# SPEC CPU®2017 Floating Point Speed Result

## Dell Inc.

PowerEdge MX750c (Intel Xeon Gold 6326, 2.90 GHz)

<table>
<thead>
<tr>
<th>SPECspeed®2017_fp_base</th>
<th>163</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECspeed®2017_fp_peak</td>
<td>166</td>
</tr>
</tbody>
</table>

### CPU2017 License:
55

### Test Sponsor:
Dell Inc.

### Tested by:
Dell Inc.

### Test Date:
May-2021

### Hardware Availability:
Apr-2021

### Software Availability:
Dec-2020

### Threads

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>SPECspeed®2017_fp_base (163)</th>
<th>SPECspeed®2017_fp_peak (166)</th>
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<tbody>
<tr>
<td>603.bwaves_s</td>
<td>32</td>
<td>195</td>
<td>616</td>
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<tr>
<td>607.cactuBSSN_s</td>
<td>32</td>
<td>124</td>
<td>163</td>
</tr>
<tr>
<td>619.ibm_s</td>
<td>32</td>
<td>152</td>
<td>163</td>
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<tr>
<td>621.wrf_s</td>
<td>32</td>
<td>104</td>
<td>162</td>
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<tr>
<td>627.cam4_s</td>
<td>32</td>
<td>84.0</td>
<td>124</td>
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<tr>
<td>628.pop2_s</td>
<td>32</td>
<td>124</td>
<td>256</td>
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<tr>
<td>638.imagick_s</td>
<td>32</td>
<td>107</td>
<td>287</td>
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<tr>
<td>644.nab_s</td>
<td>32</td>
<td>197</td>
<td>616</td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>654.roms_s</td>
<td>32</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Software

**OS:**
Red Hat Enterprise Linux 8.3 (Ootpa)
4.18.0-240.el8.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 3 (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 6326

**Max MHz:**
3500

**Nominal:**
2900

**Enabled:**
32 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:**
24 MB I+D on chip per core

**Other:**
None

**Memory:**
1 TB (16 x 64 GB 2Rx4 PC4-3200AA-R)

**Storage:**
125 GB on tmpfs

**Other:**
None

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Dell Inc.

Copyright 2017-2021 Standard Performance Evaluation Corporation

SPEC CPU®2017 Floating Point Speed Result

SPECspeed®2017_fp_base = 163

SPECspeed®2017_fp_peak = 166

Results Table

<table>
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<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
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<tr>
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<td>619</td>
<td>95.7</td>
<td>616</td>
<td>32</td>
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<td>125</td>
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<td>81.2</td>
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<td>116</td>
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<td>79.9</td>
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SPECspeed®2017_fp_base = 163
SPECspeed®2017_fp_peak = 166

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/cpu2017-1.1.7-ic2021.1/lib/intel64:/mnt/ramdisk/cpu2017-1.1.7-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

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.

Transparent Huge Pages enabled by default
Prior to runcpu invocation

(Continued on next page)
General Notes (Continued)

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

Benchmark run from a 125 GB ramdisk created with the cmd: "mount -t tmpfs -o size=125G 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/cpu2017-1.1.7-ic2021.1/bin/sysinfo
Rev: r6538 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2f1c
running on localhost.localdomain Wed May 12 08:52:19 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)
  32 "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 : 16
  siblings : 16
  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

(Continued on next page)
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**Test Date:** May-2021  
**Hardware Availability:** Apr-2021  
**Software Availability:** Dec-2020

### Platform Notes (Continued)

- **Byte Order:** Little Endian
- **CPU(s):** 32
- **On-line CPU(s) list:** 0-31
- **Thread(s) per core:** 1
- **Core(s) per socket:** 16
- **Socket(s):** 2
- **NUMA node(s):** 2
- **Vendor ID:** GenuineIntel
- **CPU family:** 6
- **Model:** 106
- **Model name:** Intel(R) Xeon(R) Gold 6326 CPU @ 2.90GHz
- **Stepping:** 6
- **CPU MHz:** 3317.087
- **BogoMIPS:** 5800.00
- **Virtualization:** VT-x
- **L1d cache:** 48K
- **L1i cache:** 32K
- **L2 cache:** 1280K
- **L3 cache:** 24576K
- **NUMA node0 CPU(s):** 0-15
- **NUMA node1 CPU(s):** 16-31
- **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 aperfmperf pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtrpr pdcm pcid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault epb cat_l3 invpcid_single intel_pinn ssbd mbfa ibrs ibpb stibp ibrs_large tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid_single intel_pinn ssbd mbfa ibrs ibpb stibp ibrs_large tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid_single intel_pinn ssbd mbfa ibrs ibpb stibp ibrs_large tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid_single intel_pinn ssbd mbfa ibrs ibpb stibp ibrs_large tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid_single intel_pinn ssbd mbfa ibrs ibpb stibp ibrs_large tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid_single intel_pinn ssbd mbfa ibrs ibpb stibp ibrs_large tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid_single intel_pinn ssbd mbfa ibrs ibpb stibp ibrs_large tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid_single intel_pinn ssbd mbfa ibrs ibpb stibp ibrs_large tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid_single intel_pinn ssbd mbfa ibrs ibpb stibp ibrs_large tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid_single intel_pinn ssbd mbfa ibrs ibpb stibp ibrs_large tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid_single intel_pinn ssbd mbfa ibrs ibpb stibp ibrs_large tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid_single intel_pinn ssbd mbfa ibrs ibpb stibp ibrs_large tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid_single intel_pinn ssbd mbfa ibrs ibpb stibp ibrs_large tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid_single intel_pinn ssbd mbfa ibrs ibpb stibp ibrs_large tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid_single intel_pinn ssbd mbfa ibrs ibpb stibp ibrs_large tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid_single intel_pinn ssbd mbfa ibrs ibpb stibp ibrs_large tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid_single intel_pinn ssbd mbfa ibrs ibpb stibp ibrs_large tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid_single intel_pinn ssbd mbfa ibrs ibpb stibp ibrs_large tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid_single intel_pinn ssbd mbfa ibrs ibpb stibp ibrs_large tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid_single intel_pinn ssbd mbfa ibrs ibpb stibp ibrs_large tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid_single intel_pinn ssbd mbfa ibrs ibpb stibp ibrs_large tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid_single intel_pinn ssbd mbfa ibrs ibpb stibp ibrs_large tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid_single intel_pinn ssbd mbfa ibrs ibpb stibp ibrs_large tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid_single intel_pinn ssbd mbfa ibrs ibpb stibp ibrs_large tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid_single intel_pinn ssbd mbfa ibrs ibpb stibp ibrs_large tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid_single intel_pinn ssbd mbfa ibrs ibpb stibp ibrs_large tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid_single intel_pinn ssbd mbfa ibrs ibpb stibp ibrs_large tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid_single intel_pinn ssbd mbfa ibrs ibpb stibp ibrs_...
- **/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:** 2 nodes (0-1)
- **node 0 cpus:** 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
- **node 0 size:** 501184 MB
- **node 0 free:** 500209 MB
- **node 1 cpus:** 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
- **node 1 size:** 501815 MB
- **node 1 free:** 514513 MB

(Continued on next page)
Platform Notes (Continued)

node distances:
node  0   1
  0:  10  20
  1:  20  10

From /proc/meminfo
 MemTotal:       1056295108 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="rheil"
      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.el8.x86_64 #1 SMP Wed Sep 23 05:13:10 EDT 2020
 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/swaps 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

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

run-level 3 May 12 05:41

SPEC is set to: /mnt/ramdisk/cpu2017-1.1.7-ic2021.1

<table>
<thead>
<tr>
<th>Filesystem</th>
<th>Type</th>
<th>Size</th>
<th>Used</th>
<th>Avail</th>
<th>Use%</th>
<th>Mounted on</th>
</tr>
</thead>
<tbody>
<tr>
<td>tmpfs</td>
<td>tmpfs</td>
<td>125G</td>
<td>11G</td>
<td>115G</td>
<td>9%</td>
<td>/mnt/ramdisk</td>
</tr>
</tbody>
</table>

From /sys/devices/virtual/dmi/id

Vendor: Dell Inc.
Product: PowerEdge MX750c
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:
- 16x 00AD063200AD HMAA8GR7AJR4N-XN 64 GB 2 rank 3200
- 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.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.
```

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| Copyright (C) 1985-2020 Intel Corporation. All rights reserved. |
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| C++, C, Fortran | 607.cactuBSSN_s(base, peak) |
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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. |
| 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) 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. |
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| Fortran          | 603.bwaves_s(base, peak) 649.fotonik3d_s(base, peak) |
|                 | 654.roms_s(base, peak)  |
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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. |
----------------------------------------------------------------------------------
| Fortran, C       | 621.wrf_s(base, peak) 627.cam4_s(base, peak) |
|                 | 628.pop2_s(base, peak)  |
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| Intel(R) Fortran Intel(R) 64 Compiler Classic for applications running on

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Benchmark Results

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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.

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

(Continued on next page)
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PowerEdge MX750c (Intel Xeon Gold 6326, 2.90 GHz)  

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Tested by: Dell Inc.  
Test Date: May-2021  
Hardware Availability: Apr-2021  
Software Availability: Dec-2020

Base Optimization Flags (Continued)

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

Peak Portability Flags

Same as Base Portability Flags
Dell Inc.

PowerEdge MX750c (Intel Xeon Gold 6326, 2.90 GHz)

| SPECspeed®2017_fp_base = 163 |
| SPECspeed®2017_fp_peak = 166 |

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**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
-flto -mfpmath=sse -funroll-loops -fiopenmp
-DSPEC_OPENMP -qopt-mem-layout-trans=4
-flto -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

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
### SPEC CPU®2017 Floating Point Speed Result

**Dell Inc.**

**PowerEdge MX750c (Intel Xeon Gold 6326, 2.90 GHz)**

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<th>SPECspeed®2017_fp_peak</th>
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