### SPEC CPU®2017 Integer Rate Result

**Hewlett Packard Enterprise**  
(Test Sponsor: HPE)  
**MicroServer Gen10 Plus**  
(3.40 GHz, Intel Xeon E-2224)

**SPECrate®2017_int_base = 27.4**  
**SPECrate®2017_int_peak = Not Run**

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>Specrate 2017_int_base</th>
<th>Specrate 2017_int_peak</th>
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</thead>
<tbody>
<tr>
<td>500.perlbench_r</td>
<td>4</td>
<td>22.5</td>
<td>0</td>
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<tr>
<td>502.gcc_r</td>
<td>4</td>
<td>26.2</td>
<td>0</td>
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<tr>
<td>505.mcf_r</td>
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<td>33.1</td>
<td>0</td>
</tr>
<tr>
<td>520.omnetpp_r</td>
<td>4</td>
<td>16.4</td>
<td>0</td>
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<tr>
<td>523.xalancbmk_r</td>
<td>4</td>
<td>31.0</td>
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<td>525.x264_r</td>
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<tr>
<td>531.deepsjeng_r</td>
<td>4</td>
<td>23.3</td>
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<tr>
<td>541.leela_r</td>
<td>4</td>
<td>18.8</td>
<td>0</td>
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<td>548.exchange2_r</td>
<td>4</td>
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<tr>
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<td>4</td>
<td>14.1</td>
<td>0</td>
</tr>
</tbody>
</table>

**Hardware**

- **CPU Name:** Intel Xeon E-2224  
- **Max MHz:** 4600  
- **Nominal:** 3400  
- **Enabled:** 4 cores, 1 chip  
- **Orderable:** 1 chip  
- **Cache L1:** 32 KB I + 32 KB D on chip per core  
- **Cache L2:** 256 KB I+D on chip per core  
- **Cache L3:** 8 MB I+D on chip per chip  
- **Memory:** 32 GB (2 x 16 GB 2Rx8 PC4-2666V-U)  
- **Storage:** 1 x 1 TB 7.2 K SATA HDD  
- **Other:** None

**Software**

- **OS:** Red Hat Enterprise Linux release 8.0 (Ootpa)  
- **Kernel:** 4.18.0-80.el8.x86_64  
- **Compiler:** C/C++: Version 19.0.4.227 of Intel C/C++ Compiler Build 20190416 for Linux; Fortran: Version 19.0.4.227 of Intel Fortran Compiler Build 20190416 for Linux  
- **Parallel:** No  
- **Compiler Build:** 20190416 for Linux  
- **Compiler:** Red Hat Enterprise Linux release 8.0 (Ootpa)  
- **Kernel:** 4.18.0-80.el8.x86_64  
- **Compiler:** C/C++: Version 19.0.4.227 of Intel C/C++ Compiler Build 20190416 for Linux; Fortran: Version 19.0.4.227 of Intel Fortran Compiler Build 20190416 for Linux  
- **Parallel:** No  
- **Compiler Build:** 20190416 for Linux  
- **File System:** xfs  
- **System State:** Run level 3 (multi-user)  
- **Base Pointers:** 64-bit  
- **Peak Pointers:** Not Applicable  
- **Other:** None  
- **Power Management:** BIOS set to prefer performance at the cost of additional power usage
Hewlett Packard Enterprise
(Test Sponsor: HPE)
MicroServer Gen10 Plus
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CPU2017 License: 3
Test Sponsor: HPE
Tested by: HPE

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Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
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SPECrate®2017_int_base = 27.4
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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"
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

Environment Variables Notes
Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH = "/home/cpu2017/lib/intel64:/home/cpu2017/lib/ia32:/home/cpu2017/je5.0.1-32"

General Notes
Binaries compiled on a system with 1x Intel Core i9-7900X CPU + 32GB RAM memory using Redhat Enterprise Linux 7.5

(Continued on next page)
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**CPU2017 License:** 3  
**Test Sponsor:** HPE  
**Tested by:** HPE

**Test Date:** Jan-2020  
**Hardware Availability:** Apr-2020  
**Software Availability:** May-2019

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### General Notes (Continued)

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

Sysinfo program `/home/cpu2017/bin/sysinfo`  
Rev: r6365 of 2019-08-21 295195f888a3d7ed1be6e46a485a0011  
running on localhost.localdomain Fri Jan 17 22:03:52 2020

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-2224 CPU @ 3.40GHz
  1 "physical id"s (chips)
  4 "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 : 4
  physical 0: cores 0 1 2 3
```

From `lscpu:`

```
Architecture:         x86_64
CPU op-mode(s):      32-bit, 64-bit
Byte Order:          Little Endian
CPU(s):              4
On-line CPU(s) list: 0-3
Thread(s) per core:  1
Core(s) per socket:  4
Socket(s):           1
NUMA node(s):        1
Vendor ID:           GenuineIntel
CPU family:          6
Model:               158
Model name:          Intel(R) Xeon(R) E-2224 CPU @ 3.40GHz
Stepping:            10
CPU MHz:             4511.709
```

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

- **BogoMIPS:** 6816.00
- **Virtualization:** VT-x
- **L1d cache:** 32K
- **L1i cache:** 32K
- **L2 cache:** 256K
- **L3 cache:** 8192K
- **NUMA node0 CPU(s):** 0-3
- **Flags:** fpu vme de pse tsc msr pae 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 tpr_shadow vnuma 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 flush_l1d

From `/proc/cpuinfo` cache data
- `cache size`: 8192 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`
- `node 0 size: 32014 MB`
- `node 0 free: 23917 MB`
- `node distances: node 0 0: 10`

From `/proc/meminfo`
- `MemTotal: 32783352 kB`
- `HugePages_Total: 0`
- `Hugepagesize: 2048 kB`

From `/etc/*release* /etc/*version*`
- `os-release`
- `NAME="Red Hat Enterprise Linux"`  
  `VERSION=\"8.0\" (Ootpa)\"
  `ID=\"rhel\"
  `ID_LIKE=\"fedora\"
  `VERSION_ID=\"8.0\"
  `PLATFORM_ID=\"platform:el8\"
  `PRETTY_NAME="Red Hat Enterprise Linux 8.0 (Ootpa)"
  `ANSI_COLOR=\"0;31\"
- `redhat-release: Red Hat Enterprise Linux release 8.0 (Ootpa)`
- `system-release: Red Hat Enterprise Linux release 8.0 (Ootpa)`

(Continued on next page)
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**Tested by**: HPE

Test Sponsor: HPE
Hardware Availability: Apr-2020
Software Availability: May-2019

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**Platform Notes (Continued)**

```plaintext
system-release-cpe: cpe:/o:redhat:enterprise_linux:8.0:ga

uname -a:
    Linux localhost.localdomain 4.18.0-80.el8.x86_64 #1 SMP Wed Mar 13 12:02:46 UTC 2019
    x86_64 x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:

    CVE-2018-3620 (L1 Terminal Fault): Mitigation: PTE Inversion; VMX: conditional
        cache flushes, SMT disabled
    Microarchitectural Data Sampling: No status reported
    CVE-2017-5754 (Meltdown): Mitigation: PTI
    CVE-2018-3639 (Speculative Store Bypass): Mitigation: Speculative Store Bypass disabled
        via prctl and seccomp
    CVE-2017-5753 (Spectre variant 1): Mitigation: __user pointer sanitization
    CVE-2017-5715 (Spectre variant 2): Mitigation: Full generic retpoline, IBPB:
        conditional, IBRS_FW, STIBP: disabled, RSB filling

run-level 3 Jan 17 10:58

SPEC is set to: /home/cpu2017
    Filesystem Type Size Used Avail Use% Mounted on
    /dev/mapper/rhel-home xfs 864G 33G 832G 4% /home

From /sys/devices/virtual/dmi/id
    BIOS: HPE U48 11/19/2019
    Vendor: HPE
    Product: ProLiant MicroServer Gen10 Plus
    Product Family: ProLiant
    Serial: 7CE936P1AD

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.
    Memory:
    2x UNKNOWN NOT AVAILABLE 16 GB 2 rank 2666

(End of data from sysinfo program)
```

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**Compiler Version Notes**

```
<table>
<thead>
<tr>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>500.perlbench_r(base)</td>
</tr>
</tbody>
</table>
```

(Continued on next page)
## 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```

(Continued on next page)
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Base Portability Flags (Continued)

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_2019.4.227/linux/compiler/lib/intel64
-lqkmalloc

C++ benchmarks:
-Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64
-lqkmalloc

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_2019.4.227/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-CLX-revB.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-CLX-revB.xml