**SPEC® CPU2017 Integer Rate Result**

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**Hewlett Packard Enterprise**  
(Test Sponsor: HPE)  
ProLiant BL460c Gen10  
(1.70 GHz, Intel Xeon Bronze 3106)

<table>
<thead>
<tr>
<th>SPECrate2017_int_base = 44.7</th>
<th>Test Date: Dec-2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECrate2017_int_peak = Not Run</td>
<td>Hardware Availability: Oct-2017</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Software</th>
<th>Hardware</th>
</tr>
</thead>
<tbody>
<tr>
<td>OS: SUSE Linux Enterprise Server 12 (x86_64) SP2</td>
<td>CPU Name: Intel Xeon Bronze 3106</td>
</tr>
<tr>
<td>Kernel 4.4.21-69-default</td>
<td>Max MHz.: 1700</td>
</tr>
<tr>
<td>Compiler: C/C++: Version 18.0.0.128 of Intel C/C++</td>
<td>Nominal: 1700</td>
</tr>
<tr>
<td>Compiler for Linux;</td>
<td>Enabled: 16 cores, 2 chips</td>
</tr>
<tr>
<td>Fortran: Version 18.0.0.128 of Intel Fortran</td>
<td>Orderable: 1, 2 chip(s)</td>
</tr>
<tr>
<td>Compiler for Linux</td>
<td>Cache L1: 32 KB I + 32 KB D on chip per core</td>
</tr>
<tr>
<td>Parallel: No</td>
<td>L2: 1 MB I+D on chip per core</td>
</tr>
<tr>
<td>File System: xfs</td>
<td>Other: None</td>
</tr>
<tr>
<td>System State: Run level 3 (multi-user)</td>
<td>Memory: 192 GB (12 x 16 GB 2Rx8 PC4-2666V-R, running at 2133)</td>
</tr>
<tr>
<td>Base Pointers: 64-bit</td>
<td>Storage: 1 x 480 GB SATA SSD, RAID 0</td>
</tr>
<tr>
<td>Peak Pointers: Not Applicable</td>
<td>Other: None</td>
</tr>
</tbody>
</table>

| Other: jemalloc memory allocator library V5.0.1 |

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**Copies**

<table>
<thead>
<tr>
<th>SPECrate2017_int_base (44.7)</th>
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<tr>
<td>500.perlbench_r 16</td>
</tr>
<tr>
<td>502.gcc_r 16</td>
</tr>
<tr>
<td>505.mcf_r 16</td>
</tr>
<tr>
<td>520.omnetpp_r 16</td>
</tr>
<tr>
<td>523.xalancbmk_r 16</td>
</tr>
<tr>
<td>525.x264_r 16</td>
</tr>
<tr>
<td>531.deepsjeng_r 16</td>
</tr>
<tr>
<td>541.leela_r 16</td>
</tr>
<tr>
<td>548.exchange2_r 16</td>
</tr>
<tr>
<td>557.xz_r 16</td>
</tr>
</tbody>
</table>

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**Hardware**

- CPU Name: Intel Xeon Bronze 3106  
- Max MHz.: 1700  
- Nominal: 1700  
- Enabled: 16 cores, 2 chips  
- Orderable: 1, 2 chip(s)  
- Cache L1: 32 KB I + 32 KB D on chip per core  
- L2: 1 MB I+D on chip per core  
- L3: 11 MB I+D on chip per chip  
- Other: None  
- Memory: 192 GB (12 x 16 GB 2Rx8 PC4-2666V-R, running at 2133)  
- Storage: 1 x 480 GB SATA SSD, RAID 0  
- Other: None
### Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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<tbody>
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<td>43.4</td>
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<tr>
<td>505.mcf_r</td>
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<td>591</td>
<td>29.2</td>
<td>591</td>
<td>29.3</td>
</tr>
</tbody>
</table>

**SPECrate2017_int_base = 44.7**

**SPECrate2017_int_peak = Not Run**

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>
```

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:/home/cpu2017/jre5.0.1-32:/home/cpu2017/jre5.0.1-64"
```

Binaries compiled on a system with 1x Intel Core i7-4790 CPU + 32GB RAM memory using Redhat Enterprise Linux 7.4

No: The test sponsor attests, as of date of publication, that CVE-2017-5754 (Meltdown)
General Notes (Continued)

is mitigated in the system as tested and documented.
No: 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.
No: 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.

This benchmark result is intended to provide perspective on past performance using the historical hardware and/or software described on this result page.

The system as described on this result page was formerly generally available. At the time of this publication, it may not be shipping, and/or may not be supported, and/or may fail to meet other tests of General Availability described in the SPEC OSG Policy document, http://www.spec.org/osg/policy.htm.

This measured result may not be representative of the result that would be measured were this benchmark run with hardware and software available as of the publication date.

jemalloc: configured and built at default for 32bit (i686) and 64bit (x86_64) targets; built with RedHat Enterprise 7.4, and the system compiler gcc 4.8.5; sources available from jemalloc.net or https://github.com/jemalloc/jemalloc/releases

Platform Notes

BIOS Configuration:
- Thermal Configuration set to Maximum Cooling
- Memory Patrol Scrubbing set to Disabled
- LLC Prefetch set to Enabled
- LLC Dead Line Allocation set to Disabled
- Workload Profile set to General Throughput Compute
- Minimum Processor Idle Power Core C-State set to C1E State

Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618bcc091c0f
running on linux-h3xn Fri Dec 15 16:31:51 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) Bronze 3106 CPU @ 1.70GHz
- 2 "physical id"s (chips)
- 16 "processors"
- cores, siblings (Caution: counting these is hw and system dependent. The following

(Continued on next page)
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SPECrate2017_int_base = 44.7
SPECrate2017_int_peak = Not Run

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

Platform Notes (Continued)

excerpts from /proc/cpuinfo might not be reliable. Use with caution.)
cpu cores : 8
siblings : 8
physical 0: cores 0 1 2 3 4 5 6 7
physical 1: cores 0 1 2 3 4 5 6 7

From lscpu:
  Architecture:            x86_64
  CPU op-mode(s):            32-bit, 64-bit
  Byte Order:                Little Endian
  CPU(s):                   16
  On-line CPU(s) list:       0-15
  Thread(s) per core:        1
  Core(s) per socket:        8
  Socket(s):                 2
  NUMA node(s):              2
  Vendor ID:                 GenuineIntel
  CPU family:                6
  Model:                     85
  Model name:                Intel(R) Xeon(R) Bronze 3106 CPU @ 1.70GHz
  Stepping:                  4
  CPU MHz:                   1696.010
  BogoMIPS:                  3392.02
  Virtualization:           VT-x
  L1d cache:                 32K
  L1i cache:                 32K
  L2 cache:                  1024K
  L3 cache:                  11264K
  NUMA node0 CPU(s):         0-3,8-11
  NUMA node1 CPU(s):         4-7,12-15
  Flags:                     fpu vme de pse ts efer pme cmov pat pse36 clflush dtes64
                             dtc acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb
                             rdkwsc l 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 xtrr pdcm pccid dca sse4_1 sse4_2 x2apic movbe
                             popcnt tsc_deadline_timer aes xsave avx f16c rdrand
                             lahf_lm abm 3dnowprefetch arat epbi pni intel_pt
                             tpr_shadow vnmi flexpriority ept vpid fsgsbase tsc_adjust
                             bmi1 hle avx2 smep bmi2  erva
                             invpcid rtm cqm mpx avx512f avx512dq rdseed adx smap
                             clflushopt clwb avx512cd
                             avx512bw avx512v1 xsaveopt xsavec xgetbv1 cqm_l1c
                             cqm_occup_llc

  /proc/cpuinfo cache data
  cache size : 11264 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 2 3 8 9 10 11

(Continued on next page)
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Hardware Availability: Oct-2017
Software Availability: Sep-2017

Platform Notes (Continued)

node 0 size: 96223 MB
node 0 free: 95680 MB
node 1 cpus: 4 5 6 7 12 13 14 15
node 1 size: 96766 MB
node 1 free: 96379 MB
node distances:
node 0 1
 0: 10 21
 1: 21 10

From /proc/meminfo
MemTotal: 197621936 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

/usr/bin/lsb_release -d
SUSE Linux Enterprise Server 12 SP2

From /etc/*release*/etc/*version*
SuSE-release:
  SUSE Linux Enterprise Server 12 (x86_64)
  VERSION = 12
  PATCHLEVEL = 2
  # 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-SP2"
    VERSION_ID="12.2"
    PRETTY_NAME="SUSE Linux Enterprise Server 12 SP2"
    ID="sles"
    ANSI_COLOR="0;32"
    CPE_NAME="cpe:/o:suse:sles:12:sp2"

uname -a:
Linux linux-h3xn 4.4.21-69-default #1 SMP Tue Oct 25 10:58:20 UTC 2016 (9464f67)
x86_64 x86_64 x86_64 GNU/Linux

run-level 3 Dec 15 16:16

SPEC is set to: /home/cpu2017
  Filesystem Type Size Used Avail Use% Mounted on
  /dev/sda4 xfs 405G 112G 293G 28% /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

(Continued on next page)
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Platform Notes (Continued)

frequent changes to hardware, firmware, and the "DMTF SMBIOS" standard.
BIOS HPE I41 09/29/2017
Memory:
4x UNKNOWN NOT AVAILABLE
12x UNKNOWN NOT AVAILABLE 16 GB 2 rank 2666, configured at 2133

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
CC  500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base) 525.x264_r(base) 557.xz_r(base)
==============================================================================
icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
==============================================================================
CXXC 520.omnetpp_r(base) 523.xalancbmk_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.
==============================================================================
FC  548.exchange2_r(base)
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
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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-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

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-V1.2-SKX-revG.html
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You can also download the XML flags sources by saving the following links:

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

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For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

Tested with SPEC CPU2017 v1.0.2 on 2017-12-15 17:31:49-0500.
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