# SPEC CPU®2017 Floating Point Speed Result

## Dell Inc.

**PowerEdge R750 (Intel Xeon Gold 6330N, 2.20 GHz)**

<table>
<thead>
<tr>
<th>SPECspeed®2017_fp_base</th>
<th>SPECspeed®2017_fp_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>171</td>
<td>174</td>
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</tbody>
</table>

### CPU2017 License: 55

**Test Date:** May-2021

**Hardware Availability:** May-2021

**Software Availability:** Feb-2021

### Test Sponsor:

Dell Inc.

### Tested by:

Dell Inc.

### Software

- **OS:** Red Hat Enterprise Linux 8.3 (Ootpa)
  - 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
- **Parallel:** Yes
- **Firmware:** Version 1.1.2 released Apr-2021
- **File System:** tmpfs
- **System State:** Run level 5 (graphical multi-user)
- **Base Pointers:** 64-bit
- **Peak Pointers:** 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.

### Hardware

- **CPU Name:** Intel Xeon Gold 6330N
- **Max MHz:** 3400
- **Nominal:** 2200
- **Enabled:** 56 cores, 2 chips
- **Orderable:** 1.2 chips
- **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 (16 x 32 GB 2Rx8 PC4-3200AA-R, running at 2666)
- **Storage:** 225 GB on tmpfs
- **Other:** None

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Dell Inc.

PowerEdge R750 (Intel Xeon Gold 6330N, 2.20 GHz)

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

Results Table

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<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
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<tr>
<td>607.cactuBSSN_s</td>
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<td>71.6</td>
<td>233</td>
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<td>45.0</td>
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<td>46.0</td>
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<tr>
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<td>78.4</td>
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<td>56</td>
<td>78.0</td>
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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/ramdisk2/cpu2017-1.1.5-ic2021.1/lib/intel64:/mnt/ramdisk2/cpu2017-1.1.5-ic2021.1/je5.0.1-64"
MALLOCONF = "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
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.

(Continued on next page)
Dell Inc.  

PowerEdge R750 (Intel Xeon Gold 6330N, 2.20 GHz)  

**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/ramdisk2/cpu2017-1.1.5-ic2021.1/bin/sysinfo
Rev: r6538 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2f1c
running on localhost.localdomain Wed May  5 15:49:18 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
  - 2 "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
- siblings : 28
- 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
- physical 1: 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
**Dell Inc.**

**PowerEdge R750 (Intel Xeon Gold 6330N, 2.20 GHz)**

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**SPEC CPU®2017 Floating Point Speed Result**

**SPECspeed®2017_fp_base = 171**

**SPECspeed®2017_fp_peak = 174**

**Platform Notes (Continued)**

```
CPU(s): 56
On-line CPU(s) list: 0-55
Thread(s) per core: 1
Core(s) per socket: 28
Socket(s): 2
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: 2954.774
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 acp1 mmx fxsr sse sse2 ss ht tm pbe syscall nx pdelsel rbdtscp
   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_pinn ssbd mba ibrs ibpb stibp ibrs_enhanced fsbgbase tsc_adjust bmi1 hle avx2
   smep bmi2 erms invpcid cgi rdt_a avx512f avx512dq rdseed adx smap avx512ifma
   clflushopt clwb intel_pt avx512dsha_hwa avx512bw avx512vl xsaveopt xsave xsetbv
   xsavec qcm_llc qcm_occup_llc qcm_mbb_total qcm_mbb_local split_lock_detect wboinvd
   dtherm ida arat pln pts avx512vmbmi umip pkv ospe avx512_vmbmi2 gfn vaes vpcmrefqd
   avx512_vnni avx512_bitalg tme avx512_vpopcntdq la57 rdpid md_clear pconfig flush_l1d
   arch_capabilities

/proc/cpuinfo cache data
   cache size: 43008 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
   node 0 size: 245262 MB
   node 0 free: 236279 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
```

(Continued on next page)
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SPECspeed®2017_fp_base = 171
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Platform Notes (Continued)

53 55
node 1 size: 248139 MB
node 1 free: 255496 MB
node distances:
  node 0 1
  0: 10 20
  1: 20 10

From /proc/meminfo
  MemTotal: 527810380 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): Mitigation: Speculative Store Bypass disabled via prctl and seccomp
CVE-2018-3639 (Speculative Store Bypass): Mitigation: usercopy/swapsgs barriers and __user pointer sanitization
CVE-2017-5753 (Spectre variant 1): Mitigation: Enhanced IBRS, IBPB:
CVE-2017-5715 (Spectre variant 2):
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Platform Notes (Continued)

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 5 11:37

SPEC is set to: /mnt/ramdisk2/cpu2017-1.1.5-ic2021.1

Filesystem  Type     Size  Used Avail Use% Mounted on
    tmpfs      tmpfs  225G   13G  213G   6% /mnt/ramdisk2

From /sys/devices/virtual/dmi/id
Vendor: Dell Inc.
Product: PowerEdge R750
Product Family: PowerEdge
Serial: 1234567

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:
  12x 002C069D002C 18ASF4G72PDZ-3G2E1 32 GB 2 rank 3200, configured at 2666
  4x 00AD063200AD HMAA4GR7AJR8N-XN 32 GB 2 rank 3200, configured at 2666
  16x Not Specified Not Specified

BIOS:
  BIOS Vendor: Dell Inc.
  BIOS Version: 1.1.2
  BIOS Date: 04/09/2021
  BIOS Revision: 1.1

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
C               619.libm_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)
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## Compiler Version Notes (Continued)

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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.

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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  
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

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<tr>
<th>C++, C, Fortran</th>
<th>607.cactuBSSN_s(base, peak)</th>
</tr>
</thead>
</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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<th>Fortran</th>
<th>603.bwaves_s(base, peak) 649.fotonik3d_s(base, peak) 654.roms_s(base, peak)</th>
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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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(Continued on next page)
## Dell Inc.

PowerEdge R750 (Intel Xeon Gold 6330N, 2.20 GHz)

<table>
<thead>
<tr>
<th>SPECspeed®2017_fp_base = 171</th>
<th>SPECspeed®2017_fp_peak = 174</th>
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</table>

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

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

### Compiler Version Notes (Continued)

<table>
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<tr>
<th>Fortran, C</th>
<th>621.wrf_s(base, peak) 627.cam4_s(base, peak) 628.pop2_s(base, peak)</th>
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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.  
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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### Base Compiler Invocation

**C benchmarks:**  
```bash
icc
```

**Fortran benchmarks:**  
```bash
ifort
```

**Benchmarks using both Fortran and C:**  
```bash
ifort icc
```

**Benchmarks using Fortran, C, and C++:**  
```bash
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
Dell Inc.
PowerEdge R750 (Intel Xeon Gold 6330N, 2.20 GHz)

SPECspeed®2017_fp_base = 171
SPECspeed®2017_fp_peak = 174

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

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 -Wl,-z,muldefs -DSPEC_OPENMP -xCORE-AVX512 -ipo -O3
- -no-prec-div -qopt-prefetch -ffinite-math-only
- -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
Dell Inc.
PowerEdge R750 (Intel Xeon Gold 6330N, 2.20 GHz)

SPECspeed®2017_fp_base = 171
SPECspeed®2017_fp_peak = 174

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

Peak Portability Flags
Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:
619.lbm_s: basepeak = yes
638.imagick_s: basepeak = yes
644.nab_s: -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math
-f1to -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: basepeak = yes
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
628.pop2_s: basepeak = yes

Benchmarks using Fortran, C, and C++:
607.cactuBSSN_s: basepeak = yes
Dell Inc.

PowerEdge R750 (Intel Xeon Gold 6330N, 2.20 GHz)

SPECspeed\textsuperscript{\textregistered}2017\_fp\_peak = 174
SPECspeed\textsuperscript{\textregistered}2017\_fp\_base = 171

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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{\textregistered}2017 v1.1.5 on 2021-05-05 16:49:18-0400.
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