Dell Inc. PowerEdge R750 (Intel Xeon Gold 6326, 2.90 GHz)

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<th>SPECrate®2017_fp_base = 286</th>
<th>SPECrate®2017_fp_peak = 296</th>
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| CPU2017 License: | 55 |
| Test Sponsor:   | Dell Inc. |
| Tested by:      | Dell Inc. |
| Test Date:      | May-2021 |
| Hardware Availability: | May-2021 |
| Software Availability: | Feb-2021 |

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- SPECrate®2017_fp_base (286)
- SPECrate®2017_fp_peak (296)

### Hardware

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<tr>
<th>Specification</th>
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<tr>
<td>CPU Name:</td>
<td>Intel Xeon Gold 6326</td>
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<tr>
<td>Max MHz:</td>
<td>3500</td>
</tr>
<tr>
<td>Nominal:</td>
<td>2900</td>
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<tr>
<td>Enabled:</td>
<td>32 cores, 2 chips, 2 threads/core</td>
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<tr>
<td>Orderable:</td>
<td>1.2 chips</td>
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<tr>
<td>Cache L1:</td>
<td>32 KB I + 48 KB D on chip per core</td>
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<tr>
<td>L2:</td>
<td>1.25 MB I+D on chip per core</td>
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<td>L3:</td>
<td>24 MB I+D on chip per chip</td>
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<td>Other:</td>
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<td>Memory:</td>
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<tr>
<td>Storage:</td>
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<td>Other:</td>
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### Software

<table>
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<tr>
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<tr>
<td>OS:</td>
<td>Red Hat Enterprise Linux 8.3 (Ootpa)</td>
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<td>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>
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<td>Parallel:</td>
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<td>Firmware:</td>
<td>Version 1.2.1 released May-2021</td>
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<tr>
<td>File System:</td>
<td>tmpfs</td>
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<tr>
<td>System State:</td>
<td>Run level 3 (multi-user)</td>
</tr>
<tr>
<td>Base Pointers:</td>
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<tr>
<td>Peak Pointers:</td>
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<td>Other:</td>
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<td>Power Management:</td>
<td>BIOS and OS set to prefer performance at the cost of additional power usage.</td>
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Results Table

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</table>

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/ramdisk2/cpu2017-1.1.5-ic2021.1/lib/intel64:/mnt/ramdisk2/cpu2017-1.1.5-ic2021.1/je5.0.1-64"
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

(Continued on next page)
Dell Inc.

PowerEdge R750 (Intel Xeon Gold 6326, 2.90 GHz)

SPEC CPU®2017 Floating Point Rate Result

Copyright 2017-2021 Standard Performance Evaluation Corporation

Dell Inc.

PowerEdge R750 (Intel Xeon Gold 6326, 2.90 GHz)

SPECrate®2017_fp_base = 286

SPECrate®2017_fp_peak = 296

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

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 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 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/ramdisk2/cpu2017-1.1.5-ic2021.1/bin/sysinfo
Rev: r6538 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2fc
running on localhost.localdomain Thu May 20 00:35:46 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 6326 CPU @ 2.90GHz
  2 "physical id"s (chips)
  64 "processors"

(Continued on next page)
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 : 16
siblings : 32
physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

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: 16
Socket(s):           2
NUMA node(s):        4
Vendor ID:           GenuineIntel
CPU family:          6
Model:               106
Model name:          Intel(R) Xeon(R) Gold 6326 CPU @ 2.90GHz
Stepping:            6
CPU MHz:             3352.934
BogoMIPS:            5800.00
Virtualization:      VT-x
L1d cache:           48K
L1i cache:           32K
L2 cache:            1280K
L3 cache:            24576K
NUMA node0 CPU(s):   0,4,8,12,16,20,24,28,32,36,40,44,48,52,56,60
NUMA node1 CPU(s):   2,6,10,14,18,22,26,30,34,38,42,46,50,54,58,62
NUMA node2 CPU(s):   1,5,9,13,17,21,25,29,33,37,41,45,49,53,57,61
NUMA node3 CPU(s):   3,7,11,15,19,23,27,31,35,39,43,47,51,55,59,63
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 art 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
xtrp 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_pcin ssbd mba ibrs ibpb stibp ibrs_enhanced fsgsbase tsc_adjust bmi1 hle avx2
smep bmi2 erms invpcid cqm rdt_a avx512f avx512dq rdseed adx smap avx512ifma
clflushopt clwb intel_pt avx512cd sha_hwi avx512bw avx512vl xsaveopt xsaves xgetbv1
xsaves cqm_l1c cqm_occpt_l1c cqm_mbb_total cqm_mbb_local split_lock_detect wboinvd
dtherm ida arat pln pts avx512v bmi umip pku ospke avx512_vbmi gfni vaes vpcmldq
avx512_vnni avx512_ bitalg tme avx512 vppopcntdq la57 rdpid md_clear pconfig flush_l1d
arch_capabilities

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

Dell Inc.
PowerEdge R750 (Intel Xeon Gold 6326, 2.90 GHz)

SPECrates®2017_fp_base = 286
SPECrates®2017_fp_peak = 296

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

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

Platform Notes (Continued)

/proc/cpuinfo cache data
  cache size: 24576 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
  node 0 size: 126235 MB
  node 0 free: 112944 MB
  node 1 cpus: 2 6 10 14 18 22 26 30 34 38 42 46 50 54 58 62
  node 1 size: 126708 MB
  node 1 free: 128246 MB
  node 2 cpus: 1 5 9 13 17 21 25 29 33 37 41 45 49 53 57 61
  node 2 size: 126998 MB
  node 2 free: 128270 MB
  node 3 cpus: 3 7 11 15 19 23 27 31 35 39 43 47 51 55 59 63
  node 3 size: 127133 MB
  node 3 free: 128282 MB
  node distances:
    node 0 1 2 3
    0: 10 11 20 20
    1: 11 10 20 20
    2: 20 20 10 11
    3: 20 20 11 10

From /proc/meminfo
  MemTotal: 527807972 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

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

Dell Inc.                    SPECrate®2017_fp_base = 286
PowerEdge R750 (Intel Xeon Gold 6326, 2.90 GHz)  SPECrate®2017_fp_peak = 296

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

Platform Notes (Continued)

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/swappgs 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

SPEC is set to: /mnt/ramdisk2/cpu2017-1.1.5-ic2021.1
Filesystem  Type    Size  Used Avail Use% Mounted on
tmpfs       tmpfs   225G   6.9G  219G   4% /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
  4x 00AD063200AD HMAA4GR7AJR8N-XN 32 GB 2 rank 3200
  16x Not Specified Not Specified

BIOS:
  BIOS Vendor: Dell Inc.
  BIOS Version: 1.2.1
  BIOS Date: 05/06/2021
  BIOS Revision: 1.2

(Continued on next page)
Dell Inc. PowerEdge R750 (Intel Xeon Gold 6326, 2.90 GHz)

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Platform Notes (Continued)

(End of data from sysinfo program)

Compiler Version Notes

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**Compiler Version Notes (Continued)**

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)
---

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.

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, Fortran | 507.cactuBSSN_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.

Intel(R) oneAPI DPC+/C++ Compiler for applications running on Intel(R) 64, Version 2021.1 Build 20201113
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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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Fortran | 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak) 554.roms_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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---

Fortran, C | 521.wrf_r(base, peak) 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

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PowerEdge R750 (Intel Xeon Gold 6326, 2.90 GHz)  

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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

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Base Compiler Invocation

C benchmarks:
icx

C++ benchmarks:
icpx

Fortran benchmarks:
ifort

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
# SPEC CPU®2017 Floating Point Rate Result

## Dell Inc.

**PowerEdge R750 (Intel Xeon Gold 6326, 2.90 GHz)**

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

### SPECrate®2017_fp_base = 286

### SPECrate®2017_fp_peak = 296

<table>
<thead>
<tr>
<th>Test Date</th>
<th>May-2021</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hardware Availability:</strong></td>
<td>May-2021</td>
</tr>
<tr>
<td><strong>Software Availability:</strong></td>
<td>Feb-2021</td>
</tr>
</tbody>
</table>

## Base Optimization Flags

### C benchmarks:

- `-w -std=c11 -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`

### C++ benchmarks:

- `-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`

### Fortran benchmarks:

- `-w -m64 -Wl,-z, muldefs -xCORE-AVX512 -O3 -ipo -no-prec-div`
- `-qopt-prefetch -ffinite-math-only`
- `-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`
- `-flto -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`
- `-flto -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`
- `-flto -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`
Dell Inc.  
PowerEdge R750 (Intel Xeon Gold 6326, 2.90 GHz)  

**SPECrate®2017_fp_base = 286**  
**SPECrate®2017_fp_peak = 296**

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

---

**Peak Compiler Invocation**

C benchmarks:  
icx

C++ benchmarks:  
icpx

Fortran benchmarks:  
ifort

Benchmarks using both Fortran and C:  
ifort icx

Benchmarks using both C and C++:  
511.povray_r: icpc icc  
526.blender_r: icpx icx

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

---

**Peak Portability Flags**

Same as Base Portability Flags

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**Peak Optimization Flags**

C benchmarks:  
519.lbm_r: basepeak = yes  
538.imagick_r: basepeak = yes  

C++ benchmarks:

(Continued on next page)
Peak Optimization Flags (Continued)

```plaintext
508.namd_r: basepeak = yes

510.parest_r: -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

Fortran benchmarks:

503.bwaves_r: basepeak = yes

549.fotonik3d_r: basepeak = yes

554.roms_r: -w -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ipo
    -no-prec-div -qopt-prefetch -ffinite-math-only
    -qopt-multiple-gather-scatter-by-shuffles
    -qopt-mem-layout-trans=4 -nstandard-realloc-lhs
    -align array32byte -auto -mbranches-within-32B-boundaries
    -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib

Benchmarks using both Fortran and C:

521.wrf_r: basepeak = yes

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:

Dell Inc.
PowerEdge R750 (Intel Xeon Gold 6326, 2.90 GHz)

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CPU2017 License: 55
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Test Date: May-2021
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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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