



# SPEC® CPU2017 Integer Rate Result

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## Hewlett Packard Enterprise

(Test Sponsor: HPE)

### ProLiant ML110 Gen10

(3.60 GHz, Intel Xeon Gold 5122)

SPECrate2017\_int\_base = 28.4

SPECrate2017\_int\_peak = 29.5

CPU2017 License: 3

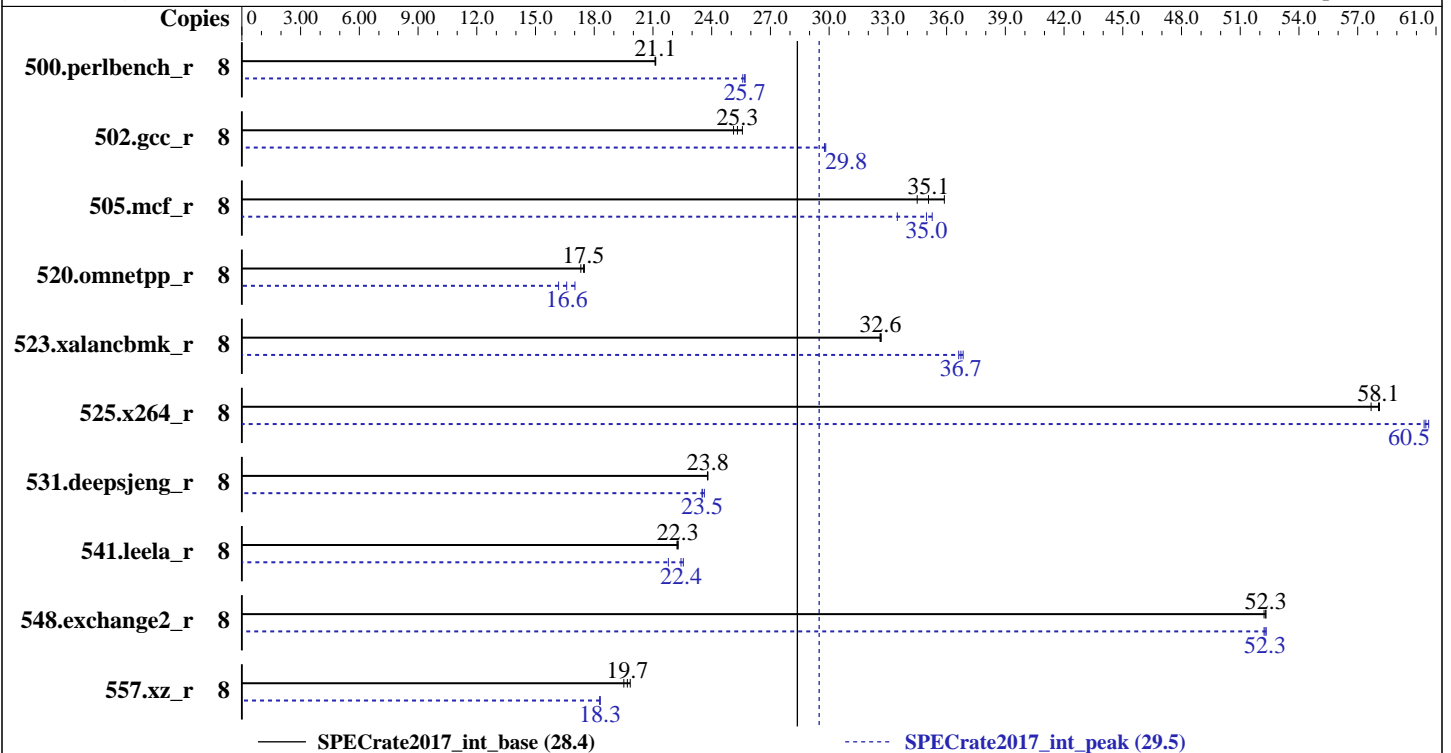
Test Sponsor: HPE

Tested by: HPE

Test Date: Nov-2017

Hardware Availability: Oct-2017

Software Availability: Sep-2017



### Hardware

CPU Name: Intel Xeon Gold 5122  
 Max MHz.: 3700  
 Nominal: 3600  
 Enabled: 4 cores, 1 chip, 2 threads/core  
 Orderable: 1 chip  
 Cache L1: 32 KB I + 32 KB D on chip per core  
 L2: 1 MB I+D on chip per core  
 L3: 16.5 MB I+D on chip per chip  
 Other: None  
 Memory: 96 GB (6 x 16 GB 2Rx8 PC4-2666V-R)  
 Storage: 1 x 480 GB SATA SSD, RAID 0  
 Other: None

### Software

OS: SUSE Linux Enterprise Server 12 (x86\_64) SP3  
 Kernel 4.4.73-5-default  
 Compiler: C/C++: Version 18.0.0.128 of Intel C/C++ Compiler for Linux;  
 Fortran: Version 18.0.0.128 of Intel Fortran Compiler for Linux  
 Parallel: No  
 Firmware: HPE BIOS Version U33 released Oct-2017 (tested with U33 11/14/2017)  
 File System: xfs  
 System State: Run level 3 (multi-user)  
 Base Pointers: 64-bit  
 Peak Pointers: 32/64-bit  
 Other: jemalloc: jemalloc memory allocator library V5.0.1;  
 jemalloc: configured and built at default for 32bit (i686) and 64bit (x86\_64) targets;  
 jemalloc: built with the RedHat Enterprise 7.4, and the system compiler gcc 4.8.5;  
 jemalloc: sources available from jemalloc.net or releases



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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	8	<b>603</b>	<b>21.1</b>	603	21.1	602	21.1	8	495	25.7	<b>496</b>	<b>25.7</b>	498	25.6
502.gcc_r	8	443	25.6	<b>447</b>	<b>25.3</b>	451	25.1	8	380	29.8	381	29.8	<b>380</b>	<b>29.8</b>
505.mcf_r	8	360	35.9	<b>369</b>	<b>35.1</b>	375	34.5	8	367	35.3	386	33.5	<b>370</b>	<b>35.0</b>
520.omnetpp_r	8	<b>601</b>	<b>17.5</b>	606	17.3	600	17.5	8	617	17.0	<b>633</b>	<b>16.6</b>	649	16.2
523.xalancbmk_r	8	<b>259</b>	<b>32.6</b>	259	32.7	259	32.6	8	229	36.8	<b>230</b>	<b>36.7</b>	231	36.6
525.x264_r	8	241	58.1	243	57.7	<b>241</b>	<b>58.1</b>	8	232	60.4	231	60.6	<b>232</b>	<b>60.5</b>
531.deepsjeng_r	8	<b>385</b>	<b>23.8</b>	385	23.8	385	23.8	8	<b>390</b>	<b>23.5</b>	388	23.6	390	23.5
541.leela_r	8	<b>595</b>	<b>22.3</b>	594	22.3	596	22.2	8	<b>591</b>	<b>22.4</b>	587	22.6	608	21.8
548.exchange2_r	8	401	52.3	401	52.2	<b>401</b>	<b>52.3</b>	8	401	52.2	<b>401</b>	<b>52.3</b>	401	52.3
557.xz_r	8	436	19.8	443	19.5	<b>439</b>	<b>19.7</b>	8	472	18.3	472	18.3	<b>472</b>	<b>18.3</b>

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

## Submit Notes

The numactl mechanism was used to bind copies to processors. The config file option 'submit' was used to generate numactl 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  
runcpu command invoked through numactl i.e.:  
numactl --interleave=all runcpu <etc>spec.cpu2017.notes\_os\_030: irqbalance disabled with "service irqbalance stop"  
tuned profile set with "tuned-adm profile throughput-performance"  
VM Dirty ratio was set to 40 using "echo 40 > /proc/sys/vm/dirty\_ratio"  
Numa balancing was disabled using "echo 0 > /proc/sys/kernel/numa\_balancing"

## General Notes

Environment variables set by runcpu before the start of the run:  
LD\_LIBRARY\_PATH = "/home/cpu2017/lib/ia32:/home/cpu2017/lib/intel64"  
LD\_LIBRARY\_PATH = "\$LD\_LIBRARY\_PATH:/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 7.4



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## Platform Notes

BIOS Configuration:

Thermal Configuration set to Maximum Cooling  
 LLC Prefetch set to Enabled  
 LLC Dead Line Allocation set to Disabled  
 Memory Patrol Scrubbing set to Disabled  
 Workload Profile set to General Throughput Compute  
 Minimum Processor Idle Power Core C-State set to C1E  
 Sysinfo program /home/cpu2017/bin/sysinfo  
 Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618bcc091c0f  
 running on m1110nsr Sun Nov 19 08:09:21 2017

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) Gold 5122 CPU @ 3.60GHz
 1 "physical id"s (chips)
 8 "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      : 4
siblings       : 8
physical 0:    : cores 2 3 4 9
```

From lscpu:

```
Architecture:    x86_64
CPU op-mode(s):  32-bit, 64-bit
Byte Order:      Little Endian
CPU(s):          8
On-line CPU(s) list:  0-7
Thread(s) per core:  2
Core(s) per socket:  4
Socket(s):       1
NUMA node(s):    2
Vendor ID:       GenuineIntel
CPU family:      6
Model:           85
Model name:      Intel(R) Xeon(R) Gold 5122 CPU @ 3.60GHz
Stepping:        4
CPU MHz:         3591.598
BogoMIPS:        7183.19
Virtualization:  VT-x
L1d cache:       32K
L1i cache:       32K
L2 cache:        1024K
L3 cache:        16896K
```

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## Platform Notes (Continued)

NUMA node0 CPU(s): 0,1,4,5

NUMA node1 CPU(s): 2,3,6,7

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 aperfmperf eagerfpu pni pclmulqdq dtes64 monitor ds\_cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtpr pdcm pcid dca sse4\_1 sse4\_2 x2apic movbe popcnt tsc\_deadline\_timer aes xsave avx f16c rdrand lahf\_lm abm 3dnowprefetch ida arat epb pln pts dtherm intel\_pt tpr\_shadow vnmi flexpriority ept vpid fsgsbase tsc\_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm cqm mpx avx512f avx512dq rdseed adx smap clflushopt clwb avx512cd avx512bw avx512vl xsaveopt xsavec xgetbv1 cqm\_llc cqm\_occup\_llc pku ospke

```
/proc/cpuinfo cache data
cache size : 16896 KB
```

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

```
available: 2 nodes (0-1)
node 0 cpus: 0 1 4 5
node 0 size: 47968 MB
node 0 free: 37393 MB
node 1 cpus: 2 3 6 7
node 1 size: 48382 MB
node 1 free: 33678 MB
node distances:
node  0  1
  0:  10  21
  1:  21  10
```

From /proc/meminfo

```
MemTotal: 98663972 kB
HugePages_Total: 0
Hugepagesize: 2048 kB
```

From /etc/\*release\* /etc/\*version\*

```
SuSE-release:
SUSE Linux Enterprise Server 12 (x86_64)
VERSION = 12
PATCHLEVEL = 3
# This file is deprecated and will be removed in a future service pack or release.
# Please check /etc/os-release for details about this release.
os-release:
NAME="SLES"
VERSION="12-SP3"
VERSION_ID="12.3"
PRETTY_NAME="SUSE Linux Enterprise Server 12 SP3"
ID="sles"
```

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## Platform Notes (Continued)

ANSI\_COLOR="0;32"

CPE\_NAME="cpe:/o:suse:sles:12:sp3"

uname -a:

Linux ml110nsr 4.4.73-5-default #1 SMP Tue Jul 4 15:33:39 UTC 2017 (b7ce4e4) x86\_64 x86\_64 x86\_64 GNU/Linux

run-level 3 Nov 17 06:28

SPEC is set to: /home/cpu2017

Filesystem	Type	Size	Used	Avail	Use%	Mounted on
/dev/sdb4	xfs	405G	49G	356G	13%	/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 U33 11/14/2017

Memory:

6x UNKNOWN NOT AVAILABLE 16 GB 2 rank 2666

(End of data from sysinfo program)

## Compiler Version Notes

```
=====
CC 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base, peak)
   525.x264_r(base, peak) 557.xz_r(base, peak)
=====
```

icc (ICC) 18.0.0 20170811

Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

```
=====
CC 500.perlbench_r(peak) 502.gcc_r(peak)
=====
```

icc (ICC) 18.0.0 20170811

Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

```
=====
CXXC 520.omnetpp_r(base) 523.xalanbmk_r(base) 531.deepsjeng_r(base)
     541.leela_r(base)
=====
```

icpc (ICC) 18.0.0 20170811

Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

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## Compiler Version Notes (Continued)

```
=====
CXXC 520.omnetpp_r(peak) 523.xalancbmk_r(peak) 531.deepsjeng_r(peak)
      541.leela_r(peak)
-----
```

```
icpc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
-----
```

```
=====
FC 548.exchange2_r(base, peak)
-----
```

```
ifort (IFORT) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
-----
```

## Base Compiler Invocation

C benchmarks:

icc

C++ benchmarks:

icpc

Fortran benchmarks:

ifort

## 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
```



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## Base Optimization Flags

C benchmarks:

```
-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div  
-qopt-mem-layout-trans=3 -L/usr/local/je5.0.1-64/lib -ljemalloc
```

C++ benchmarks:

```
-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div  
-qopt-mem-layout-trans=3 -L/usr/local/je5.0.1-64/lib -ljemalloc
```

Fortran benchmarks:

```
-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div  
-qopt-mem-layout-trans=3 -nostandard-realloc-lhs -align array32byte  
-L/usr/local/je5.0.1-64/lib -ljemalloc
```

## Base Other Flags

C benchmarks:

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

C++ benchmarks:

```
-m64
```

Fortran benchmarks:

```
-m64
```

## Peak Compiler Invocation

C benchmarks:

```
icc
```

C++ benchmarks:

```
icpc
```

Fortran benchmarks:

```
ifort
```

## Peak Portability Flags

```
500.perlbench_r: -DSPEC_LP64 -DSPEC_LINUX_X64
```

```
502.gcc_r: -D_FILE_OFFSET_BITS=64
```

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## Peak Portability Flags (Continued)

```
505.mcf_r: -DSPEC_LP64
520.omnetpp_r: -DSPEC_LP64
523.xalancbmk_r: -D_FILE_OFFSET_BITS=64 -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
```

## Peak Optimization Flags

C benchmarks:

```
500.perlbench_r: -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo
-xCORE-AVX512 -O3 -no-prec-div -qopt-mem-layout-trans=3
-fno-strict-overflow -L/usr/local/je5.0.1-64/lib
-ljemalloc
```

```
502.gcc_r: -L/opt/intel/compilers_and_libraries_2018/linux/lib/ia32
-Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo
-xCORE-AVX512 -O3 -no-prec-div -qopt-mem-layout-trans=3
-L/usr/local/je5.0.1-32/lib -ljemalloc
```

```
505.mcf_r: -Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=3 -L/usr/local/je5.0.1-64/lib
-ljemalloc
```

```
525.x264_r: -Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=3 -fno-alias
-L/usr/local/je5.0.1-64/lib -ljemalloc
```

```
557.xz_r: Same as 505.mcf_r
```

C++ benchmarks:

```
520.omnetpp_r: -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo
-xCORE-AVX512 -O3 -no-prec-div -qopt-mem-layout-trans=3
-L/usr/local/je5.0.1-64/lib -ljemalloc
```

```
523.xalancbmk_r: -L/opt/intel/compilers_and_libraries_2018/linux/lib/ia32
-Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo
-xCORE-AVX512 -O3 -no-prec-div -qopt-mem-layout-trans=3
-L/usr/local/je5.0.1-32/lib -ljemalloc
```

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## Peak Optimization Flags (Continued)

531.deepsjeng\_r: Same as 520.omnetpp\_r

541.leela\_r: Same as 520.omnetpp\_r

Fortran benchmarks:

```
-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div  
-qopt-mem-layout-trans=3 -nostandard-realloc-lhs -align array32byte  
-L/usr/local/je5.0.1-64/lib -ljemalloc
```

## Peak Other Flags

C benchmarks (except as noted below):

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

502.gcc\_r: -m32 -std=c11

C++ benchmarks (except as noted below):

```
-m64
```

523.xalancbmk\_r: -m32

Fortran benchmarks:

```
-m64
```

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

<http://www.spec.org/cpu2017/flags/Intel-ic18.0-official-linux64.2017-10-19.html>

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

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

<http://www.spec.org/cpu2017/flags/Intel-ic18.0-official-linux64.2017-10-19.xml>

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

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