Dell Inc.

PowerEdge M640 (Intel Xeon Gold 6230R, 2.10 GHz)

CPU2017 License: 55
Test Sponsor: Dell Inc.
Tested by: Dell Inc.

Test Date: Nov-2021
Hardware Availability: Apr-2019
Software Availability: May-2021

SPECrate®2017_int_base = 285
SPECrate®2017_int_peak = 296

<table>
<thead>
<tr>
<th>SPECrate®2017_int_base (285)</th>
<th>SPECrate®2017_int_peak (296)</th>
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</thead>
<tbody>
<tr>
<td>500.perlbench_r 104</td>
<td>502.gcc_r 104</td>
</tr>
<tr>
<td>505.mcf_r 104</td>
<td>520.omnetpp_r 104</td>
</tr>
<tr>
<td>523.xalancbmk_r 104</td>
<td>525.x264_r 104</td>
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<td>541.leela_r 104</td>
</tr>
<tr>
<td>548.exchange2_r 104</td>
<td>557.xz_r 104</td>
</tr>
</tbody>
</table>

Hardware

CPU Name: Intel Xeon Gold 6230R
Max MHz: 4000
Nominal: 2100
Enabled: 52 cores, 2 chips, 2 threads/core
Orderable: 1.2 chips
Cache L1: 32 KB I + 32 KB D on chip per core
L2: 1 MB I+D on chip per core
L3: 35.75 MB I+D on chip per chip
Other: None
Memory: 192 GB (12 x 16 GB 2Rx4 PC4-2666V-R)
Storage: 125 GB on tmpfs
Other: None

Software

OS: Red Hat Enterprise Linux 8.4 (Ootpa)
4.18.0-305.el8.x86_64
Compiler: C/C++: Version 2021.1 of Intel oneAPI DPC++/C++
Compiler Build 20201113 for Linux;
Fortran: Version 2021.1 of Intel Fortran Compiler
Classic Build 20201112 for Linux;
C/C++: Version 2021.1 of Intel C/C++ Compiler
Classic Build 20201112 for Linux
Parallel: No
Firmware: Version 2.12.2 released Jul-2021
File System: tmpfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: 32/64-bit
Other: jemalloc memory allocator V5.0.1
Power Management: BIOS and OS set to prefer performance
at the cost of additional power usage.
Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>Seconds</th>
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</tr>
</tbody>
</table>

SPECrate®2017_int_base = 285
SPECrate®2017_int_peak = 296
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 = 
"/mnt/ramdisk/cpu2017-1.1.8-ic2021.1/lib/intel64:/mnt/ramdisk/cpu2017-1.1.8-ic2021.1/lib/ia32:/mnt/ramdisk/cpu2017-1.1.8-ic2021.1/je5.0.1-32"
MALLOCONF = "retain:true"

General Notes
Binaries compiled on a system with 1x Intel Core i9-7980XE CPU + 64GB RAM memory using Red Hat Enterprise Linux 8.1
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

(Continued on next page)
SPEC CPU®2017 Integer Rate Result

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General Notes (Continued)

runcpu 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

NA: 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.

Benchmark run from a 125 GB ramdisk created with the cmd: "mount -t tmpfs -o size=125G tmpfs /mnt/ramdisk"

Platform Notes

BIOS Settings:
- Sub NUMA Cluster : 2-Way Clustering
- Virtualization Technology : Disabled

- System Profile : Custom
- CPU Power Management : Maximum Performance
- C1E : Disabled
- C States : Autonomous
- Memory Patrol Scrub : Disabled
- Energy Efficiency Policy : Performance
- CPU Interconnect Bus Link
  - Power Management : Disabled
- PCI ASPM L1 Link
  - Power Management : Disabled

Sysinfo program /mnt/ramdisk/cpu2017-1.1.8-ic2021.1/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acaf64d
running on localhost.localdomain Tue Nov 2 04:43:15 2021

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 6230R CPU @ 2.10GHz
  - 2 "physical id"s (chips)
  - 104 "processors"
cores, siblings (Caution: counting these is hw and system dependent. The following

(Continued on next page)
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Platform Notes (Continued)

excerpt from /proc/cpuinfo might not be reliable. Use with caution.)

    cpu cores : 26
    siblings : 52
    physical 0: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 16 17 18 19 20 21 22 24 25 26 27 28 29
    physical 1: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 16 17 18 19 20 21 22 24 25 26 27 28 29

From lscpu from util-linux 2.32.1:

    Architecture: x86_64
    CPU op-mode(s): 32-bit, 64-bit
    Byte Order: Little Endian
    CPU(s): 104
    On-line CPU(s) list: 0-103
    Thread(s) per core: 2
    Core(s) per socket: 26
    Socket(s): 2
    NUMA node(s): 4
    Vendor ID: GenuineIntel
    BIOS Vendor ID: Intel
    CPU family: 6
    Model: 85
    Model name: Intel(R) Xeon(R) Gold 6230R CPU @ 2.10GHz
    BIOS Model name: Intel(R) Xeon(R) Gold 6230R CPU @ 2.10GHz
    Stepping: 7
    CPU MHz: 2530.247
    CPU max MHz: 4000.0000
    CPU min MHz: 1000.0000
    BogoMIPS: 4200.00
    Virtualization: VT-x
    L1d cache: 32K
    L1i cache: 32K
    L2 cache: 1024K
    L3 cache: 36608K

NUMA node0 CPU(s):
    0,4,8,12,16,20,21,24,28,32,32,36,40,44,48,52,56,60,64,68,72,76,80,84,88,92,96,100
NUMA node1 CPU(s):
    1,5,9,13,17,21,25,29,33,37,41,45,49,53,57,61,65,69,73,77,81,85,89,93,97,101
NUMA node2 CPU(s):
    2,6,10,14,18,22,26,30,34,38,42,46,50,54,58,62,66,70,74,78,82,86,90,94,98,102
NUMA node3 CPU(s):

Flags: fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov
pat pse36 clflush dts acp1 mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtscp
 lm constant_tsc arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid
aperfmpref 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

(Continued on next page)
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Platform Notes (Continued)

avx f16c rtrand lahf_lm abm 3dnowprefetch cpuid_fault epb cat_l3 cdp_l3
invpcid_single intel_pnni ssbd mba ibrs ibpb stibp ibrs_enhanced fsqsbase tsc_adjust
bm1 hle avx2 smep bmi2 erms invpcid cqm mpx rdt_a avx512f avx512dq rdseed adx smap
clfushopt clwb intel_pt avx512cd avx512bw avx512vl xsaveopt xsavec xgetbv1 xsave
xsaveq cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local dtherm ida arat pln pts pkup spke
avx512_vnni md_clear flush_l1d arch_capabilities

/proc/cpuinfo cache data
    cache size : 36608 KB

From numactl --hardware
WARNING: a numactl 'node' might or might not correspond to a physical chip.
    available: 4 nodes (0-3)
    node 0 cpus: 0 4 8 12 16 20 24 28 32 36 40 44 48 52 56 60 64 68 72 76 80 84 88 92 96
    node 0 size: 46881 MB
    node 0 free: 46591 MB
    node 1 cpus: 1 5 9 13 17 21 25 29 33 37 41 45 49 53 57 61 65 69 73 77 81 85 89 93 97
    node 1 size: 48378 MB
    node 1 free: 48092 MB
    node 2 cpus: 2 6 10 14 18 22 26 30 34 38 42 46 50 54 58 62 66 70 74 78 82 86 90 94 98
    node 2 size: 48378 MB
    node 2 free: 48092 MB
    node 3 cpus: 3 7 11 15 19 23 27 31 35 39 43 47 51 55 59 63 67 71 75 79 83 87 91 95 99
    node 3 size: 48377 MB
    node 3 free: 39116 MB
    node distances:
    node 0 1 2 3
    0: 10 21 11 21
    1: 21 10 21 11
    2: 11 21 10 21
    3: 21 11 21 10

From /proc/meminfo
    MemTotal: 196624100 KB
    HugePages_Total: 0
    Hugepagesize: 2048 KB

/sbin/tuned-adm active
Current active profile: throughput-performance

/sys/devices/system/cpu/cpu*/cpufreq/scaling_governor has performance

(Continued on next page)
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SPEC CPU®2017 Integer Rate Result

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

```
FROM /etc/*release* /etc/*version*
  os-release:
    NAME="Red Hat Enterprise Linux"
    VERSION="8.4 (Ootpa)"
    ID="rhel"
    ID_LIKE="fedora"
    VERSION_ID="8.4"
    PLATFORM_ID="platform:el8"
    PRETTY_NAME="Red Hat Enterprise Linux 8.4 (Ootpa)"
    ANSI_COLOR="0;31"

redhat-release: Red Hat Enterprise Linux release 8.4 (Ootpa)
system-release: Red Hat Enterprise Linux release 8.4 (Ootpa)
system-release-cpe: cpe:/o:redhat:enterprise_linux:8.4:ga
```

uname -a:
```
Linux localhost.localdomain 4.18.0-305.el8.x86_64 #1 SMP Thu Apr 29 08:54:30 EDT 2021
x86_64 x86_64 x86_64 GNU/Linux
```

Kernel self-reported vulnerability status:

```
CVE-2018-12207 (iTLB Multihit): KVM: Mitigation: Split huge pages
CVE-2018-3620 (L1 Terminal Fault): Not affected
Microarchitectural Data Sampling: Not affected
CVE-2017-5754 (Meltdown): Mitigation: Speculative Store
CVE-2018-3639 (Speculative Store Bypass):
  Bypass disabled via prctl and seccomp
CVE-2017-5753 (Spectre variant 1):
  Mitigation: userscopy/swapgs barriers and __user pointer
  sanitization
CVE-2017-5715 (Spectre variant 2):
  Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling
CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
CVE-2019-11135 (TSX Asynchronous Abort):
  Mitigation: TSX disabled
```

run-level 3 Nov 2 04:38

SPEC is set to: /mnt/ramdisk/cpu2017-1.1.8-ic2021.1
```
Filesystem Type Size Used Avail Use% Mounted on
tmpfs tmpfs 125G 4.4G 121G 4% /mnt/ramdisk
```

From /sys/devices/virtual/dmi/id
```
Vendor: Dell Inc.
Product: PowerEdge M640
Product Family: PowerEdge
```

Additional information from dmidecode 3.2 follows. WARNING: Use caution when you

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

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:
- 6x 00AD063200AD HMA82GR7AFR8N-VK 16 GB 2 rank 2666
- 6x 00CE063200CE M393A2K43BB1-CTD 16 GB 2 rank 2666

BIOS:
- BIOS Vendor: Dell Inc.
- BIOS Version: 2.12.2
- BIOS Date: 07/12/2021
- BIOS Revision: 2.12

(End of data from sysinfo program)

## Compiler Version Notes

```
<table>
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Intel(R) C Intel(R) 64 Compiler Classic for applications running on Intel(R) 64, Version 2021.1 Build 20201112_000000
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```
<table>
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Intel(R) oneAPI DPC++/C++ Compiler for applications running on IA-32, Version 2021.1 Build 20201113
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Compiler Version Notes (Continued)

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Version 2021.1 Build 20201113
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==============================================================================
C   | 502.gcc_r(peak)
==============================================================================

Intel(R) oneAPI DPC++/C++ Compiler for applications running on IA-32, Version
2021.1 Build 20201113
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==============================================================================
C   | 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base, peak)
    | 525.x264_r(base, peak) 557.xz_r(base)
==============================================================================

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
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==============================================================================
C   | 502.gcc_r(peak)
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Intel(R) oneAPI DPC++/C++ Compiler for applications running on IA-32, Version
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**SPEC CPU®2017 Integer Rate Result**

**Dell Inc.**

**PowerEdge M640 (Intel Xeon Gold 6230R, 2.10 GHz)**

<table>
<thead>
<tr>
<th>SPECrate®2017_int_base</th>
<th>285</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECrate®2017_int_peak</td>
<td>296</td>
</tr>
</tbody>
</table>

**CPU2017 License:** 55  
**Test Sponsor:** Dell Inc.  
**Tested by:** Dell Inc.

<table>
<thead>
<tr>
<th>Test Date</th>
<th>Nov-2021</th>
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<tbody>
<tr>
<td>Hardware Availability</td>
<td>Apr-2019</td>
</tr>
<tr>
<td>Software Availability</td>
<td>May-2021</td>
</tr>
</tbody>
</table>

**Compiler Version Notes (Continued)**

```plaintext
C++  | 520.omnetpp_r(base, peak) 523.xalancbmk_r(base, peak)  
     | 531.deepsjeng_r(base, peak) 541.leela_r(base, peak)  

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,  
Version 2021.1 Build 20201113  
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
```

```plaintext
Fortran | 548.exchange2_r(base, peak)  
```

Intel(R) Fortran Intel(R) 64 Compiler Classic for applications running on  
Intel(R) 64, Version 2021.1 Build 20201112_000000  
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---

**Base Compiler Invocation**

**C benchmarks:**
- icx

**C++ benchmarks:**
- icpx

**Fortran benchmarks:**
- ifort

---

**Base Portability Flags**

```plaintext
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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SPEC CPU®2017 Integer Rate Result

Dell Inc.

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SPECrater®2017_int_base = 285

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Dell Inc.  
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Test Date: Nov-2021  
Hardware Availability: Apr-2019  
Software Availability: May-2021

Base Optimization Flags

C benchmarks:  
-w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ffast-math  
-fflto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4  
-mbranches-within-32B-boundaries  
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin  
-lqkmalloc

C++ benchmarks:  
-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ffast-math -flto  
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4  
-mbranches-within-32B-boundaries  
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin  
-lqkmalloc

Fortran benchmarks:  
-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ipo -no-prec-div  
-qopt-mem-layout-trans=4 -nostandard-realloc-lhs -align array32byte  
-auto -mbranches-within-32B-boundaries  
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin  
-lqkmalloc

Peak Compiler Invocation

C benchmarks (except as noted below):  
icx

500.perlbench_r: icc

557.xz_r: icc

C++ benchmarks:  
icpx

Fortran benchmarks:  
ifort

Peak Portability Flags

500.perlbench_r: -DSPEC_LP64 -DSPEC_LINUX_X64  
502.gcc_r: -D_FILE_OFFSET_BITS=64  
505.mcf_r: -DSPEC_LP64

(Continued on next page)
Dell Inc. PowerEdge M640 (Intel Xeon Gold 6230R, 2.10 GHz)

SPECrate®2017_int_base = 285
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CPU2017 License: 55
Test Sponsor: Dell Inc.
Tested by: Dell Inc.

Peak Portability Flags (Continued)

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

Peak Optimization Flags

C benchmarks:

500.perlbench_r: -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2)
-xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4 -fno-strict-overflow
-mbranches-within-32B-boundaries
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin
-lqkmalloc

502.gcc_r: -m32
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/ia32_lin
-std=gnu89 -Wl,-z,muldefs -fprofile-generate(pass 1)
-fprofile-use=default.profdata(pass 2) -xCORE-AVX512 -flto
-Ofast(pass 1) -O3 -ffast-math -qopt-mem-layout-trans=4
-mbranches-within-32B-boundaries
-L/usr/local/jemalloc32-5.0.1/lib -ljemalloc

505.mcf_r: basepeak = yes

525.x264_r: -w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX512 -flto
-O3 -ffast-math -qopt-mem-layout-trans=4 -fno-alias
-mbranches-within-32B-boundaries
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin
-lqkmalloc

557.xz_r: -Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin
-lqkmalloc

C++ benchmarks:

520.omnetpp_r: basepeak = yes

(Continued on next page)
**SPEC CPU®2017 Integer Rate Result**

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**Hardware Availability:** Apr-2019  
**Tested by:** Dell Inc.  
**Software Availability:** May-2021

---

### Peak Optimization Flags (Continued)

- 523.xalancbmk_r: basepeak = yes
- 531.deepsjeng_r: basepeak = yes
- 541.leela_r: basepeak = yes

For Fortran benchmarks:

- 548.exchange2_r: basepeak = yes

---

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

Tested with SPEC CPU®2017 v1.1.8 on 2021-11-02 04:43:14-0400.  
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