



# SPEC CPU®2017 Integer Rate Result

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## Hewlett Packard Enterprise

(Test Sponsor: HPE)

### ProLiant DL20 Gen10

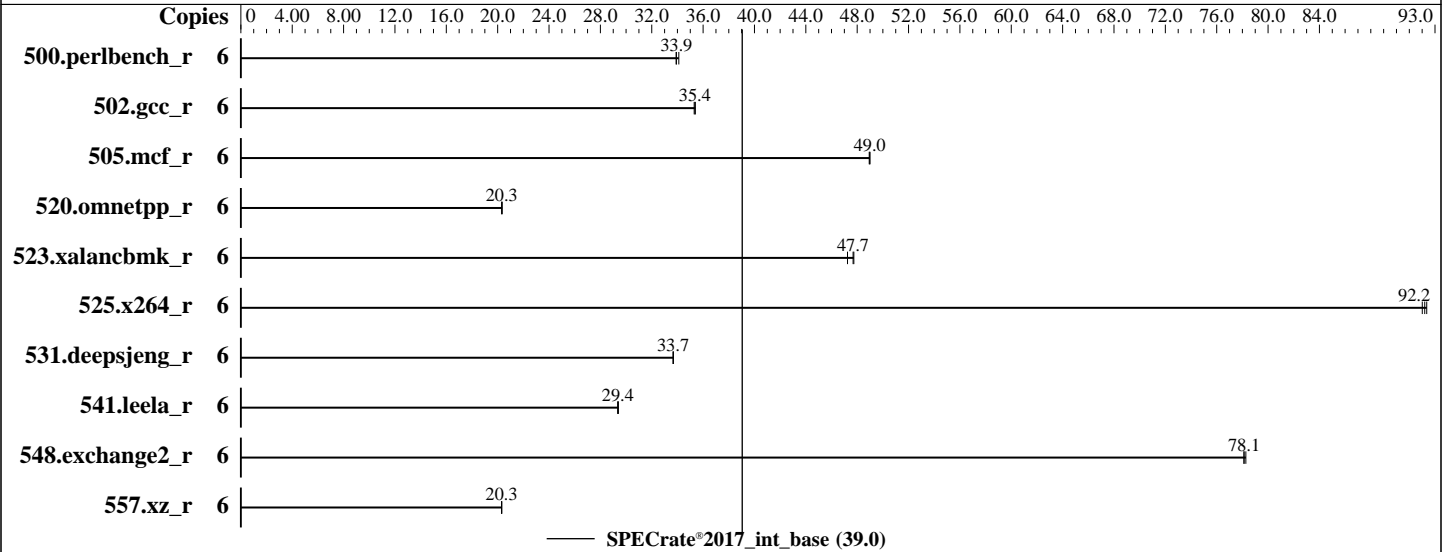
(3.40 GHz, Intel Xeon E-2226G)

SPECrate®2017\_int\_base = 39.0

SPECrate®2017\_int\_peak = Not Run

**CPU2017 License:** 3  
**Test Sponsor:** HPE  
**Tested by:** HPE

**Test Date:** Sep-2019  
**Hardware Availability:** Nov-2019  
**Software Availability:** Oct-2019



### Hardware

CPU Name: Intel Xeon E-2226G  
Max MHz: 4700  
Nominal: 3400  
Enabled: 6 cores, 1 chip  
Orderable: 1 chip(s)  
Cache L1: 32 KB I + 32 KB D on chip per core  
L2: 256 KB I+D on chip per core  
L3: 12 MB I+D on chip per chip  
Other: None  
Memory: 64 GB (4 x 16 GB 2Rx8 PC4-2666V-U)  
Storage: 1 x 400 GB SATA SSD, RAID 0  
Other: None

### Software

OS: SUSE Linux Enterprise Server 15 (x86\_64) SP1 4.12.14-195-default  
Compiler: C/C++: Version 19.0.1.144 of Intel C/C++ Compiler Build 20181018 for Linux; Fortran: Version 19.0.1.144 of Intel Fortran Compiler Build 20181018 for Linux  
Parallel: No  
Firmware: HPE BIOS Version U43 09/05/2019 released Sep-2019  
File System: xfs  
System State: Run level 3 (multi-user)  
Base Pointers: 64-bit  
Peak Pointers: Not Applicable  
Other: None  
Power Management: --



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## Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
500.perlbench_r	6	280	34.1	<b><u>282</u></b>	<b><u>33.9</u></b>	282	33.9							
502.gcc_r	6	241	35.3	<b><u>240</u></b>	<b><u>35.4</u></b>	240	35.4							
505.mcf_r	6	198	48.9	198	49.0	<b><u>198</u></b>	<b><u>49.0</u></b>							
520.omnetpp_r	6	<b><u>387</u></b>	<b><u>20.3</u></b>	387	20.3	387	20.3							
523.xalancbmk_r	6	133	47.7	<b><u>133</u></b>	<b><u>47.7</u></b>	134	47.2							
525.x264_r	6	114	92.0	114	92.4	<b><u>114</u></b>	<b><u>92.2</u></b>							
531.deepsjeng_r	6	204	33.7	<b><u>204</u></b>	<b><u>33.7</u></b>	204	33.7							
541.leela_r	6	339	29.3	<b><u>338</u></b>	<b><u>29.4</u></b>	338	29.4							
548.exchange2_r	6	201	78.3	201	78.1	<b><u>201</u></b>	<b><u>78.1</u></b>							
557.xz_r	6	319	20.3	<b><u>319</u></b>	<b><u>20.3</u></b>	319	20.3							

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Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

## Submit Notes

The taskset mechanism was used to bind copies to processors. The config file option 'submit' was used to generate taskset commands to bind each copy to a specific processor. For details, please see the config file.

## Operating System Notes

Stack size set to unlimited using "ulimit -s unlimited"  
Prior to runcpu invocation  
Filesystem page cache synced and cleared with:  
sync; echo 3> /proc/sys/vm/drop\_caches

## General Notes

Environment variables set by runcpu before the start of the run:

LD\_LIBRARY\_PATH = "/home/cpu2017/lib/ia32:/home/cpu2017/lib/intel64:/home/cpu2017/je5.0.1-32:/home/cpu2017/je5.0.1-64"

Binaries compiled on a system with 1x Intel Core i7-4790 CPU + 32GB RAM  
memory using Redhat Enterprise Linux 7.5

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.



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## Platform Notes

BIOS Configuration:

Thermal Configuration set to Maximum Cooling

LLC prefetch set to Enabled

Workload Profile set to General Throughput Compute

Minimum Processor Idle Power Core C-State set to C1E

Sysinfo program /home/cpu2017/bin/sysinfo

Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9

running on linux-vb4y Fri Sep 27 19:48:52 2019

SUT (System Under Test) info as seen by some common utilities.

For more information on this section, see

<https://www.spec.org/cpu2017/Docs/config.html#sysinfo>

From /proc/cpuinfo

model name : Intel(R) Xeon(R) E-2226G CPU @ 3.40GHz

1 "physical id"s (chips)

6 "processors"

cores, siblings (Caution: counting these is hw and system dependent. The following excerpts from /proc/cpuinfo might not be reliable. Use with caution.)

cpu cores : 6

siblings : 6

physical 0: cores 0 1 2 3 4 5

From lscpu:

Architecture: x86\_64

CPU op-mode(s): 32-bit, 64-bit

Byte Order: Little Endian

Address sizes: 39 bits physical, 48 bits virtual

CPU(s): 6

On-line CPU(s) list: 0-5

Thread(s) per core: 1

Core(s) per socket: 6

Socket(s): 1

NUMA node(s): 1

Vendor ID: GenuineIntel

CPU family: 6

Model: 158

Model name: Intel(R) Xeon(R) E-2226G CPU @ 3.40GHz

Stepping: 10

CPU MHz: 3400.000

BogoMIPS: 6816.00

Virtualization: VT-x

L1d cache: 32K

L1i cache: 32K

L2 cache: 256K

L3 cache: 12288K

NUMA node0 CPU(s): 0-5

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## Platform Notes (Continued)

Flags: fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtscp lm constant\_tsc art arch\_perfmon pebs bts rep\_good nopl xtopology nonstop\_tsc cpuid aperfmperf tsc\_known\_freq pni pclmulqdq dtes64 monitor ds\_cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtpr pdcm pcid sse4\_1 sse4\_2 x2apic movbe popcnt tsc\_deadline\_timer aes xsave avx f16c rdrand lahf\_lm abm 3dnowprefetch cpuid\_fault epb invpcid\_single pti ssbd ibrs ibpb stibp tpr\_shadow vnmi flexpriority ept vpid fsgsbase tsc\_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm mpx rdseed adx smap clflushopt intel\_pt xsaveopt xsavec xgetbv1 xsaves dtherm ida arat pln pts md\_clear flush\_lld

```
/proc/cpuinfo cache data
cache size : 12288 KB
```

From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a physical chip.

```
available: 1 nodes (0)
node 0 cpus: 0 1 2 3 4 5
node 0 size: 64022 MB
node 0 free: 63483 MB
node distances:
node 0
0: 10
```

```
From /proc/meminfo
MemTotal: 65558680 kB
HugePages_Total: 0
Hugepagesize: 2048 kB
```

```
From /etc/*release* /etc/*version*
os-release:
NAME="SLES"
VERSION="15-SP1"
VERSION_ID="15.1"
PRETTY_NAME="SUSE Linux Enterprise Server 15 SP1"
ID="sles"
ID_LIKE="suse"
ANSI_COLOR="0;32"
CPE_NAME="cpe:/o:suse:sles:15:sp1"
```

```
uname -a:
Linux linux-vb4y 4.12.14-195-default #1 SMP Tue May 7 10:55:11 UTC 2019 (8fba516)
x86_64 x86_64 x86_64 GNU/Linux
```

Kernel self-reported vulnerability status:

CVE-2017-5754 (Meltdown): Mitigation: PTI  
CVE-2017-5753 (Spectre variant 1): Mitigation: \_\_user pointer sanitization

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## Platform Notes (Continued)

CVE-2017-5715 (Spectre variant 2): Mitigation: Indirect Branch Restricted Speculation, IBPB: conditional, IBRS\_FW, STIBP: disabled, RSB filling

run-level 3 Sep 27 19:47

SPEC is set to: /home/cpu2017

Filesystem	Type	Size	Used	Avail	Use%	Mounted on
/dev/sda3	xfs	270G	63G	208G	24%	/home

Additional information from dmidecode follows. WARNING: Use caution when you interpret this section. The 'dmidecode' program reads system data which is "intended to allow hardware to be accurately determined", but the intent may not be met, as there are frequent changes to hardware, firmware, and the "DMTF SMBIOS" standard.

BIOS HPE U43 09/05/2019

Memory:

4x UNKNOWN NOT AVAILABLE 16 GB 2 rank 2666

(End of data from sysinfo program)

## Compiler Version Notes

```

=====
C          | 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base)
          | 525.x264_r(base) 557.xz_r(base)
=====

```

```

Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
=====

```

```

=====
C++       | 520.omnetpp_r(base) 523.xalancbmk_r(base) 531.deepsjeng_r(base)
          | 541.leela_r(base)
=====

```

```

Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
=====

```

```

=====
Fortran   | 548.exchange2_r(base)
=====

```

```

Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
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```



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## Base Compiler Invocation

C benchmarks:

```
icc -m64 -std=c11
```

C++ benchmarks:

```
icpc -m64
```

Fortran benchmarks:

```
ifort -m64
```

## Base Portability Flags

```
500.perlbench_r: -DSPEC_LP64 -DSPEC_LINUX_X64  
502.gcc_r: -DSPEC_LP64  
505.mcf_r: -DSPEC_LP64  
520.omnetpp_r: -DSPEC_LP64  
523.xalancbmk_r: -DSPEC_LP64 -DSPEC_LINUX  
525.x264_r: -DSPEC_LP64  
531.deepsjeng_r: -DSPEC_LP64  
541.leela_r: -DSPEC_LP64  
548.exchange2_r: -DSPEC_LP64  
557.xz_r: -DSPEC_LP64
```

## Base Optimization Flags

C benchmarks:

```
-Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div  
-qopt-mem-layout-trans=4  
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/intel64  
-lqkmallo
```

C++ benchmarks:

```
-Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div  
-qopt-mem-layout-trans=4  
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/intel64  
-lqkmallo
```

Fortran benchmarks:

```
-Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div  
-qopt-mem-layout-trans=4 -nostandard-realloc-lhs -align array32byte  
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/intel64  
-lqkmallo
```



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The flags files that were used to format this result can be browsed at

<http://www.spec.org/cpu2017/flags/Intel-ic18.0-official-linux64.2019-04-02.html>

<http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-V1.2-CLX-revB.html>

You can also download the XML flags sources by saving the following links:

<http://www.spec.org/cpu2017/flags/Intel-ic18.0-official-linux64.2019-04-02.xml>

<http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-V1.2-CLX-revB.xml>

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For questions about this result, please contact the tester. For other inquiries, please contact [info@spec.org](mailto:info@spec.org).

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