Dell Inc. PowerEdge XR12 (Intel Xeon Gold 5320T, 2.30 GHz)

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

<table>
<thead>
<tr>
<th>SPECspeed®2017_fp_base = 104</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECspeed®2017_fp_peak = 105</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Threads</th>
<th>SPECspeed®2017_fp_base (104)</th>
</tr>
</thead>
<tbody>
<tr>
<td>603.bwaves_s</td>
<td>135</td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>135</td>
</tr>
<tr>
<td>619.lbm_s</td>
<td>135</td>
</tr>
<tr>
<td>621.wrf_s</td>
<td>135</td>
</tr>
<tr>
<td>627.cam4_s</td>
<td>135</td>
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<td>628.pop2_s</td>
<td>135</td>
</tr>
<tr>
<td>638.imagick_s</td>
<td>135</td>
</tr>
<tr>
<td>644.nab_s</td>
<td>135</td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>135</td>
</tr>
<tr>
<td>654.roms_s</td>
<td>135</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Hardware</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU Name: Intel Xeon Gold 5320T</td>
</tr>
<tr>
<td>Max MHz: 3500</td>
</tr>
<tr>
<td>Nominal: 2300</td>
</tr>
<tr>
<td>Enabled: 20 cores, 1 chip</td>
</tr>
<tr>
<td>Orderable: 1 chip</td>
</tr>
<tr>
<td>Cache L1: 32 KB I + 48 KB D on chip per core</td>
</tr>
<tr>
<td>L2: 1.25 MB I+D on chip per core</td>
</tr>
<tr>
<td>L3: 30 MB I+D on chip per chip</td>
</tr>
<tr>
<td>Other: None</td>
</tr>
<tr>
<td>Memory: 512 GB (8 x 64 GB 2Rx4 PC4-3200AA-R, running at 2933)</td>
</tr>
<tr>
<td>Storage: 225 GB on tmpfs</td>
</tr>
<tr>
<td>Other: None</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Software</th>
</tr>
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<tbody>
<tr>
<td>OS: Red Hat Enterprise Linux 8.3 (Ootpa) 4.18.0-240.15.1.el8_3.x86_64</td>
</tr>
<tr>
<td>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</td>
</tr>
<tr>
<td>Parallel: Yes</td>
</tr>
<tr>
<td>Firmware: Version 0.6.3 released May-2021</td>
</tr>
<tr>
<td>File System: tmpfs</td>
</tr>
<tr>
<td>System State: Run level 5 (graphical multi-user)</td>
</tr>
<tr>
<td>Base Pointers: 64-bit</td>
</tr>
<tr>
<td>Peak Pointers: 64-bit</td>
</tr>
<tr>
<td>Other: jemalloc memory allocator V5.0.1</td>
</tr>
<tr>
<td>Power Management: BIOS and OS set to prefer performance at the cost of additional power usage.</td>
</tr>
</tbody>
</table>
## Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Base</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Peak</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Peak</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
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<tr>
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<td>607.cactuBSSN_s</td>
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<td>649.fotonik3d_s</td>
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<td>139</td>
<td>65.7</td>
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<td>654.roms_s</td>
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<td>88.2</td>
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<td>178</td>
<td>88.2</td>
<td>179</td>
<td>20</td>
<td>178</td>
<td>88.2</td>
<td>179</td>
<td>20</td>
<td>178</td>
<td>88.2</td>
</tr>
</tbody>
</table>

Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

### 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:
- KMP_AFFINITY = "granularity=fine,compact"
- 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"
- OMP_STACKSIZE = "192M"

### General Notes

Binaries compiled on a system with 1x Intel Core i9–7980XE CPU + 64GB RAM memory using Redhat Enterprise Linux 8.0

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
```


NA: The test sponsor attests, as of date of publication, that CVE-2017-5754 (Meltdown) is mitigated in the system as tested and documented.
General Notes (Continued)

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:
Logical Processor : Disabled
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 e8664e66d2d7080afeaa89d4b38e2f1c
running on localhost.localdomain Tue May 11 08:54:24 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 5320T CPU @ 2.30GHz
 1 "physical id"s (chips)
 20 "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 : 20
siblings : 20
physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 20

(Continued on next page)
Dell Inc.

PowerEdge XR12 (Intel Xeon Gold 5320T, 2.30 GHz)

On-line CPU(s) list: 0-19
Thread(s) per core: 1
Core(s) per socket: 20
Socket(s): 1
NUMA node(s): 1
Vendor ID: GenuineIntel
CPU family: 6
Model: 106
Model name: Intel(R) Xeon(R) Gold 5320T CPU @ 2.30GHz
Stepping: 6
CPU MHz: 3452.711
BogoMIPS: 4600.00
Virtualization: VT-x
L1d cache: 48K
L1i cache: 32K
L2 cache: 1280K
L3 cache: 30720K
NUMA node0 CPU(s): 0-19
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 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 avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault epb cat_l3 invpcid_single intel_pppin ssbd mba ibrs ibpb stibp ibrs_enhanced fs.gsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid cqm rdt_a avx512f avx512dq rdseed adx smap avx512ifma clflushopt clwb intel_pt avx512cd sha_ni avx512bw avx512vl xsaves cmqm_llc cmqm_occup_llc cmqm_mb_total cmqm_mb_local split_lock_detect wbnoinvd dtc.therm ida arat pln pts avx512vmbi umip pku ospke avx512_vbmi2 gfni vaes vpclmulqdq avx512_vnni avx512_bitalg tme avx512_vpopcntdq la57 rdrpid md_clear pconfig flush_l1d arch_capabilities

/proc/cpuinfo cache data
  cache size : 30720 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 8 9 10 11 12 13 14 15 16 17 18 19
  node 0 size: 493707 MB
  node 0 free: 492190 MB
  node distances:
    node 0
      0: 10

From /proc/meminfo
  MemTotal: 527818116 KB

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

Dell Inc.

PowerEdge XR12 (Intel Xeon Gold 5320T, 2.30 GHz)

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

SPECspeed®2017_fp_base = 104
SPECspeed®2017_fp_peak = 105

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

Platform Notes (Continued)

```
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
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 11 04:53

SPEC is set to: /mnt/ramdisk/cpu2017-1.1.5-ic2021.1
 Filesystem     Type     Size  Used Avail Use% Mounted on
 tmpfs       tmpfs      225G   13G   213G   6% /mnt/ramdisk
```

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

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 2933
- 3x 00CE063200CE M393A8G40AB2-CWE 64 GB 2 rank 3200, configured at 2933

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.

## Compiler Version Notes

```
C               | 619.lbm_s(base, peak) 638.imagick_s(base, peak)
                | 644.nab_s(base)
```

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               | 644.nab_s(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               | 619.lbm_s(base, peak) 638.imagick_s(base, peak)
```

(Continued on next page)
Dell Inc.

PowerEdge XR12 (Intel Xeon Gold 5320T, 2.30 GHz)

SPECspeed®2017_fp_base = 104
SPECspeed®2017_fp_peak = 105

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

Compiler Version Notes (Continued)

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<tr>
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<table>
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(Continued on next page)
Dell Inc.

PowerEdge XR12 (Intel Xeon Gold 5320T, 2.30 GHz)

**SPECspeed®2017_fp_base = 104**  
**SPECspeed®2017_fp_peak = 105**

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

### Compiler Version Notes (Continued)

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---

### Base Compiler Invocation

**C benchmarks:**

`icc`

**Fortran benchmarks:**

`ifort`

**Benchmarks using both Fortran and C:**

`ifort icc`

**Benchmarks using Fortran, C, and C++:**

`icpc icc ifort`

### Base Portability Flags

- 603.bwaves_s: -DSPEC_LP64
- 607.cactuBSSN_s: -DSPEC_LP64
- 619.lbm_s: -DSPEC_LP64
- 621.wrf_s: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
- 627.cam4_s: -DSPEC_LP64 -DSPEC_CASE_FLAG
- 628.pop2_s: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
- -assume byterecl
- 638.imagick_s: -DSPEC_LP64
- 644.nab_s: -DSPEC_LP64
- 649.fotonik3d_s: -DSPEC_LP64
- 654.roms_s: -DSPEC_LP64

### Base Optimization Flags

**C benchmarks:**

- -m64 -std=c11 -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
- -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
- -mbranches-within-32B-boundaries

**Fortran benchmarks:**

- -m64 -w1, -z, mdefs -DSPEC_OPENMP -xCORE-AVX512 -ipo -O3
- -no-prec-div -qopt-prefetch -ffinite-math-only

(Continued on next page)
Dell Inc.  
PowerEdge XR12 (Intel Xeon Gold 5320T, 2.30 GHz)  

SPECspeed®2017_fp_base = 104  
SPECspeed®2017_fp_peak = 105

Base Optimization Flags (Continued)

Fortran benchmarks (continued):
- -qopt-mem-layout-trans=4 -qopenmp -nostandard-realloc-lhs
- -mbranches-within-32B-boundaries -L/usr/local/jemalloc64-5.0.1/lib
- -ljemalloc

Benchmarks using both Fortran and C:
- -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
- -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp
- -DSPEC_OpenMP -mbranches-within-32B-boundaries -nostandard-realloc-lhs
- -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

Benchmarks using Fortran, C, and C++:
- -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
- -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp
- -DSPEC_OpenMP -mbranches-within-32B-boundaries -nostandard-realloc-lhs
- -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

Peak Compiler Invocation

C benchmarks (except as noted below):
icc

644.nab_s: icx

Fortran benchmarks:
ifort

Benchmarks using both Fortran and C:
ifort icc

Benchmarks using Fortran, C, and C++:
icpc icc ifort

Peak Portability Flags

Same as Base Portability Flags
# SPEC CPU®2017 Floating Point Speed Result

## Dell Inc.

**PowerEdge XR12 (Intel Xeon Gold 5320T, 2.30 GHz)**

<table>
<thead>
<tr>
<th>SPECspeed®2017_fp_base</th>
<th>104</th>
</tr>
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<tbody>
<tr>
<td>SPECspeed®2017_fp_peak</td>
<td>105</td>
</tr>
</tbody>
</table>

**CPU2017 License:** 55

**Test Sponsor:** Dell Inc.

**Tested by:** Dell Inc.

**Test Date:** May-2021

**Hardware Availability:** Jul-2021

**Software Availability:** Feb-2021

## Peak Optimization Flags

### C benchmarks:

- 619.lbm_s: basepeak = yes
- 638.imagick_s: basepeak = yes
- 644.nah_s: -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math
  -flio -mfpmath=sse -funroll-loops -fiopenmp
  -DSPEC_OPENMP -qopt-mem-layout-trans=4
  -fimf-accuracy-bits=14:sqrt
  -mbranches-within-32B-boundaries
  -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

### Fortran benchmarks:

- 603.bwaves_s: -m64 -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2)
  -DSPEC_SUPPRESS_OPENMP -DSPEC_OPENMP -ipo -xCORE-AVX512
  -O3 -no-prec-div
  -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4
  -mbranches-within-32B-boundaries
  -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

- 649.fotonik3d_s: basepeak = yes
- 654.roms_s: basepeak = yes

### Benchmarks using both Fortran and C:

- 621.wrf_s: -m64 -std=c11 -Wl,-z,muldefs -prof-gen(pass 1)
  -prof-use(pass 2) -ipo -xCORE-AVX512 -O3 -no-prec-div
  -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4
  -DSPEC_SUPPRESS_OPENMP -qopenmp -DSPEC_OPENMP
  -mbranches-within-32B-boundaries -nostandard-realloc-lhs
  -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

- 627.cam4_s: basepeak = yes

### Benchmarks using Fortran, C, and C++:

- 607.cactuBSSN_s: basepeak = yes
Dell Inc.

PowerEdge XR12 (Intel Xeon Gold 5320T, 2.30 GHz)

| SPECspeed®2017_fp_base = 104 |
| SPECspeed®2017_fp_peak = 105 |

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

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

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