Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL360 Gen10
(2.20 GHz, Intel Xeon Silver 4210)

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

Test Date: Apr-2019
Hardware Availability: Apr-2019
Software Availability: Feb-2019

SPECrate2017_int_base = 110
SPECrate2017_int_peak = Not Run

### Hardware
- CPU Name: Intel Xeon Silver 4210
- Max MHz.: 3200
- Nominal: 2200
- Enabled: 20 cores, 2 chips, 2 threads/core
- 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: 13.75 MB I+D on chip per chip
- Other: None
- Memory: 384 GB (24 x 16 GB 2Rx8 PC4-2933V-R, running at 2400)
- Storage: 1 x 400 GB SAS SSD, RAID 0
- Other: None

### Software
- OS: SUSE Linux Enterprise Server 15 (x86_64)
- Compiler: 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
- Parallel: No
- Firmware: HPE BIOS Version U32 02/02/2019 released Apr-2019
- File System: xfs
- System State: Run level 3 (multi-user)
- Base Pointers: 64-bit
- Peak Pointers: Not Applicable
- Other: None
**SPEC CPU2017 Integer Rate Result**

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<tr>
<th>Benchmark</th>
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<th>Ratio</th>
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<th>Ratio</th>
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<tbody>
<tr>
<td>500.perlbench_r</td>
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<td>758</td>
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<td>91.2</td>
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<tr>
<td>520.omnetpp_r</td>
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<td>548.exchange2_r</td>
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<td>557.xz_r</td>
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<td>72.9</td>
<td>593</td>
<td>72.8</td>
</tr>
</tbody>
</table>

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"
Transparent Huge Pages enabled by default
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>

**General Notes**

Environment variables set by runcpu before the start of the run:
   LD_LIBRARY_PATH = "/home/cpu2017_u2/lib/ia32:/home/cpu2017_u2/lib/intel64"

   Binaries compiled on a system with 1x Intel Core i9-7900X 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)

(Continued on next page)
## General Notes (Continued)

is mitigated in the system as tested and documented.

## 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
- Enhanced Processor Performance set to Enabled
- Workload Profile set to General Throughput Compute
- Workload Profile set to Custom
- Energy/Performance Bias set to Balanced Performance

**Sysinfo program** /home/cpu2017_u2/bin/sysinfo
Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
running on linux-nub3 Mon Apr 8 00:23:44 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) Silver 4210 CPU @ 2.20GHz
- 2 "physical id"s (chips)
- 40 "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 : 10
  - siblings : 20
  - physical 0: cores 0 1 2 3 4 8 9 10 11 12
  - physical 1: cores 0 1 2 3 4 8 9 10 11 12

From lscpu:
- Architecture: x86_64
- CPU op-mode(s): 32-bit, 64-bit
- Byte Order: Little Endian
- CPU(s): 40
- On-line CPU(s) list: 0-39
- Thread(s) per core: 2
- Core(s) per socket: 10
- Socket(s): 2
- NUMA node(s): 2
- Vendor ID: GenuineIntel
- CPU family: 6
- Model: 85
- Model name: Intel(R) Xeon(R) Silver 4210 CPU @ 2.20GHz

(Continued on next page)
### SPEC CPU2017 Integer Rate Result

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- **Hewlett Packard Enterprise**
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**Platform Notes (Continued)**

- **Stepping:** 6
- **CPU MHz:** 2200.000
- **BogoMIPS:** 4400.00
- **Virtualization:** VT-x
- **L1d cache:** 32K
- **L1i cache:** 32K
- **L2 cache:** 1024K
- **L3 cache:** 14080K
- **NUMA node0 CPU(s):** 0-9,20-29
- **NUMA node1 CPU(s):** 10-19,30-39
- **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 pdpes1gb rdtscp lm constant_tsc 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 dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault ebpt cat-i3 cdp_l3 invpcid_single intel_pinn mba tpr_shadow vmmi flexpriority ept vpid fsgsbse tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm cqm mpx rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local ibpb ibrs stibp dtherm ida arat pin pts pku ospke avx512_vnni arch_capabilities ssbd

/proc/cpuinfo cache data

- **cache size:** 14080 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 4 5 6 7 8 9 20 21 22 23 24 25 26 27 28 29
- **node 0 size:** 193118 MB
- **node 0 free:** 192706 MB
- **node 1 cpus:** 10 11 12 13 14 15 16 17 18 19 30 31 32 33 34 35 36 37 38 39
- **node 1 size:** 193502 MB
- **node 1 free:** 193185 MB
- **node distances:**
  - node 0: 0 1
  - node 1: 21 10

From `/proc/meminfo`

- **MemTotal:** 395900040 KB
- **HugePages_Total:** 0
- **Hugepagesize:** 2048 KB

From `/etc/*release*` /etc/*version*

- **os-release:**
  - NAME="SLES"

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Platform Notes (Continued)

VERSION="15"
VERSION_ID="15"
PRETTY_NAME="SUSE Linux Enterprise Server 15"
ID="sles"
ID_LIKE="suse"
ANSI_COLOR="0;32"
CPE_NAME="cpe:/o:suse:sles:15"

uname -a:
Linux linux-nub3 4.12.14-23-default #1 SMP Tue May 29 21:04:44 UTC 2018 (cd0437b)
x86_64 x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:

CVE-2017-5754 (Meltdown): Not affected
CVE-2017-5753 (Spectre variant 1): Mitigation: __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Indirect Branch Restricted Speculation, IBPB, IBRS_FW

run-level 3 Apr 8 00:21

SPEC is set to: /home/cpu2017_u2

Filesystem Type Size Used Avail Use% Mounted on
/dev/sda1 xfs 373G 94G 279G 26% /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 U32 02/02/2019
Memory:
24x UNKNOWN NOT AVAILABLE 16 GB 2 rank 2933, configured at 2400

(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)
==============================================================================

Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.2.187 Build 20190117
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

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Compiler Version Notes (Continued)

==============================================================================
CXXC 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 19.0.2.187 Build 20190117
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
==============================================================================
FC  548.exchange2_r(base)
------------------------------------------------------------------------------
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
64, Version 19.0.2.187 Build 20190117
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

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
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**Base Optimization Flags**

- **C benchmarks:**
  - `-WI,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div`
  - `-qopt-mem-layout-trans=4`
  - `-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/intel64`
  - `-lqkmalloc`

- **C++ benchmarks:**
  - `-WI,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div`
  - `-qopt-mem-layout-trans=4`
  - `-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/intel64`
  - `-lqkmalloc`

- **Fortran benchmarks:**
  - `-WI,-z,muldefs -xCORE-AVX512 -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`
  - `-lqkmalloc`

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-revJ.html](http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-V1.2-SKX-revJ.html)

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-revJ.xml](http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-V1.2-SKX-revJ.xml)

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Tested with SPEC CPU2017 v1.0.5 on 2019-04-07 14:53:43-0400.
Originally published on 2019-05-03.