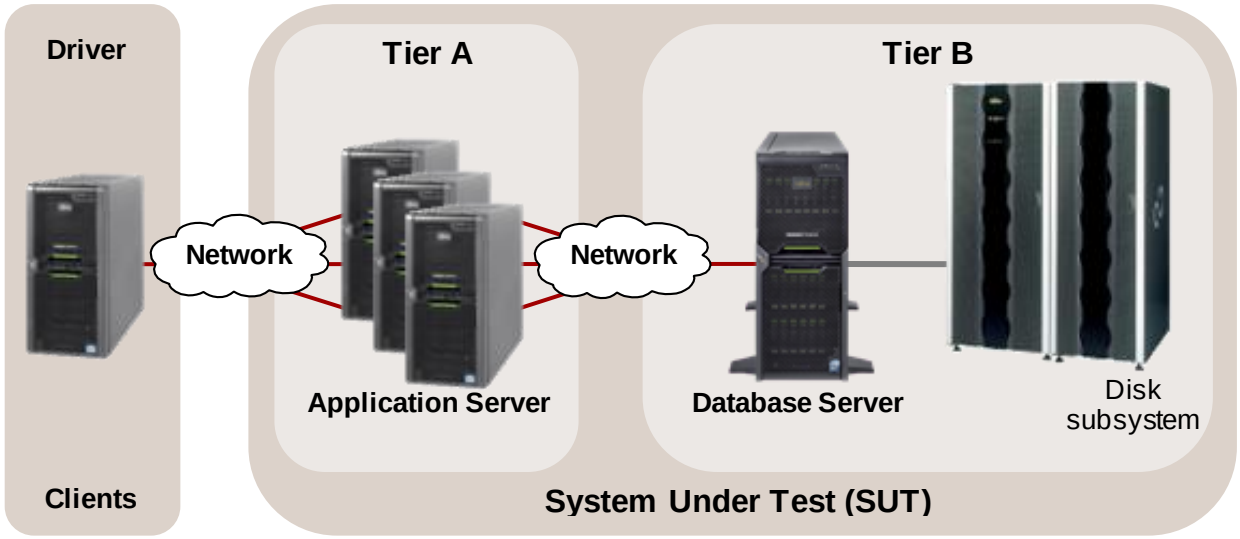
In contrast to benchmarks such as SPECint and TPC-E, which were standardized by independent bodies and for which adherence to the respective rules and regulations are monitored, OLTP-2 is an internal benchmark of Fujitsu. OLTP-2 is based on the well-known database benchmark TPC-E. OLTP-2 was designed 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 :6 × 64 GB (1x64 GB) 4Rx4 DDR4-2933 LR ECC 2 processors: 12 × 64 GB (1x64 GB) 4Rx4 DDR4-2933 LR ECC
Network interface	1 × Dual onboard LAN 10 Gb/s
Disk subsystem	PRIMERGY RX2540 M5: Onboard RAID controller PRAID EP420i 2 × 300 GB 10k rpm SAS Drive, RAID 1 (OS), 6 × 1.6 TB SSD, RAID 10 (LOG) 4 × 1.6 TB SSD, RAID 10 (temp) 5 × PRAID EP540e 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 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.

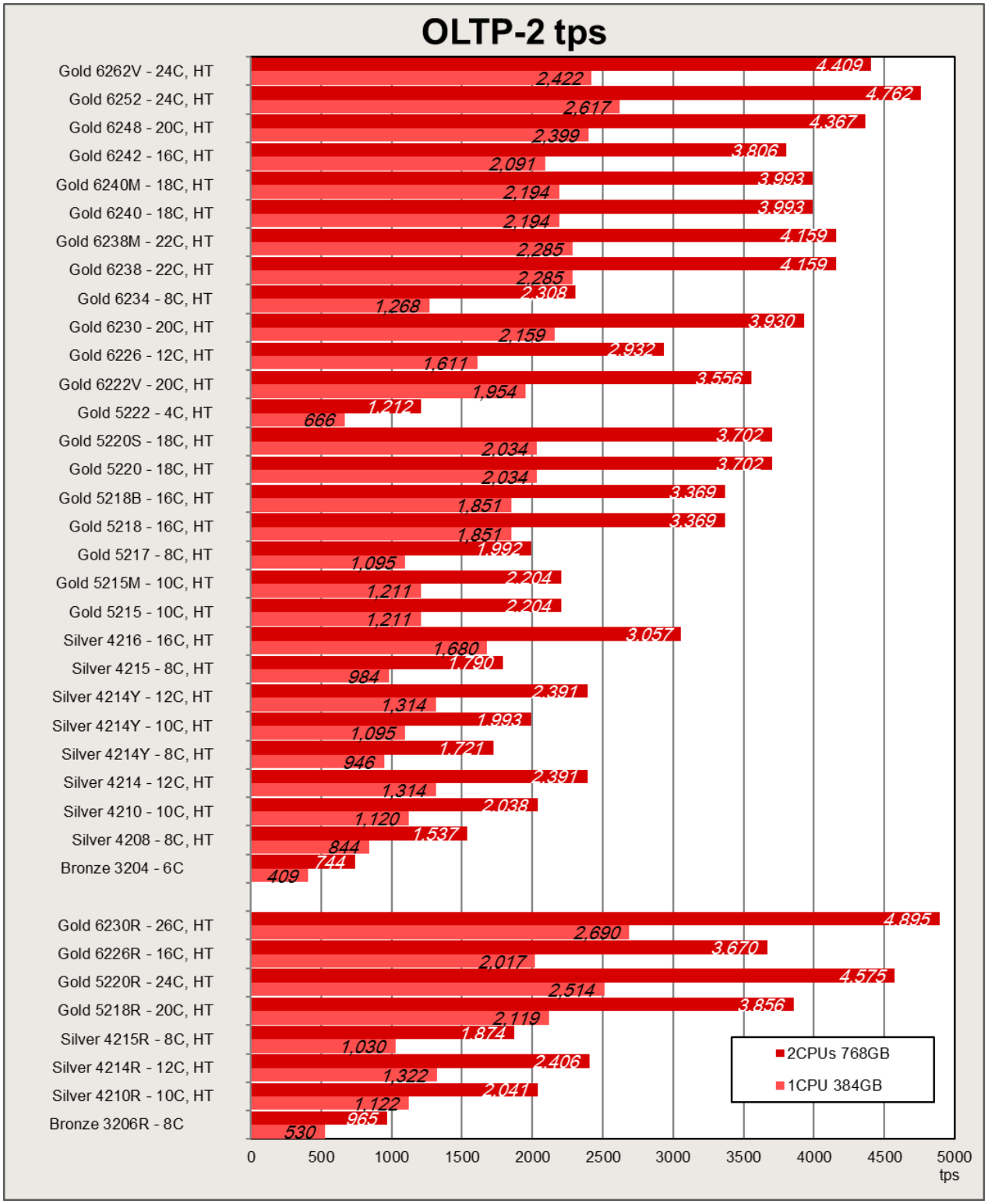
A guideline in the database environment for selecting main memory is that sufficient quantity is more important than the speed of the memory accesses. This why a configuration with a total memory of 768 GB was considered for the measurements with two processors and a configuration with a total memory 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	CX2560 M5	
			2CPU Score	1CPU Score
April 2019 released				
Xeon Gold 6262V	24	48	4,409 (est.)	2,422 (est.)
Xeon Gold 6252	24	48	4,762 (est.)	2,617 (est.)
Xeon Gold 6248	20	40	4,367 (est.)	2,399 (est.)
Xeon Gold 6242	16	32	3,806 (est.)	2,091 (est.)
Xeon Gold 6240M	18	36	3,993 (est.)	2,194 (est.)
Xeon Gold 6240	18	36	3,993 (est.)	2,194 (est.)
Xeon Gold 6238M	22	44	4,159 (est.)	2,285 (est.)
Xeon Gold 6238	22	44	4,159 (est.)	2,285 (est.)
Xeon Gold 6234	8	16	2,308 (est.)	1,268 (est.)
Xeon Gold 6230	20	40	3,930 (est.)	2,159 (est.)
Xeon Gold 6226	12	24	2,932 (est.)	1,611 (est.)
Xeon Gold 6222V	20	40	3,556 (est.)	1,954 (est.)
Xeon Gold 5222	4	8	1,212 (est.)	666 (est.)
Xeon Gold 5220S	18	36	3,702 (est.)	2,034 (est.)
Xeon Gold 5220	18	36	3,702 (est.)	2,034 (est.)
Xeon Gold 5218B	16	32	3,369 (est.)	1,851 (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 5215M	10	20	2,204 (est.)	1,211 (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	1,993 (est.)	1,095 (est.)
	8	16	1,721 (est.)	946 (est.)
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.)
March 2020 released				
Xeon Gold 6230R	26	52	4,895 (est.)	2,690 (est.)
Xeon Gold 6226R	16	32	3,670 (est.)	2,017 (est.)
Xeon Gold 5220R	24	48	4,575 (est.)	2,514 (est.)
Xeon Gold 5218R	20	40	3,856 (est.)	2,119 (est.)

Xeon Silver 4215R	8	16	1,874 (est.)	1,030 (est.)
Xeon Silver 4214R	12	24	2,406 (est.)	1,322 (est.)
Xeon Silver 4210R	10	20	2,041 (est.)	1,122 (est.)
Xeon Bronze 3206R	8	16	965 (est.)	530 (est.)

The following diagram shows the OLTP-2 transaction rates that can be achieved with 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 Gold 6252), the result is an 7-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

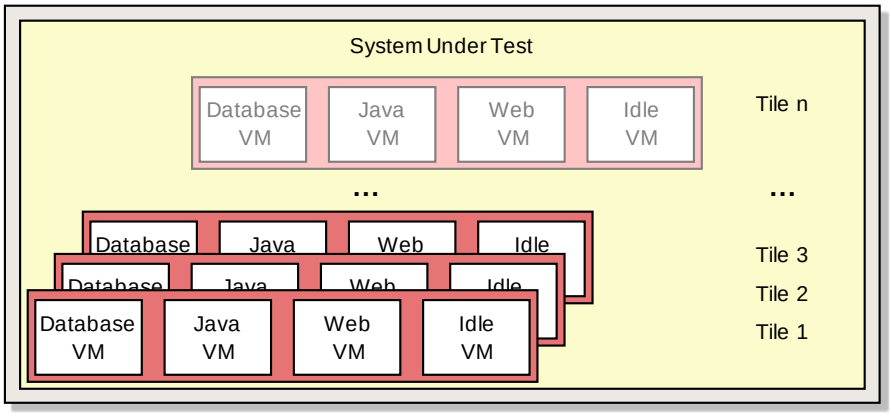
Benchmark description

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.

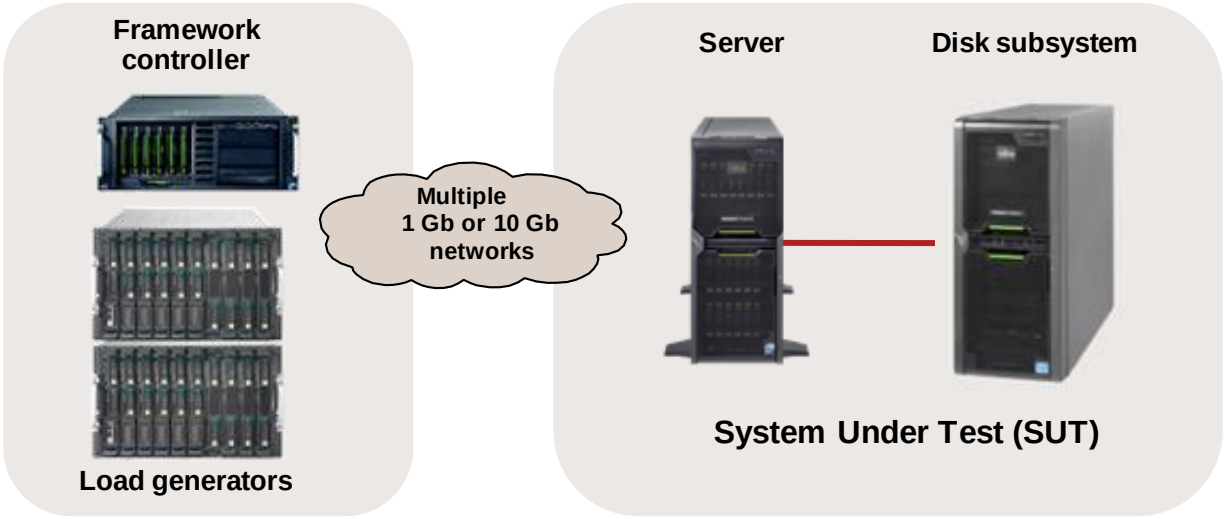
As a general rule, start with one tile, and this procedure is performed for an increasing number of tiles until no further significant increase in this vServCon score occurs. The final vServCon score is then the maximum of the vServCon scores for all tile numbers. This score thus reflects the maximum 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	2 × 2nd Generation Intel Xeon Scalable Processors Family
Memory	12 × 32 GB (1x32 GB) 2Rx4 DDR4-2933 R ECC
Network interface	1 × Intel Ethernet Controller X710 for 10GbE SFP+
Disk subsystem	1 ×dual-channel FC controller Emulex LPe160021 LINUX/LIO based flash storage system
Software	
Operating system	VMware ESXi 6.7 EP06 Build 11675023

Load generator (incl. Framework controller)	
Hardware (Shared)	
Enclosure	4 × 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 U2 Build 3620759

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 rack systems dealt with here are based on processors of the 2nd Generation Intel Xeon Scalable Processors Family. 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.

PRIMERGY CX2550 M5/ CX2560 M5/ CX2570 M5 are equivalent in performance. (It includes scores on processor configurations that are not supported by some hardware).

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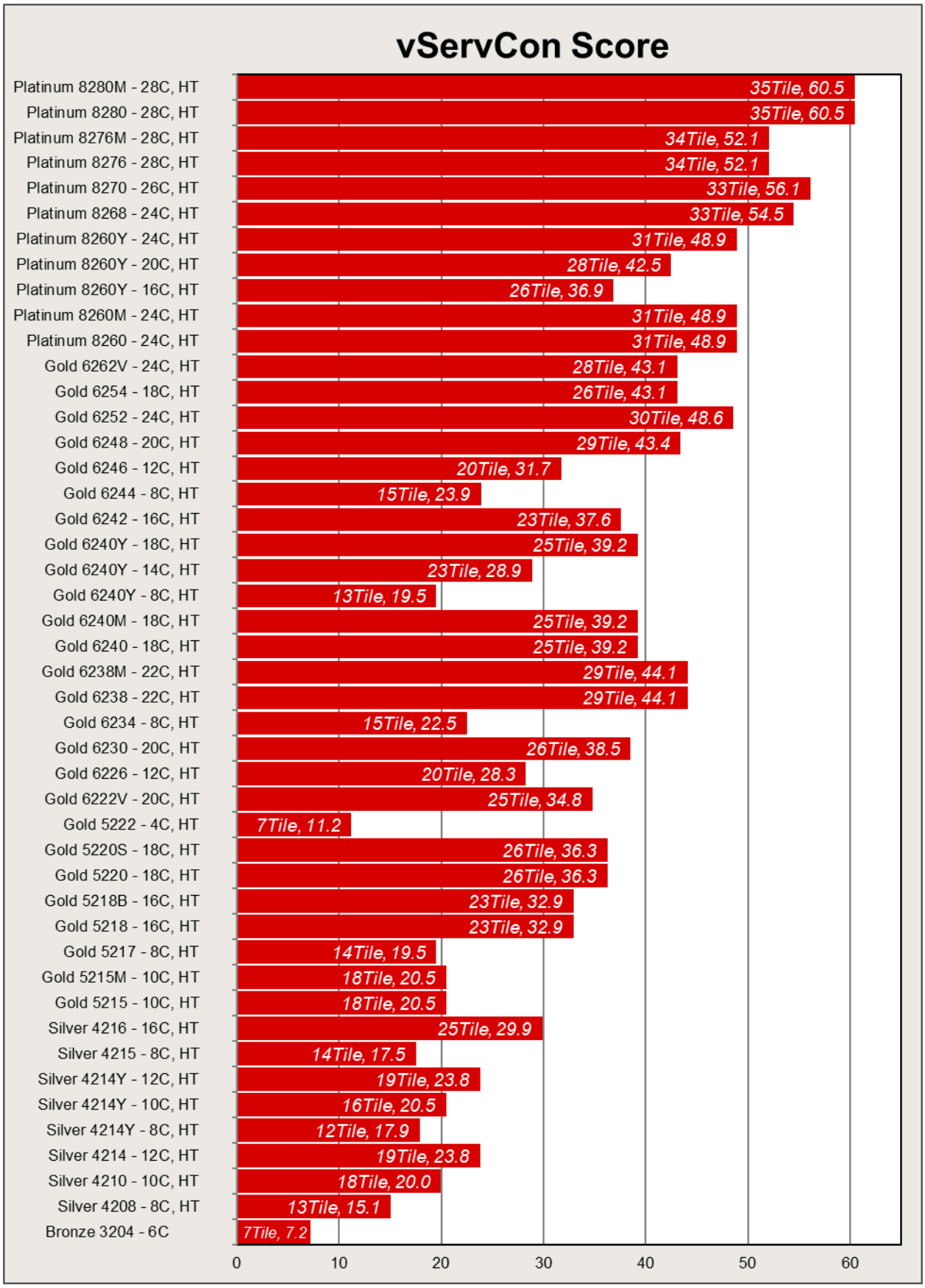
The result with "est." are the estimated values.

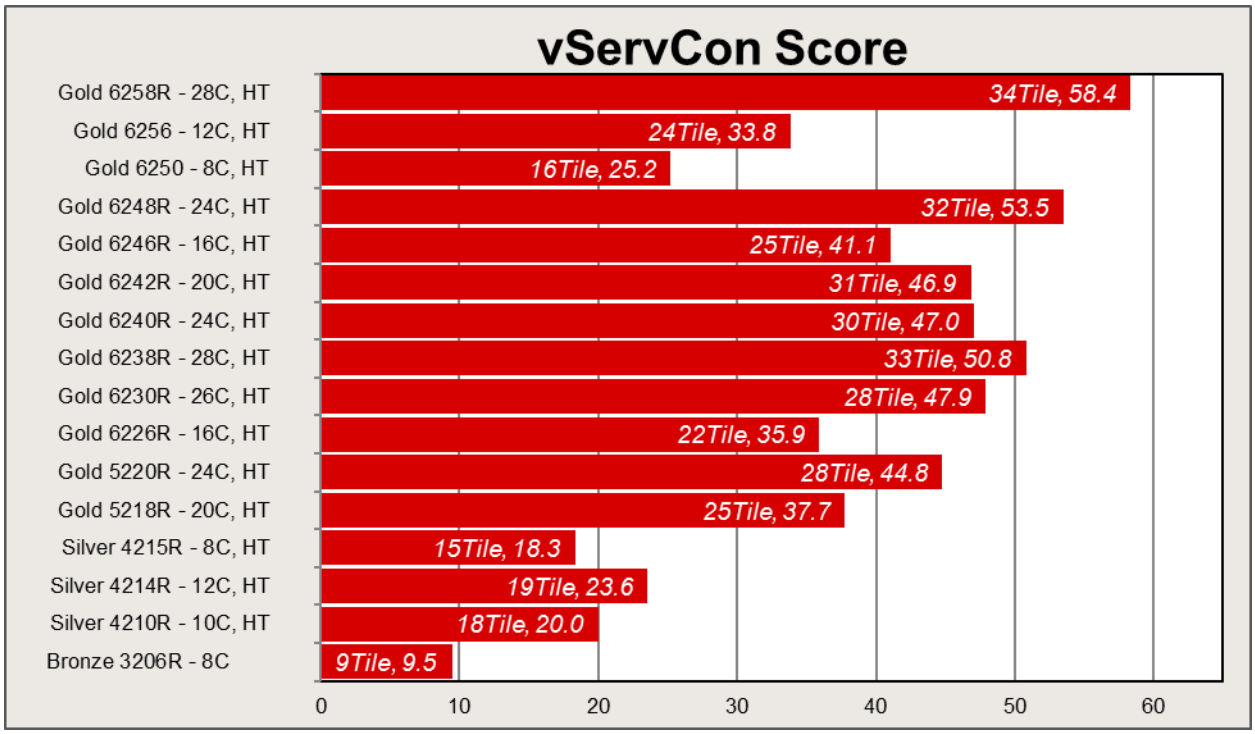
Processor	Cores	Threads	Number of Processors	#Tiles	Score
April 2019 released					
Xeon Platinum 8280M	28	56	2	35 (est.)	60.5 (est.)
Xeon Platinum 8280	28	56	2	35 (est.)	60.5 (est.)
Xeon Platinum 8276M	28	56	2	34 (est.)	52.1 (est.)
Xeon Platinum 8276	28	56	2	34 (est.)	52.1 (est.)
Xeon Platinum 8270	26	52	2	33 (est.)	56.1 (est.)
Xeon Platinum 8268	24	48	2	33 (est.)	54.5 (est.)
Xeon Platinum 8260M	24	48	2	31 (est.)	48.9 (est.)
Xeon Platinum 8260Y	24	48	2	31 (est.)	48.9 (est.)
	20	40	2	28 (est.)	42.5 (est.)
	16	32	2	26 (est.)	36.9 (est.)
Xeon Platinum 8260	24	48	2	31 (est.)	48.9 (est.)
Xeon Gold 6262V	24	48	2	28 (est.)	43.1 (est.)
Xeon Gold 6254	18	36	2	26 (est.)	43.1 (est.)
Xeon Gold 6252	24	48	2	30 (est.)	48.6 (est.)
Xeon Gold 6248	20	40	2	29 (est.)	43.4 (est.)
Xeon Gold 6246	12	24	2	20 (est.)	31.7 (est.)
Xeon Gold 6244	8	16	2	15 (est.)	23.9 (est.)
Xeon Gold 6242	16	32	2	23 (est.)	37.6 (est.)
Xeon Gold 6240M	18	36	2	25 (est.)	39.2 (est.)
Xeon Gold 6240Y	18	36	2	25 (est.)	39.2 (est.)
	14	28	2	23 (est.)	28.9 (est.)
	8	16	2	13 (est.)	19.5 (est.)
Xeon Gold 6240	18	36	2	25 (est.)	39.2 (est.)

Xeon Gold 6238M	22	44	2	29 (est.)	44.1 (est.)
Xeon Gold 6238	22	44	2	29 (est.)	44.1 (est.)
Xeon Gold 6234	8	16	2	15 (est.)	22.5 (est.)
Xeon Gold 6230	20	40	2	26 (est.)	38.5 (est.)
Xeon Gold 6226	12	24	2	20 (est.)	28.3 (est.)
Xeon Gold 6222V	20	40	2	25 (est.)	34.8 (est.)
Xeon Gold 5222	4	8	2	7 (est.)	11.2 (est.)
Xeon Gold 5220S	18	36	2	26 (est.)	36.3 (est.)
Xeon Gold 5220	18	36	2	26 (est.)	36.3 (est.)
Xeon Gold 5218B	16	32	2	23 (est.)	32.9 (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 5215M	10	20	2	18 (est.)	20.5 (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	16 (est.)	20.5 (est.)
	8	16	2	12 (est.)	17.9 (est.)
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.)
March 2020 released					
Xeon Gold 6258R	28	56	2	34 (est.)	58.4 (est.)
Xeon Gold 6256	12	24	2	24 (est.)	33.8 (est.)
Xeon Gold 6250	8	16	2	16 (est.)	25.2 (est.)
Xeon Gold 6248R	24	48	2	32 (est.)	53.5 (est.)
Xeon Gold 6246R	16	32	2	25 (est.)	41.1 (est.)
Xeon Gold 6242R	20	40	2	31 (est.)	46.9 (est.)
Xeon Gold 6240R	24	48	2	30 (est.)	47.0 (est.)
Xeon Gold 6238R	28	56	2	33 (est.)	50.8 (est.)
Xeon Gold 6230R	26	52	2	28 (est.)	47.9 (est.)
Xeon Gold 6226R	16	32	2	22 (est.)	35.9 (est.)
Xeon Gold 5220R	24	48	2	28 (est.)	44.8 (est.)
Xeon Gold 5218R	20	40	2	25 (est.)	37.7 (est.)
Xeon Silver 4215R	8	16	2	15 (est.)	18.3 (est.)
Xeon Silver 4214R	12	24	2	19 (est.)	23.6 (est.)
Xeon Silver 4210R	10	20	2	18 (est.)	20.0 (est.)
Xeon Bronze 3206R	8	8	2	9 (est.)	9.5 (est.)

These PRIMERGY rack systems are very suitable for application virtualization owing to the progress made in processor technology. Compared with a system based on the previous processor generation, approximately 3.6% higher virtualization performance can be achieved (measured in vServCon score in their maximum configuration).

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




vServCon Score
Gold 6258R - 28C, HT
Gold 6256 - 12C, HT
Gold 6250 - 8C, HT
Gold 6248R - 24C, HT
Gold 6246R - 16C, HT
Gold 6242R - 20C, HT
Gold 6240R - 24C, HT
Gold 6238R - 28C, HT
Gold 6230R - 26C, HT
Gold 6226R - 16C, HT
Gold 5220R - 24C, HT
Gold 5218R - 20C, HT
Silver 4215R - 8C, HT
Silver 4214R - 12C, HT
Silver 4210R - 10C, HT
Bronze 3206R - 8C
34Tile, 58.4
24Tile, 33.8
16Tile, 25.2
32Tile, 53.5
25Tile, 41.1
31Tile, 46.9
30Tile, 47.0
33Tile, 50.8
28Tile, 47.9
22Tile, 35.9
28Tile, 44.8
25Tile, 37.7
15Tile, 18.3
19Tile, 23.6
18Tile, 20.0
9Tile, 9.5
0
10
20
30
40
50
60

STREAM

Benchmark description

STREAM is a synthetic benchmark that has been used for many years to determine memory throughput and was developed by John McCalpin during his professorship at the University of Delaware. Today STREAM is supported at the University of Virginia, where the source code can be downloaded in either Fortran or C. STREAM continues to play an important role in the HPC environment in particular. It is for example an integral part of the HPC Challenge benchmark suite.

The benchmark is designed in such a way that it can be used both on PCs and on server systems. The unit of measurement of the benchmark is GB/s, i.e. the number of gigabytes that can be read and written per second.

STREAM measures the memory throughput for sequential accesses. These can generally be performed more efficiently than accesses that are randomly distributed on the memory, because the processor caches are used for sequential access.

Before execution the source code is adapted to the environment to be measured. Therefore, the size of the data area must be at least 12 times larger than the total of all last-level processor caches so that these have as little influence as possible on the result. The OpenMP program library is used to enable selected parts of the program to be executed in parallel during the runtime of the benchmark, consequently achieving optimal load distribution to the available processor cores.

During implementation the defined data area, consisting of 8 byte elements, it is successively copied to four types, and arithmetic calculations are also performed to some extent.

Type	Execution	Bytes per step	Floating-point calculation per step
COPY	a(i) = b(i)	16	0
SCALE	a(i) = q × b(i)	16	1
SUM	a(i) = b(i) + c(i)	24	1
TRIAD	a(i) = b(i) + q × c(i)	24	2

The throughput is output in GB/s for each type of calculation. The differences between the various values are usually only minor on modern systems. In general, only the determined TRIAD value is used as a comparison.

The measured results primarily depend on the clock frequency of the memory modules; the processors influence the arithmetic calculations.

This chapter specifies throughputs on a basis of 10 (1 GB/s = 10^9 Byte/s).

Benchmark environment

System Under Test (SUT)	
Hardware	
Model	PRIMERGY CX2550 M5/ CX2560 M5/ CX2570 M5
Processor	2nd Generation Intel Xeon Scalable Processors Family
Memory	12 × 32 GB (1x32 GB) 2Rx4 DDR4-2933 R ECC
Software	
BIOS settings	ntel Virtualization = Disabled Power Technology = Custom Override OS Energy Performance = Enabled HWPM Support = Disable Sub NUMA Clustering = Disabled*1 Stale AtoS = Enabled LLC Dead Line Alloc = Disabled XPT Prefetch = Enable *1: Xeon Gold 5217, Xeon Gold 5215, Xeon Silver 4215, Xeon Silver 4210, Xeon Silver 4208, Xeon Bronze 3204, Xeon Bronze 3206R, Xeon Silver 4210R, Xeon Silver 4215R
Operating system	SUSE Linux Enterprise Server 15
Operating system settings	Kernel Boot Parameter set with : nohz_full=1-X (X: logical core number -1) echo never > /sys/kernel/mm/transparent_hugepage/enabled run with avx512 or avx2*1 *1: Xeon Gold 5220R, Xeon Gold 5218R, Xeon Silver 4215R, Xeon Silver 4214R, Xeon Silver 4210R, Xeon Bronze 3206R
Compiler	CPU released in April 2019 C/C++: Version 2019.3.0.591499 of Intel C/C++ Compiler for Linux CPU released in March 2020 C/C++: Version 19.0.4.227 of Intel C/C++ Compiler for Linux
Benchmark	STREAM Version 5.10

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

Benchmark results

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

Processor	Memory Frequency [MHz]	Max. Memory Bandwidth [GB/s]	Cores	Processor Frequency [GHz]	Number of Processors	CX2550M5 TRIAD [GB/s]	CX2560M5 TRIAD [GB/s]	CX2570M5 TRIAD [GB/s]
April 2019 released								
Xeon Platinum 8280M	2933	140.8	28	2.7	2	231(est.)		232(est.)
Xeon Platinum 8280	2933	140.8	28	2.7	2	**231**		**232**
Xeon Platinum 8276M	2933	140.8	28	2.2	2	230(est.)		229(est.)
Xeon Platinum 8276	2933	140.8	28	2.2	2	**230**		229(est.)
Xeon Platinum 8270	2933	140.8	26	2.7	2	**229**		230(est.)
Xeon Platinum 8268	2933	140.8	24	2.9	2	**231**		231(est.)
Xeon Platinum 8260M	2933	140.8	24	2.4	2	231(est.)		230(est.)
Xeon Platinum 8260Y	2933	140.8	24	2.4	2	231(est.)		230(est.)
	2933	140.8	20	2.4	2	234(est.)		233(est.)
	2933	140.8	16	2.4	2	233(est.)		232(est.)
Xeon Platinum 8260	2933	140.8	24	2.4	2	**231**		230(est.)
Xeon Gold 6262V	2933	140.8	24	1.9	2	191(est.)	190(est.)	190(est.)
Xeon Gold 6254	2933	140.8	18	3.1	2	**211**		212(est.)
Xeon Gold 6252	2933	140.8	24	2.1	2	**231**	**230**	**230**
Xeon Gold 6248	2933	140.8	20	2.5	2	**219**	218(est.)	218(est.)
Xeon Gold 6246	2933	140.8	12	3.3	2	**216**		215(est.)
Xeon Gold 6244	2933	140.8	8	3.6	2	**191**		190(est.)
Xeon Gold 6242	2933	140.8	16	2.8	2	**211**	210(est.)	209(est.)
Xeon Gold 6240M	2933	140.8	18	2.6	2	211(est.)	210(est.)	210(est.)
Xeon Gold 6240Y	2933	140.8	18	2.6	2	211(est.)		210(est.)
	2933	140.8	14	2.6	2	218(est.)		217(est.)
	2933	140.8	8	2.6	2	183(est.)		182(est.)
Xeon Gold 6240	2933	140.8	18	2.6	2	**211**	210(est.)	210(est.)
Xeon Gold 6238M	2933	140.8	22	2.1	2	221(est.)	220(est.)	220(est.)
Xeon Gold 6238	2933	140.8	22	2.1	2	**221**	220(est.)	220(est.)
Xeon Gold 6234	2933	140.8	8	3.3	2	153(est.)	153(est.)	153(est.)
Xeon Gold 6230	2933	140.8	20	2.1	2	**218**	217(est.)	217(est.)
Xeon Gold 6226	2933	140.8	12	2.7	2	203(est.)	202(est.)	202(est.)
Xeon Gold 6222V	2400	140.8	20	1.8	2	189(est.)	188(est.)	188(est.)
Xeon Gold 5222	2933	140.8	4	3.8	2	**101**	100(est.)	100(est.)
Xeon Gold 5220S	2666	128.0	18	2.7	2	199(est.)	198(est.)	198(est.)
Xeon Gold 5220	2666	128.0	18	2.2	2	**199**	**199**	**199**
Xeon Gold 5218B	2666	128.0	16	2.3	2	198(est.)	197(est.)	197(est.)
Xeon Gold 5218	2666	128.0	16	2.3	2	**198**	197(est.)	197(est.)
Xeon Gold 5217	2666	128.0	8	3	2	**132**	131(est.)	131(est.)

Xeon Gold 5215M	2666	128.0	10	2.5	2	148(est.)	148(est.)	148(est.)
Xeon Gold 5215	2666	128.0	10	2.5	2	**148**	148(est.)	148(est.)
Xeon Silver 4216	2400	115.2	16	2.1	2		**185**	184(est.)
Xeon Silver 4215	2400	115.2	8	2.5	2		92.6(est.)	92.5(est.)
Xeon Silver 4214Y	2400	115.2	12	2.2	2		158(est.)	165(est.)
	2400	115.2	10	2.2	2		166(est.)	166(est.)
	2400	115.2	8	2.2	2		157(est.)	157(est.)
Xeon Silver 4214	2400	115.2	12	2.2	2		**158**	165(est.)
Xeon Silver 4210	2400	115.2	10	2.2	2		**90.8**	93.5(est.)
Xeon Silver 4208	2400	115.2	8	2.1	2		90.5(est.)	90.5(est.)
Xeon Bronze 3204	2133	102.4	6	1.9	2		**77.4**	73.0(est.)
March 2020 relesed								
Xeon Gold 6258R	2933	140.8	28	2.7	2	**231**		**231**
Xeon Gold 6256	2933	140.8	12	3.6	2	221(est.)		221(est.)
Xeon Gold 6250	2933	140.8	8	3.9	2	176(est.)		177(est.)
Xeon Gold 6248R	2933	140.8	24	3.0	2	232(est.)		232(est.)
Xeon Gold 6246R	2933	140.8	16	3.4	2	235(est.)		235(est.)
Xeon Gold 6242R	2933	140.8	20	3.1	2	235(est.)		235(est.)
Xeon Gold 6240R	2933	140.8	24	2.4	2	229(est.)		232(est.)
Xeon Gold 6238R	2933	140.8	28	2.2	2	**228**		231(est.)
Xeon Gold 6230R	2933	140.8	26	2.1	2	**228**	**227**	230(est.)
Xeon Gold 6226R	2933	140.8	16	2.9	2	209(est.)	209(est.)	212(est.)
Xeon Gold 5220R	2666	128.0	24	2.2	2	210(est.)	210(est.)	213(est.)
Xeon Gold 5218R	2666	128.0	20	2.1	2	204(est.)	204(est.)	207(est.)
Xeon Silver 4215R	2400	115.2	8	3.2	2		112(est.)	113(est.)
Xeon Silver 4214R	2400	115.2	12	2.4	2		157(est.)	159(est.)
Xeon Silver 4210R	2400	115.2	10	2.4	2		89.3(est.)	90.7(est.)
Xeon Bronze 3206R	2133	102.4	8	1.9	2		77.7(est.)	78.9(est.)

LINPACK

Benchmark description

LINPACK was developed in the 1970s by Jack Dongarra and some other people to show the performance of supercomputers. The benchmark consists of a collection of library functions for the analysis and solution of linear system of equations. A description can be found in the document https://www.netlib.org/utk/people/JackDongarra/PAPERS/hplpaper.pdf.

LINPACK can be used to measure the speed of computers when solving a linear equation system. For this purpose, an n × n matrix is set up and filled with random numbers between -2 and +2. The calculation is then performed via LU decomposition with partial pivoting.

A memory of $8n^2$ bytes is required for the matrix. In case of an n × n matrix the number of arithmetic operations required for the solution is $^2/_3n^3 + 2n^2$. Thus, the choice of n determines the duration of the measurement: a doubling of n results in an approximately eight-fold increase in the duration of the measurement. The size of n also has an influence on the measurement result itself. As n increases, the measured value asymptotically approaches a limit. The size of the matrix is therefore usually adapted to the amount of memory available. Furthermore, the memory bandwidth of the system only plays a minor role for the measurement result, but a role that cannot be fully ignored. The processor performance is the decisive factor for the measurement result. Since the algorithm used permits parallel processing, in particular the number of processors used and their processor cores are - in addition to the clock rate - of outstanding significance.

LINPACK is used to measure how many floating point operations were carried out per second. The result is referred to as **Rmax** and specified in GFlops (Giga Floating Point Operations per Second).

An upper limit, referred to as **Rpeak**, for the speed of a computer can be calculated from the maximum number of floating point operations that its processor cores could theoretically carry out in one clock cycle.

Rpeak = Maximum number of floating point operations per clock cycle
× Number of processor cores of the computer
× Rated processor frequency [GHz]

LINPACK is classed as one of the leading benchmarks in the field of high performance computing (HPC). LINPACK is one of the seven benchmarks currently included in the HPC Challenge benchmark suite, which takes other performance aspects in the HPC environment into account.

Manufacturer-independent publication of LINPACK results is possible at https://top500.org/. The use of a LINPACK version based on HPL is prerequisite for this (see https://www.netlib.org/benchmark/hpl/).

Intel offers a highly optimized LINPACK version (shared memory version) for individual systems with Intel processors. Parallel processes communicate here via "shared memory", i.e. jointly used memory. Another version provided by Intel is based on HPL (High Performance Linpack). Intercommunication of the LINPACK processes here takes place via OpenMP and MPI (Message Passing Interface). This enables communication between the parallel processes - also from one computer to another. Both versions can be downloaded from https://software.intel.com/content/www/us/en/develop/articles/intel-mkl-benchmarks-suite.html.

Manufacturer-specific LINPACK versions also come into play when graphics cards for General Purpose Computation on Graphics Processing Unit (GPGPU) are used. These are based on HPL and include extensions which are needed for communication with the graphics cards.

Benchmark environment

System Under Test (SUT)	
Hardware	
Model	PRIMERGY CX2550 M5/ CX2560 M5/ CX2570 M5
Processor	2nd Generation Intel Xeon Scalable Processors Family
Memory	12 × 32 GB (1x16 GB) 2Rx4 DDR4-2933 R ECC
Software	
BIOS settings	HyperThreading = Disabled Intel Virtualization Technology = Disabled Power Technology = Custom HWPM Support = Disabled Link Frequency Select = 10.4 GT/s Sub NUMA Clustering = Disabled Stale AtoS = Enabled LLC Dead Line Alloc = Disabled XPT Prefetch = Enabled
Operating system	SUSE Linux Enterprise Server 15
Operating system settings	Kernel Boot Parameter set with : nohz_full=1-X (X: logical core number -1) cpupower -c all frequency-set -g performance echo 50000 > /proc/sys/kernel/sched_cfs_bandwidth_slice_us echo 240000000 > /proc/sys/kernel/sched_latency_ns echo 5000000 > /proc/sys/kernel/sched_migration_cost_ns echo 100000000 > /proc/sys/kernel/sched_min_granularity_ns echo 150000000 > /proc/sys/kernel/sched_wakeup_granularity_ns echo always > /sys/kernel/mm/transparent_hugepage/enabled echo 1048576 > /proc/sys/fs/aio-max-nr run with avx512 or avx2[*1] *1: Xeon Gold 5220R, Xeon Gold 5218R, Xeon Silver 4215R, Xeon Silver 4214R, Xeon Silver 4210R, Xeon Bronze 3206R
Compiler	CPU released in April 2019 C/C++: Version 2019.3.0.591499 of Intel C/C++ Compiler for Linux CPU released in March 2020 C/C++: Version 19.0.4.227 of Intel C/C++ Compiler for Linux
Benchmark	Intel Optimized MP LINPACK Benchmark for Clusters

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

Benchmark results

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

Processor	Cores	Processor Frequency [GHz]	Number of Processors	Rpeak GFlops]	CX2550 M5		CX2560 M5		CX2570 M5	
					Rmax [GFlops]	Effi-ciency	Rmax [GFlops]	Effi-ciency	Rmax [GFlops]	Effi-ciency
April 2019 released										
Xeon Platinum 8280M	28	2.7	2	4,838	3,461(est.)	72%			3,454(est.)	71%
Xeon Platinum 8280	28	2.7	2	4,838	**3,461**	72%			**3,454**	71%
Xeon Platinum 8276M	28	2.2	2	3,942	2,852(est.)	72%			2,702(est.)	69%
Xeon Platinum 8276	28	2.2	2	3,942	**2,852**	72%			2,702(est.)	69%
Xeon Platinum 8270	26	2.7	2	4,493	**3,153**	70%			3,147(est.)	70%
Xeon Platinum 8268	24	2.9	2	4,454	**3,189**	72%			3,183(est.)	71%
Xeon Platinum 8260M	24	2.4	2	3,686	2,755(est.)	75%			2,610(est.)	71%
Xeon Platinum 8260Y	24	2.4	2	3,686	2,755(est.)	75%			2,610(est.)	71%
	20	2.4	2	3,072	2,502(est.)	81%			2370(est.)	77%
	16	2.4	2	2,458	2,214(est.)	90%			2098(est.)	85%
Xeon Platinum 8260	24	2.4	2	3,686	**2,755**	75%			2,610(est.)	71%
Xeon Gold 6262V	24	1.9	2	2,918	2,124(est.)	73%	2,015(est.)	69%	2,012(est.)	69%
Xeon Gold 6254	18	3.1	2	3,571	**2,705**	76%			2,700(est.)	76%
Xeon Gold 6252	24	2.1	2	3,226	**2,502**	78%	**2,374**	74%	**2,370**	73%
Xeon Gold 6248	20	2.5	2	3,200	**2,397**	75%	2,275(est.)	74%	2,271(est.)	71%
Xeon Gold 6246	12	3.3	2	2,534	**1,866**	74%			1,768(est.)	70%
Xeon Gold 6244	8	3.6	2	1,843	**1,457**	79%			1,381(est.)	75%
Xeon Gold 6242	16	2.8	2	2,867	**2,139**	75%	2,030(est.)	71%	2,027(est.)	71%
Xeon Gold 6240M	18	2.6	2	2,995	2,232(est.)	75%	2,118(est.)	71%	2,115(est.)	71%
Xeon Gold 6240Y	18	2.6	2	2,995	2,232(est.)	75%			2,115(est.)	71%
	14	2.6	2	2,330	1,952(est.)	84%			1849	79%
	8	2.6	2	1,331	1,444(est.)	108%			1368	103%
Xeon Gold 6240	18	2.6	2	2,995	**2,232**	75%	2,118(est.)	71%	2,115(est.)	71%
Xeon Gold 6238M	22	2.1	2	2,957	2,345(est.)	79%	2,225(est.)	75%	2,221(est.)	75%
Xeon Gold 6238	22	2.1	2	2,957	**2,345**	79%	2,225(est.)	75%	2,221(est.)	75%
Xeon Gold 6234	8	3.3	2	1,690	1366(est.)	81%	1296(est.)	77%	1,294(est.)	77%
Xeon Gold 6230	20	2.1	2	2,688	**1,966**	73%	1,865(est.)	69%	1,863(est.)	69%
Xeon Gold 6226	12	2.8	2	2,074	1,785(est.)	86%	1,694(est.)	82%	1,691(est.)	82%
Xeon Gold 6222V	20	1.8	2	2,304	1,943(est.)	84%	1,843(est.)	80%	1,840(est.)	80%
Xeon Gold 5222	4	3.8	2	973	**771**	79%	732(est.)	75%	730(est.)	75%
Xeon Gold 5220S	18	2.7	2	1,555	1,298(est.)	83%	1,231(est.)	79%	1,230(est.)	79%
Xeon Gold 5220	18	2.2	2	1,267	**1,293**	102%	**1,242**	98%	**1,179**	93%
Xeon Gold 5218B	16	2.3	2	1,178	1,113(est.)	95%	1,056(est.)	90%	1,054(est.)	90%
Xeon Gold 5218	16	2.3	2	1,178	**1,113**	95%	1,056(est.)	90%	1,054(est.)	90%
Xeon Gold 5217	8	3	2	768	**711**	93%	675(est.)	88%	674(est.)	88%
Xeon Gold 5215M	10	2.5	2	800	734(est.)	92%	696(est.)	87%	695(est.)	87%
Xeon Gold 5215	10	2.5	2	800	**734**	92%	696(est.)	87%	695(est.)	87%

Xeon Silver 4216	16	2.1	2	1,075			**953**	89%	945(est.)	88%
Xeon Silver 4215	8	2.5	2	640			**617**	96%	555(est.)	87%
Xeon Silver 4214Y	12	2.2	2	845			763(est.)	90%	713(est.)	84%
	10	2.2	2	704			643(est.)	91%	642(est.)	91%
	8	2.2	2	563			580(est.)	103%	579(est.)	103%
Xeon Silver 4214	12	2.2	2	845			**763**	90%	713(est.)	84%
Xeon Silver 4210	10	2.2	2	704			**691**	98%	618(est.)	88%
Xeon Silver 4208	8	2.1	2	538			**484**	90%	459(est.)	85%
Xeon Bronze 3204	6	1.9	2	365			**273**	75%	243(est.)	67%
March 2020 relesed										
Xeon Gold 6258R	28	2.7	2	4,838	**3,401**	70%			3332	69%
Xeon Gold 6256	12	3.6	2	2,765	2,180(est.)	79%			2136	77%
Xeon Gold 6250	8	3.9	2	1,997	1,591(est.)	80%			1559	78%
Xeon Gold 6248R	24	3.0	2	4,608	3,187(est.)	69%			3123	68%
Xeon Gold 6246R	16	3.4	2	3,482	2,589(est.)	74%			2537	73%
Xeon Gold 6242R	20	3.1	2	3,968	2,934(est.)	74%			2875	72%
Xeon Gold 6240R	24	2.4	2	3,686	2,584(est.)	70%			2573	70%
Xeon Gold 6238R	28	2.2	2	3,942	**2,707**	69%			2695	68%
Xeon Gold 6230R	16	2.1	2	3,494	**2,484**	71%	2356(est.)	67%	2465	71%
Xeon Gold 6226R	16	2.9	2	2,970	2,129(est.)	72%	2026(est.)	68%	2119	71%
Xeon Gold 5220R	24	2.2	2	1,690	1,500(est.)	89%	1428(est.)	84%	1493	88%
Xeon Gold 5218R	20	2.1	2	1,344	1,215(est.)	90%	1157(est.)	86%	1210	90%
Xeon Silver 4215R	8	3.2	2	819			593(est.)	72%	621	76%
Xeon Silver 4214R	12	2.4	2	922			838(est.)	91%	877	95%
Xeon Silver 4210R	10	2.4	2	768			715(est.)	93%	748	97%
Xeon Bronze 3206R	8	1.9	2	486			420(est.)	86%	439	90%

Rpeak values in the table above were calculated by the base frequency of each processor. Since we enabled Turbo mode in measurements of *Rmax*, the average Turbo frequency exceeded the base frequency for some processors. That is the reason why *Efficiency* of some processors exceeds 100%.

As explained in the section "Technical Data", Intel generally does not guarantee that the maximum turbo frequency can be reached in the processor models due to manufacturing tolerances. A further restriction applies for workloads, such as those generated by LINPACK, with intensive use of AVX instructions and a high number of instructions per clock unit. Here the frequency of a core can also be limited if the upper limits of the processor for power consumption and temperature are reached before the upper limit for the current consumption. This can result in the achievement of a lower performance with turbo mode than without turbo mode. In such cases, you should disable the turbo functionality via BIOS option.

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