# SPEC CPU®2017 Integer Rate Result

**Dell Inc.**

PowerEdge R240 (Intel Xeon E-2244G, 3.80 GHz)  

<table>
<thead>
<tr>
<th>SPECrate®2017_int_base = 34.0</th>
<th>SPECrate®2017_int_peak = 35.4</th>
</tr>
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</table>

**CPU2017 License:** 55  
**Test Sponsor:** Dell Inc.  
**Tested by:** Dell Inc.  
**Test Date:** Nov-2019  
**Hardware Availability:** Dec-2019  
**Software Availability:** Jun-2019  

<table>
<thead>
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<th>SPECrate®2017_int_base</th>
<th>SPECrate®2017_int_peak</th>
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<tbody>
<tr>
<td>8</td>
<td>30.4</td>
<td>35.4</td>
</tr>
<tr>
<td>500.perlbench_r</td>
<td>34.5</td>
<td>34.9</td>
</tr>
<tr>
<td>502.gcc_r</td>
<td>44.5</td>
<td>44.6</td>
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<td>505.mcf_r</td>
<td>19.3</td>
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</tr>
<tr>
<td>520.omnetpp_r</td>
<td>37.6</td>
<td>40.4</td>
</tr>
<tr>
<td>523.xalancbmk_r</td>
<td>28.9</td>
<td>28.8</td>
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<tr>
<td>531.deepsjeng_r</td>
<td>26.2</td>
<td>26.2</td>
</tr>
<tr>
<td>541.leela_r</td>
<td>69.0</td>
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</tr>
<tr>
<td>548.exchange2_r</td>
<td>20.4</td>
<td>20.3</td>
</tr>
<tr>
<td>557.xz_r</td>
<td>65.1</td>
<td>77.5</td>
</tr>
</tbody>
</table>

## Hardware

- **CPU Name:** Intel Xeon E-2244G  
- **Max MHz:** 4800  
- **Nominal:** 3800  
- **Enabled:** 8 cores, 1 chip  
- **Orderable:** 1 chips  
- **Cache L1:** 32 KB I + 32 KB D on chip per core  
- **L2:** 256 KB I+D on chip per core  
- **L3:** 8 MB I+D on chip per chip  
- **Other:** None  
- **Memory:** 64 GB (4 x 16 GB 2Rx8 PC4-2666V-R)  
- **Storage:** 1 x 960 GB SATA SSD  
- **Other:** None

## Software

- **OS:** SUSE Linux Enterprise Server 15 SP1  
  *kernel 4.12.14-195-default*  
- **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  
- **Firmware:** Version 2.1.6 released Nov-2019  
- **File System:** xfs  
- **System State:** Run level 3 (multi-user)  
- **Base Pointers:** 64-bit  
- **Peak Pointers:** 32/64-bit  
- **Other:** None  
- **Power Management:** BIOS set to prefer performance at the cost of additional power usage  
- **jemalloc memory allocator V5.0.1**
### Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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<tbody>
<tr>
<td>perbench_r</td>
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<tr>
<td>gcc_r</td>
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<td>373</td>
<td>30.4</td>
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<td></td>
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<tr>
<td>mcf_r</td>
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<td>290</td>
<td>44.7</td>
<td>291</td>
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<td>omnetpp_r</td>
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<td>543</td>
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<tr>
<td>xalancbmk_r</td>
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<td>37.7</td>
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<tr>
<td>x264_r</td>
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<td>deepsjeng_r</td>
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<td>317</td>
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<td>316</td>
<td>29.0</td>
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<tr>
<td>leela_r</td>
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<td>506</td>
<td>26.2</td>
<td>506</td>
<td>26.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>exchange2_r</td>
<td>8</td>
<td>304</td>
<td>69.0</td>
<td>304</td>
<td>69.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>xz_r</td>
<td>8</td>
<td>424</td>
<td>20.4</td>
<td>424</td>
<td>20.4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SPECBenchmarks®2017_int_base = 34.0
SPECBenchmarks®2017_int_peak = 35.4

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"

### 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 i9-799X 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)
SPEC CPU®2017 Integer Rate Result

Dell Inc.  
PowerEdge R240 (Intel Xeon E-2244G, 3.80 GHz)

| SPECrate®2017_int_base = 34.0 |
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**CPU2017 License:** 55  
**Test Date:** Nov-2019  
**Test Sponsor:** Dell Inc.  
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**Software Availability:** Jun-2019

---

**General Notes (Continued)**

is mitigated in the system as tested and documented.  
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
```
runruncpu command invoked through numactl i.e.:  
```
numactl --interleave=all runcpu <etc>
```
jemalloc, a general purpose malloc implementation  
built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5  

---

**Platform Notes**

BIOS settings:  
Virtualization Technology disabled  
DCU Streamer Prefetcher disabled  
System Profile set to Custom  
CPU Performance set to Maximum Performance  
C States set to Autonomous  
C1E disabled  
Uncore Frequency set to Dynamic  
Energy Efficiency Policy set to Performance  
Memory Patrol Scrub disabled  
Logical Processor disabled  
PCI ASPM L1 Link Power Management disabled

Sysinfo program /home/cpu2017/bin/sysinfo  
Rev: r6365 of 2019-08-21 295195f888a3d7edbble6e46a485a0011  
running on linux-g3ob Sat Nov 16 13:47:32 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-2244G CPU @ 3.80GHz
  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 0 1 2 3
```

From lscpu:
```
Architecture: x86_64
```

(Continued on next page)
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Hardware Availability: Dec-2019
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Hardware Availability: Dec-2019

Software Availability: Jun-2019

Platform Notes (Continued)

CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
Address sizes: 39 bits physical, 48 bits virtual
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): 1
Vendor ID: GenuineIntel
CPU family: 6
Model: 158
Model name: Intel(R) Xeon(R) E-2244G CPU @ 3.80GHz
Stepping: 10
CPU MHz: 3800.000
BogoMIPS: 7584.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 256K
L3 cache: 8192K
NUMA node0 CPU(s): 0-7
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 cpuid
aperfmpref tsc_known_freq pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3
sdkg fma cx16 xtrac pcmid 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_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 4 5 6 7
  node 0 size: 64258 MB
  node 0 free: 63463 MB
  node distances:
    node 0
    0: 10

From /proc/meminfo
MemTotal: 65800812 KB

(Continued on next page)
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Platform Notes (Continued)

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-g3ob 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-2018-3620 (L1 Terminal Fault): Mitigation: PTE Inversion  
Microarchitectural Data Sampling: Mitigation: Clear CPU buffers; SMT vulnerable  
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: Indirect Branch Restricted Speculation, IBPB: conditional, IBRS_FW, STIBP: conditional, RSB filling

run-level 3 Nov 16 13:47 last=5

SPEC is set to: /home/cpu2017  
    Filesystem  Type  Size  Used Avail Use% Mounted on  
    /dev/sda2  xfs   440G  34G  407G   8%  /

From /sys/devices/virtual/dmi/id  
BIOS: Dell Inc. 2.1.6 09/27/2018  
Vendor: Dell Inc.  
Product: PowerEdge R240  
Product Family: PowerEdge

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:  

(Continued on next page)
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Platform Notes (Continued)

2x 00AD00000A02 HMA82GU7CJR8N-VK 16 GB 2 rank 2666
2x 00AD00000A07 HMA82GU7CJR8N-VK 16 GB 2 rank 2666

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
C       | 502.gcc_r(peak)
Intel(R) C Intel(R) 64 Compiler for applications running on IA-32, Version
19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
==============================================================================
C       | 500.perlbench_r(base, peak) 502.gcc_r(base) 505.mcf_r(base, peak)
        | 525.x264_r(base, peak) 557.xz_r(base, peak)
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
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Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
==============================================================================
C++     | 523.xalancbmk_r(peak)
Intel(R) C++ Intel(R) 64 Compiler for applications running on IA-32, Version
19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
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SPECratenew

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Compiler Version Notes (Continued)

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==============================================================================
C++     | 520.omnetpp_r(base, peak) 523.xalancbmk_r(base)
        | 531.deepsjeng_r(base, peak) 541.leela_r(base, peak)
==============================================================================
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.4.227 Build 20190416
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C++     | 523.xalancbmk_r(peak)
==============================================================================
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==============================================================================
C++     | 520.omnetpp_r(base, peak) 523.xalancbmk_r(base)
        | 531.deepsjeng_r(base, peak) 541.leela_r(base, peak)
==============================================================================
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

==============================================================================
Fortran | 548.exchange2_r(base, peak)
==============================================================================
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
64, Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

Base Compiler Invocation

C benchmarks:
icc -m64 -std=c11

C++ benchmarks:
icpc -m64

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**SPECrate®2017_int_base = 34.0**

**SPECrate®2017_int_peak = 35.4**

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**Base Compiler Invocation (Continued)**

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:

-W1, -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:

-W1, -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:

-W1, -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

---

**Peak Compiler Invocation**

C benchmarks (except as noted below):

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

(Continued on next page)
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PowerEdge R240 (Intel Xeon E-2244G, 3.80 GHz)  

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</tr>
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</table>

---

### Peak Compiler Invocation (Continued)

502.gcc_r.icc -m32 -std=c11 -L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/ia32_lin

C++ benchmarks (except as noted below):

icpc -m64

523.xalancbmk_r.icpc -m32 -L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/ia32_lin

Fortran benchmarks:

ifort -m64

---

### Peak Portability Flags

500.perlbench_r: -DSPEC_LP64 -DSPEC_LINUX_X64
502.gcc_r: -D_FILE_OFFSET_BITS=64
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-AVX2 -O3 -no-prec-div -qopt-mem-layout-trans=4
-fno-strict-overflow
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64 -lqkmalloc

502.gcc_r: -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo
-xCORE-AVX2 -O3 -no-prec-div -qopt-mem-layout-trans=4
-L/usr/local/je5.0.1-32/lib -ljemalloc

505.mcf_r: -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

(Continued on next page)
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Peak Optimization Flags (Continued)

505.mcf\_r (continued):
-\texttt{-lqkmalloc}

525.x264\_r: -\texttt{-Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div}
-\texttt{-qopt-mem-layout-trans=4 -fno-alias}
-\texttt{-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64 -lqkmalloc}

557.xz\_r: Same as 505.mcf\_r

C++ benchmarks:

520.omnetpp\_r: -\texttt{-Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div}
-\texttt{-qopt-mem-layout-trans=4}
-\texttt{-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64 -lqkmalloc}

523.xalancbmk\_r: -\texttt{-Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo}
-\texttt{-xCORE-AVX2 -O3 -no-prec-div -qopt-mem-layout-trans=4}
-\texttt{-L/usr/local/je5.0.1-32/lib -ljemalloc}

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

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

Fortran benchmarks:

-\texttt{-Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div}
-\texttt{-qopt-mem-layout-trans=4 -nostandard-realloc-lhs -align array32byte}
-\texttt{-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


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


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