Dell Inc. PowerEdge XR12 (Intel Xeon Gold 6338N, 2.20 GHz)

SPECrater2017_fp_base = 184
SPECrater2017_fp_peak = 195

Dell Inc.

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

Hardware

CPU Name: Intel Xeon Gold 6338N
Max MHz: 3500
Nominal: 2200
Enabled: 32 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: 48 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)
Version: 4.18.0-240.15.1.el8_3.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

Firmware: No
Version: 0.6.2 released Apr-2021

File System: tmpfs
System State: Run level 5 (graphical multi-user)
Base Pointers: 64-bit
Peak Pointers: 64-bit
Power Management: BIOS and OS set to prefer performance
at the cost of additional power usage.
Spec CPU®2017 Floating Point Rate Result  

Dell Inc.  

PowerEdge XR12 (Intel Xeon Gold 6338N, 2.20 GHz)  

SPECrater®2017_fp_base = 184  
SPECrater®2017_fp_peak = 195  

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</table>

Results Table

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:

```bash
LD_LIBRARY_PATH = 
"/mnt/ramdisk/cpu2017-1.1.5-ic2021.1/lib/intel64:/mnt/ramdisk/cpu2017-1.1.5-ic2021.1/je5.0.1-64"

MALLOC_CONF = "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.

(Continued on next page)
Dell Inc. PowerEdge XR12 (Intel Xeon Gold 6338N, 2.20 GHz) SPECrate®2017_fp_peak = 195
SPECrate®2017_fp_base = 184

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

General Notes (Continued)

Prior to runcpu invocation
Filesystem page cache synced and cleared with:
sync; echo 3>/proc/sys/vm/drop_caches
runcpu command invoked through numacl i.e.:
umacl --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 e8664e66d2d708a9eaa89d4b38e2f1c
running on localhost.localdomain Fri Apr 23 09:43:25 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 6338N CPU @ 2.20GHz
  1 "physical id"s (chips)
  64 "processors"

(Continued on next page)
Dell Inc.

PowerEdge XR12 (Intel Xeon Gold 6338N, 2.20 GHz)

SPECrates\textsuperscript{\textregistered}2017\_fp\_base = 184
SPECrates\textsuperscript{\textregistered}2017\_fp\_peak = 195

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

Test Date: Apr-2021
Hardware Availability: Jul-2021
Software Availability: Feb-2021

Platform Notes (Continued)

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 : 32
siblings : 64
physical 0: cores 0 1 2 3 4 5 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 64
On-line CPU(s) list: 0-63
Thread(s) per core: 2
Core(s) per socket: 32
Socket(s): 1
NUMA node(s): 2
Vendor ID: GenuineIntel
CPU family: 6
Model: 106
Model name: Intel(R) Xeon(R) Gold 6338N CPU @ 2.20GHz
Stepping: 6
CPU MHz: 2738.530
BogoMIPS: 4400.00
Virtualization: VT-x
L1d cache: 48K
L1i cache: 32K
L2 cache: 1280K
L3 cache: 49152K
NUMA node0 CPU(s):
0,2,4,6,8,10,12,14,16,18,20,22,24,26,28,30,32,34,36,38,40,42,44,46,48,50,52,54,56,58,60,62
NUMA node1 CPU(s):
1,3,5,7,9,11,13,15,17,19,21,23,25,27,29,31,33,35,37,39,41,43,45,47,49,51,53,55,57,59,61,63
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_tsc cpuid aperfmperf pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtrac 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 fsgraybase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid cmqm rdt_a avx512f avx512dq rdseed adx smap avx512ifma clflushopt clwb intel_pt avx512cd sha ni avx512bw avx512vl xsaveopt xsaves x87 vfb vclwb intel_pt avx512cd sha ni avx512bw avx512vl xsaveopt xsaves xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local split_lock_detect wbnoinvd dtcHelvetica

(Continued on next page)
Dell Inc. PowerEdge XR12 (Intel Xeon Gold 6338N, 2.20 GHz)

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Test Date: Apr-2021
Hardware Availability: Jul-2021
Software Availability: Feb-2021

Platform Notes (Continued)

/proc/cpuinfo cache data
  cache size : 49152 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 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 56 58 60 62
  node 0 size: 248397 MB
  node 0 free: 241080 MB
  node 1 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
  53 55 57 59 61 63
  node 1 size: 248646 MB
  node 1 free: 256667 MB
  node distances:
  node 0 1
  0: 10 11
  1: 11 10

From /proc/meminfo
  MemTotal: 527808252 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

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

**Dell Inc.**

PowerEdge XR12 (Intel Xeon Gold 6338N, 2.20 GHz)  

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

### Platform Notes (Continued)

**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
- **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 sanitation
  - 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 Apr 23 04:05**

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

**Filesystem** | **Type** | **Size** | **Used** | **Avail** | **Use%** | **Mounted on**
--- | --- | --- | --- | --- | --- | ---
tmpfs | tmpfs | 225G | 7.0G | 219G | 4% | /mnt/ramdisk

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

- **Vendor:** Dell Inc.
- **Product:** PowerEdge XR12
- **Product Family:** PowerEdge
- **Serial:** 0990104

**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:**

- 5x 002C0632002C 36ASF8G72PZ-3G2B2 64 GB 2 rank 3200, configured at 2666
- 3x 00CE063200CE M393A8G40AB2-CWE 64 GB 2 rank 3200, configured at 2666

**BIOS:**

- **BIOS Vendor:** Dell Inc.
- **BIOS Version:** 0.6.2
- **BIOS Date:** 04/12/2021
- **BIOS Revision:** 0.6

(End of data from sysinfo program)
Compiler Version Notes

==============================================================================
C  | 519.lbm_r(base, peak) 538.imagick_r(base, peak)
   | 544.nab_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.
==============================================================================
C++ | 508.namd_r(base, peak) 510.parest_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.
==============================================================================
C++, C | 511.povray_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.
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++, C | 511.povray_r(base) 526.blender_r(base, peak)
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   64, Version 2021.1 Build 20201112_000000
(Continued on next page)
Dell Inc. PowerEdge XR12 (Intel Xeon Gold 6338N, 2.20 GHz)

**Compiler Version Notes (Continued)**

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<th>Platform</th>
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(Continued on next page)
**Dell Inc.**

**PowerEdge XR12 (Intel Xeon Gold 6338N, 2.20 GHz)**

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</tr>
</tbody>
</table>

---

### Compiler Version Notes (Continued)

```
Fortran, C      | 521.wrf_r(base) 527.cam4_r(base, peak)
```

Intel(R) Fortran 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.

```
Fortran, C      | 521.wrf_r(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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```
Fortran, C      | 521.wrf_r(base) 527.cam4_r(base, peak)
```

Intel(R) Fortran 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.

---

### Base Compiler Invocation

C benchmarks:
- icx

C++ benchmarks:
- icpx

Fortran benchmarks:
- ifort

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

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CPU2017 License: 55
Test Sponsor: Dell Inc.
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Software Availability: Feb-2021

Base Compiler Invocation (Continued)

Benchmarks using both Fortran and C:
ifort icx

Benchmarks using both C and C++:
icpx icx

Benchmarks using Fortran, C, and C++:
icpx icx ifort

Base Portability Flags

503.bwaves_r: -DSPEC_LP64
507.cactuBSSN_r: -DSPEC_LP64
508.namd_r: -DSPEC_LP64
510.parest_r: -DSPEC_LP64
511.povray_r: -DSPEC_LP64
519.lbm_r: -DSPEC_LP64
521.wrf_r: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
526.blender_r: -DSPEC_LP64 -DSPEC_LINUX -funsigned-char
527.cam4_r: -DSPEC_LP64 -DSPEC_CASE_FLAG
538.imagick_r: -DSPEC_LP64
544.nab_r: -DSPEC_LP64
549.fotonik3d_r: -DSPEC_LP64
554.roms_r: -DSPEC_LP64

Base Optimization Flags

C benchmarks:
-w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -gopt-mem-layout-trans=4
-mbranches-within-32B-boundaries -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

C++ benchmarks:
-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math -flto
-mfpmath=sse -funroll-loops -gopt-mem-layout-trans=4
-mbranches-within-32B-boundaries -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

Fortran benchmarks:
-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -03 -ipo -no-prec-div
-gopt-prefetch -ffinite-math-only

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Dell Inc.

PowerEdge XR12 (Intel Xeon Gold 6338N, 2.20 GHz)

SPECrate®2017_fp_base = 184
SPECrate®2017_fp_peak = 195

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

Dell Inc.

Base Optimization Flags (Continued)

Fortran benchmarks (continued):
-qopt-multiple-gather-scatter-by-shuffles -qopt-mem-layout-trans=4
-nostandard-realloc-lhs -align array32byte -auto
-mbranches-within-32B-boundaries -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

Benchmarks using both Fortran and C:
-w -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math
-fflto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -O3 -ipo
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-multiple-gather-scatter-by-shuffles
-mbranches-within-32B-boundaries -nostandard-realloc-lhs
-align array32byte -auto -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib

Benchmarks using both C and C++:
-w -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math
-fflto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-mbranches-within-32B-boundaries -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

Benchmarks using Fortran, C, and C++:
-w -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math
-fflto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -O3
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-multiple-gather-scatter-by-shuffles
-mbranches-within-32B-boundaries -nostandard-realloc-lhs
-align array32byte -auto -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib

Peak Compiler Invocation

C benchmarks:
icx

C++ benchmarks:
icpx

Fortran benchmarks:
ifort

Benchmarks using both Fortran and C:
521.wrf_r:ifort icc

(Continued on next page)
<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Compiler Invocation</th>
<th>Portability Flags</th>
<th>Optimization Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>527.cam4_r</td>
<td>icf, icx</td>
<td>basepeak = yes</td>
<td>-flto -mfpmath=sse -funroll-loops</td>
</tr>
<tr>
<td>511.povray_r</td>
<td>icpc, icc</td>
<td>basepeak = yes</td>
<td>-qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries</td>
</tr>
<tr>
<td>526.blender_r</td>
<td>icpx, icx</td>
<td>basepeak = yes</td>
<td>-ljemalloc -L/usr/local/jemalloc64-5.0.1/lib</td>
</tr>
<tr>
<td>519.lbm_r</td>
<td>basepeak = yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>538.imagick_r</td>
<td>basepeak = yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>544.nab_r</td>
<td>basepeak = yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>508.namd_r</td>
<td>basepeak = yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>510.parest_r</td>
<td>-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math -flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib</td>
<td></td>
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</tr>
</tbody>
</table>

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Dell Inc.

PowerEdge XR12 (Intel Xeon Gold 6338N, 2.20 GHz)

SPECrate®2017_fp_base = 184
SPECrate®2017_fp_peak = 195

Peak Optimization Flags (Continued)

549.fotonik3d_r: basepeak = yes
554.roms_r: Same as 503.bwaves_r

Benchmarks using both Fortran and C:
521.wrf_r: -prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX512 -O3
-ipo -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-multiple-gather-scatter-by-shuffles
-qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries
-nostandard-realloc-lhs -align array32byte -auto
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

527.cam4_r: basepeak = yes

Benchmarks using both C and C++:
511.povray_r: -prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX512 -O3
-ipo -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-multiple-gather-scatter-by-shuffles
-qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

526.blender_r: basepeak = yes

Benchmarks using Fortran, C, and C++:
507.cactuBSSN_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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