Dell Inc.
PowerEdge XR11 (Intel Xeon Gold 6330N, 2.20 GHz)  

**SPEC CPU®2017 Integer Rate Result**

**Copyright 2017-2021 Standard Performance Evaluation Corporation**

- **CPU2017 License:** 55
- **Test Sponsor:** Dell Inc.
- **Tested by:** Dell Inc.
- **Test Date:** May-2021
- **Hardware Availability:** Jul-2021
- **Software Availability:** Feb-2021

### Hardware

<table>
<thead>
<tr>
<th>Benchmark</th>
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<tbody>
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**CPU Name:** Intel Xeon Gold 6330N  
**Max MHz:** 3400  
**Nominal:** 2200  
**Enabled:** 28 cores, 1 chip, 2 threads/core  
**Orderable:** 1 chip  
**Cache L1:** 32 KB I + 48 KB D on chip per core  
**L2:** 1.25 MB I+D on chip per core  
**L3:** 42 MB I+D on chip per chip  
**Other:** None  
**Memory:** 512 GB (8 x 64 GB 2Rx4 PC4-3200AA-R, running at 2666)  
**Storage:** 225 GB on tmpfs  
**Other:** None

### Software

**OS:** Red Hat Enterprise Linux 8.3 (Ootpa)  
**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 0.6.3 released May-2021  
**File System:** tmpfs  
**System State:** Run level 5 (graphical 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.

**SPECrate®2017_int_base = 179**  
**SPECrate®2017_int_peak = 186**

---

**Results:**

- **SPECrate®2017_int_peak = 186**
- **SPECrate®2017_int_base = 179**

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**SPECrate®2017_int_base (179)**  
**SPECrate®2017_int_peak (186)**

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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"

Environment Variables Notes
Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH =
        "/mnt/ramdisk/cpu2017-1.1.5-ic2021.1/lib/intel64:/mnt/ramdisk/cpu2017-1.1.5-ic2021.1/lib/ia32:/mnt/ramdisk/cpu2017-1.1.5-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)
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General Notes (Continued)

runcpu command invoked through numact1 i.e.:
numact1 --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 225 GB ramdisk created with the cmd: "mount -t tmpfs -o size=225G 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

Sysinfo program /mnt/ramdisk/cpu2017-1.1.5-ic2021.1/bin/sysinfo
Rev: r6538 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2fc
running on localhost.localdomain Wed May 12 03:39:29 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 6330N CPU @ 2.20GHz
  1 "physical id"s (chips)
  56 "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 : 28

(Continued on next page)
Platform Notes (Continued)

siblings: 56
physical 0: cores 0 1 2 3 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 56
On-line CPU(s) list: 0-55
Thread(s) per core: 2
Core(s) per socket: 28
Socket(s): 1
NUMA node(s): 2
Vendor ID: GenuineIntel
CPU family: 6
Model: 106
Model name: Intel(R) Xeon(R) Gold 6330N CPU @ 2.20GHz
Stepping: 6
CPU MHz: 2628.756
BogoMIPS: 4400.00
Virtualization: VT-x
L1d cache: 48K
L1i cache: 32K
L2 cache: 1280K
L3 cache: 43008K
NUMA node0 CPU(s):
0,2,4,6,8,10,12,14,16,18,20,22,24,26,28,30,32,34,36,38,40,42,44,46,48,50,52,54
NUMA node1 CPU(s):
1,3,5,7,9,11,13,15,17,19,21,23,25,27,29,31,33,35,37,39,41,43,45,47,49,51,53,55
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 arch_perfmon pebs bts rep_good nopl xtopology nonstop_cpuid aperfmperf
pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16
xtrr pdcm pcid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave
avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault epb cat_l3 invpcid_single
intel_pinn ssbd mba ibrs ibpb stibp ibrs_enhanced fsogiebase tsc_adjust bmi1 hle avx2
smep bmi2 erms invpcid cmq rdt_a avx512f avx512dq rdseed adx smap avx512ifma
cflushtot clwb intel_pt avx512cd sha_ni avx512bw avx512vl xsaveopt xsavec xgetbv1
xsave cqm_l1c cqm_occop_l1c cqm_mbb_total cqm_mbb_local split_lock_detect wbinvd
dtherm tifi arat pln pts avx512vmbi umip pku ospke avx512_vbmi2 gfnl vaes vpclmulqdq
avx512_vnni avx512_bitalg tme avx512_vpopcntdq la57 rdpid md_clear pconfig flush_lld
arch_capabilities

/proc/cpuinfo cache data
cache size: 4308 KB

From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a
Dell Inc.

PowerEdge XR11 (Intel Xeon Gold 6330N, 2.20 GHz)

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Platform Notes (Continued)

physical chip.
  available: 2 nodes (0-1)
  node 0 cpus: 0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50
  node 0 size: 249038 MB
  node 0 free: 255909 MB
  node 0 cpus: 1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51
  node 0 size: 249570 MB
  node 0 free: 242189 MB
  node distances:
  node 0 1
  0: 10 11
  1: 11 10

From /proc/meminfo
  MemTotal: 527809992 kB
  HugePages_Total: 0
  Hugepagesize: 2048 kB

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

From /etc/*release* /etc/*version*
  os-release:
    NAME="Red Hat Enterprise Linux"
    VERSION="8.3 (Ootpa)"
    ID="rhel"
    ID_LIKE="fedora"
    VERSION_ID="8.3"
    PLATFORM_ID="platform:el8"
    PRETTY_NAME="Red Hat Enterprise Linux 8.3 (Ootpa)"
    ANSI_COLOR="0;31"
  redhat-release: Red Hat Enterprise Linux release 8.3 (Ootpa)
  system-release: Red Hat Enterprise Linux release 8.3 (Ootpa)
  system-release-cpe: cpe:/o:redhat:enterprise_linux:8.3:ga

uname -a:
  Linux localhost.localdomain 4.18.0-240.15.1.el8_3.x86_64 #1 SMP Wed Feb 3 03:12:15 EST 2021 x86_64 x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:

CVE-2018-12207 (iTLB Multihit): Not affected
CVE-2018-3620 (L1 Terminal Fault): Not affected
Microarchitectural Data Sampling: Not affected
CVE-2017-5754 (Meltdown): Not affected

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

- **CVE-2018-3639** (Speculative Store Bypass):  
  Mitigation: Speculative Store Bypass disabled via prctl and seccomp

- **CVE-2017-5753** (Spectre variant 1):  
  Mitigation: usercopy/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): Not affected

---

**run-level 5 May 12 03:37**

**SPEC is set to:** /mnt/ramdisk/cpu2017-1.1.5-ic2021.1

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<tr>
<td>tmpfs</td>
<td>tmpfs</td>
<td>225G</td>
<td>7.0G</td>
<td>219G</td>
<td>4%</td>
<td>/mnt/ramdisk</td>
</tr>
</tbody>
</table>

**From /sys/devices/virtual/dmi/id**

- **Vendor:** Dell Inc.
- **Product:** PowerEdge XR11
- **Product Family:** PowerEdge
- **Serial:** 09A000K

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:**

- 4x 00AD00B300AD HMAA8GR7AJR4N-XN 64 GB 2 rank 3200, configured at 2666
- 1x 00AD063200AD HMAA8GR7AJR4N-XN 64 GB 2 rank 3200, configured at 2666
- 3x 00AD069D00AD HMAA8GR7AJR4N-XN 64 GB 2 rank 3200, configured at 2666

**BIOS:**

- **BIOS Vendor:** Dell Inc.
- **BIOS Version:** 0.6.3
- **BIOS Date:** 05/04/2020
- **BIOS Revision:** 0.6

(End of data from sysinfo program)

**BIOS Note:** Version 0.6.3 was built with an incorrect date stamp which is reflected in the sysinfo section. The correct release date is reflected in the "Firmware" field of the disclosure.
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Compiler Version Notes

==============================================================================
C       | 500.perlbench_r(peak)
------------------------------------------------------------------------------
Intel(R) C Intel(R) 64 Compiler Classic for applications running on Intel(R) 64, Version 2021.1 Build 20201112_000000
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
==============================================================================

==============================================================================
C       | 502.gcc_r(peak)
------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on IA-32, Version 2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
==============================================================================

==============================================================================
C       | 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base, peak)
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| 525.x264_r(base, peak) 557.xz_r(base, peak)
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Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2021.1 Build 20201113

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<th>C</th>
<th>500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base, peak)</th>
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*Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2021.1 Build 20201113
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<table>
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<tr>
<th>C++</th>
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<table>
<thead>
<tr>
<th>Fortran</th>
<th>548.exchange2_r(base, peak)</th>
</tr>
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</table>

*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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## SPEC CPU®2017 Integer Rate Result

**Dell Inc.**

PowerEdge XR11 (Intel Xeon Gold 6330N, 2.20 GHz)

<table>
<thead>
<tr>
<th><strong>SPECrate®2017_int_base</strong></th>
<th><strong>SPECrate®2017_int_peak</strong></th>
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<tbody>
<tr>
<td>179</td>
<td>186</td>
</tr>
</tbody>
</table>

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

**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
```

**Base Optimization Flags**

- **C benchmarks:**
  ```bash
  -w -std=c11 -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
  ```

- **C++ benchmarks:**
  ```bash
  -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:**
  ```bash
  -w -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ipo -no-prec-div
  -qopt-mem-layout-trans=4 -no-prec-div -lqkmalloc -align array32byte
  ```

*(Continued on next page)*
Dell Inc.  
PowerEdge XR11 (Intel Xeon Gold 6330N, 2.20 GHz) 

| SPECrate®2017_int_base = 179 |
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CPU2017 License: 55  
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Test Date: May-2021  
Hardware Availability: Jul-2021  
Software Availability: Feb-2021

### Base Optimization Flags (Continued)

Fortran benchmarks (continued):
- `-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`

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`
- `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 -03 -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`

(Continued on next page)
Dell Inc.  
PowerEdge XR11 (Intel Xeon Gold 6330N, 2.20 GHz)  

**SPEC CPU®2017 Integer Rate Result**

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**Peak Optimization Flags (Continued)**

```plaintext
520.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  

502.mcf_r: basepeak = yes
```

```plaintext
505.mcf_r: basepeak = yes
```

```plaintext
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  

541.leela_r: basepeak = yes
```

**C++ benchmarks**:

```plaintext
523.xalancbmk_r: basepeak = yes
```

```plaintext
531.deepsjeng_r: basepeak = yes
```

```plaintext
541.leela_r: basepeak = yes
```

**Fortran benchmarks**:

```plaintext
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:

http://www.spec.org/cpu2017/flags/Intel-ic2021-official-linux64_revA.xml  
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Tested with SPEC CPU\textsuperscript{*}2017 v1.1.5 on 2021-05-12 04:39:28-0400.
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