Dell Inc.

PowerEdge MX760c (Intel Xeon Platinum 8468)

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

<table>
<thead>
<tr>
<th>SPECspeed®2017_fp_base = 322</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECspeed®2017_fp_peak = 322</td>
</tr>
</tbody>
</table>

**CPU2017 License:** 6573  
**Test Sponsor:** Dell Inc.  
**Tested by:** Dell Inc.  
**Test Date:** Dec-2022  
**Hardware Availability:** Feb-2023  
**Software Availability:** Nov-2022

### Hardware

- **CPU Name:** Intel Xeon Platinum 8468  
- **Max MHz:** 3800  
- **Nominal:** 2100  
- **Enabled:** 96 cores, 2 chips  
- **Orderable:** 1.2 chips  
- **Cache L1:** 32 KB I + 48 KB D on chip per core  
- **Cache L2:** 2 MB I+D on chip per core  
- **Cache L3:** 105 MB I+D on chip per chip  
- **Other:** None  
- **Memory:** 1 TB (16 x 64 GB 2Rx4 PC5-4800B-R)  
- **Storage:** 125 GB on tmpfs  
- **Other:** None

### Software

- **OS:** Red Hat Enterprise Linux 8.7 (Ootpa)  
  4.18.0-425.3.1.el8.x86_64  
- **Compiler:** C/C++: Version 2022.1 of Intel oneAPI DPC++/C++ Compiler for Linux;  
  Fortran: Version 2022.1 of Intel Fortran Compiler for Linux;  
- **Parallel:** Yes  
- **Firmware:** Version 0.3.2 released Nov-2022  
- **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.

### threads

| Threads | 0 | 50 | 100 | 150 | 200 | 250 | 300 | 350 | 400 | 450 | 500 | 550 | 600 | 650 | 700 | 750 | 800 | 850 | 900 | 950 | 1000 | 1050 |
|---------|---|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 603.bwaves_s 96 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 607.cactuBSSN_s 96 | 96 | | | | | | | | | | | | | | | | | | | | | | | | | |
| 619.lbm_s 96 | | | | | | | | | | | | | | | | | | | | | | | | | |
| 621.wrf_s 96 | | | | | | | | | | | | | | | | | | | | | | | | | |
| 627.cam4_s 96 | | | | | | | | | | | | | | | | | | | | | | | | | |
| 628.pop2_s 96 | | | | | | | | | | | | | | | | | | | | | | | | | |
| 638.imagick_s 96 | | | | | | | | | | | | | | | | | | | | | | | | | |
| 644.nab_s 96 | | | | | | | | | | | | | | | | | | | | | | | | | |
| 649.fotonik3d_s 96 | | | | | | | | | | | | | | | | | | | | | | | | | |
| 654.roms_s 96 | | | | | | | | | | | | | | | | | | | | | | | | | |

---

**Threads**

| 0 | 50 | 100 | 150 | 200 | 250 | 300 | 350 | 400 | 450 | 500 | 550 | 600 | 650 | 700 | 750 | 800 | 850 | 900 | 950 | 1000 | 1050 |
|---|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 603.bwaves_s | | | | | | | | | | | | | | | | | | | | | | | | | |
| 607.cactuBSSN_s | 96 | | | | | | | | | | | | | | | | | | | | | | | | |
| 619.lbm_s | 96 | | | | | | | | | | | | | | | | | | | | | | | | |
| 621.wrf_s | 96 | | | | | | | | | | | | | | | | | | | | | | | | |
| 627.cam4_s | 96 | | | | | | | | | | | | | | | | | | | | | | | | |
| 628.pop2_s | 96 | | | | | | | | | | | | | | | | | | | | | | | | |
| 638.imagick_s | 96 | | | | | | | | | | | | | | | | | | | | | | | | |
| 644.nab_s | 96 | | | | | | | | | | | | | | | | | | | | | | | | |
| 649.fotonik3d_s | 96 | | | | | | | | | | | | | | | | | | | | | | | | |
| 654.roms_s | 96 | | | | | | | | | | | | | | | | | | | | | | | | |

---

**Software**

- **OS:** Red Hat Enterprise Linux 8.7 (Ootpa)  
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Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
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<th>Ratio</th>
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<tr>
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<td>57.6</td>
<td>1020</td>
<td>57.9</td>
<td>1020</td>
<td>96</td>
<td>57.5</td>
<td>1030</td>
<td>57.5</td>
<td>1030</td>
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<tr>
<td>607.cactuBSSN_s</td>
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<td>208</td>
<td>96</td>
<td>64.4</td>
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<tr>
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<td>189</td>
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<td>46.0</td>
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<td>46.3</td>
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<tr>
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<td>135</td>
<td>87.8</td>
<td>134</td>
<td>88.9</td>
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<tr>
<td>638.imagick_s</td>
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<td>96</td>
<td>19.9</td>
<td>723</td>
<td>19.7</td>
<td>733</td>
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</tr>
<tr>
<td>644.nab_s</td>
<td>96</td>
<td>23.7</td>
<td>739</td>
<td>23.7</td>
<td>738</td>
<td>96</td>
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<td>739</td>
<td>23.7</td>
<td>738</td>
<td></td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
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<td>58.6</td>
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<td>58.8</td>
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<tr>
<td>654.roms_s</td>
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<td>476</td>
<td>32.9</td>
<td>479</td>
<td>96</td>
<td>33.1</td>
<td>476</td>
<td>32.9</td>
<td>479</td>
<td></td>
</tr>
</tbody>
</table>

SPECspeed®2017_fp_base = 322
SPECspeed®2017_fp_peak = 322

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/cpu2017-1.1.8-ic2022.1/lib/intel64:/mnt/ramdisk/cpu2017-1.1.8-ic2022.1/jre5.0.1-64"
MALLOC_CONF = "retain:true"
OMP_STACKSIZE = "192M"

General Notes

Binaries compiled on a system with 2x Intel Xeon Platinum 8280M CPU + 384GB 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)
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 125 GB ramdisk created with the cmd: "mount -t tmpfs -o size=125G tmpfs /mnt/ramdisk"

Platform Notes

BIOS settings:
- ADDDC Setting: Disabled
- DIMM Self Healing on
- Uncorrectable Memory Error: Disabled
- Virtualization Technology: Disabled
- Logical Processor: Disabled
- Sub NUMA Cluster: 2-way Clustering
- DCU Streamer Prefetcher: Disabled
- LLC Prefetch: Disabled
- Dead Line LLC Alloc: Disabled
- Optimizer Mode: Enabled
- System Profile: Custom
- CPU Power Management: Maximum Performance
  - C1E: Disabled
  - C States: Autonomous
- Memory Patrol Scrub: Disabled
- Energy Efficiency Policy: Performance
- PCI ASPM L1 Link
- Power Management: Disabled

Sysinfo program /mnt/ramdisk/cpu2017-1.1.8-ic2022.1/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acaf64d
running on localhost.localdomain Wed Dec 7 01:48:38 2022

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) Platinum 8468
- 2 "physical id"s (chips)
- 96 "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: 48

(Continued on next page)
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CPU2017 License: 6573
Test Sponsor: Dell Inc.
Tested by: Dell Inc.

Platform Notes (Continued)

siblings : 48
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 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
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 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47

From lscpu from util-linux 2.32.1:

Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 96
On-line CPU(s) list: 0-95
Thread(s) per core: 1
Core(s) per socket: 48
Socket(s): 2
NUMA node(s): 4
Vendor ID: GenuineIntel
BIOS Vendor ID: Intel
CPU family: 6
Model: 143
Model name: Intel(R) Xeon(R) Platinum 8468
BIOS Model name: Intel(R) Xeon(R) Platinum 8468
Stepping: 8
CPU MHz: 2100.000
BogoMIPS: 4200.00
L1d cache: 48K
L1i cache: 32K
L2 cache: 2048K
L3 cache: 107520K
NUMA node0 CPU(s):
0,4,8,12,16,20,24,28,32,36,40,44,48,52,56,60,64,68,72,76,80,84,88,92
NUMA node1 CPU(s):
2,6,10,14,18,22,26,30,34,38,42,46,50,54,58,62,66,70,74,78,82,86,90,94
NUMA node2 CPU(s):
1,5,9,13,17,21,25,29,33,37,41,45,49,53,57,61,65,69,73,77,81,85,89,93
NUMA node3 CPU(s):
Flags: fpum 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 aperfmerf tsc_known_freq pni pclmulqdq dtes64 monitor ds_cpl smx est tm2 ssse3 sdbg fma cx16 xtrunc 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 cat_l2 cdp_l3 invpcid_single cdp_12 ssbd mba ibrs ibpb stibp ibrs_enhanced fsgsbase tsc_adjust bmi1 avx2 smep bmi2 erms invpcid cmx rdt_a avx512f avx512dq rdseed adx smap avx512ifma clflushopt clwb intel_pt avx512cd sha ni avx512bw avx512vl xsaves xgetbv1 xsaves cmq_llc cmq_occunion cmq_mbb_total cmq_mbb_local

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

split_lock_detect avx_vnni avx512_bf16 wbnoinvd dtherm ida arat pln pts avx512vbmi umip pku ospke waitpkg avx512_vbm2 gfni vaes vpclmulqdq avx512_vnni avx512_bitalg tme avx512_vpopcntdq la57 rdpid bus_lock_detect cldemote movdir movdir64b enqcmd fsrm md_clear serialize tsxldtrk pconfig arch_lbr amx_bf16 avx512_fp16 amx_tile amx_int8 flush_l1d arch_capabilities

/proc/cpuinfo cache data

```
cache size : 107520 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 64 68 72 76 80 84 88 92
  node 0 size: 257197 MB
  node 0 free: 248872 MB
  node 1 cpus: 2 6 10 14 18 22 26 30 34 38 42 46 50 54 58 62 66 70 74 78 82 86 90 94
  node 1 size: 258042 MB
  node 1 free: 250375 MB
  node 2 cpus: 1 5 9 13 17 21 25 29 33 37 41 45 49 53 57 61 65 69 73 77 81 85 89 93
  node 2 size: 258042 MB
  node 2 free: 257298 MB
  node 3 cpus: 3 7 11 15 19 23 27 31 35 39 43 47 51 55 59 63 67 71 75 79 83 87 91 95
  node 3 size: 258039 MB
  node 3 free: 257647 MB
  node distances:

```
    node   0   1   2   3
  0:  10  12  21  21
  1:  12  10  21  21
  2:  21  21  10  12
  3:  21  21  12  10
```

From `/proc/meminfo`
MemTotal: 1056074184 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="8.7 (Ootpa)"
  ID="rhel"
  ID_LIKE="fedora"
  VERSION_ID="8.7"
  PLATFORM_ID="platform:el8"
```

(Continued on next page)
Dell Inc.

PowerEdge MX760c (Intel Xeon Platinum 8468)  

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

Copyright 2017-2023 Standard Performance Evaluation Corporation

**SPECspeed®2017_fp_peak = 322**  
**SPECspeed®2017_fp_base = 322**

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**Test Sponsor:** Dell Inc.  
**Tested by:** Dell Inc.

**Test Date:** Dec-2022  
**Hardware Availability:** Feb-2023  
**Software Availability:** Nov-2022

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### Platform Notes (Continued)

**PRETTY_NAME="Red Hat Enterprise Linux 8.7 (Ootpa)"**

ANSI_COLOR="0;31"

cveda-release: Red Hat Enterprise Linux release 8.7 (Ootpa)

system-release: Red Hat Enterprise Linux release 8.7 (Ootpa)

system-release-cpe: cpe:/o:redhat:enterprise_linux:8::baseos

uname -a:

Linux localhost.localdomain 4.18.0-425.3.1.el8.x86_64 #1 SMP Fri Sep 30 11:45:06 EDT 2022 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
mmio_stale_data: Not affected
retbleed: Not affected
CVE-2018-3639 (Speculative Store Bypass): Mitigation: Speculative Store Bypass disabled via prctl
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, PBRSB-eIBRS: SW sequence
CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
CVE-2019-11135 (TSX Asynchronous Abort): Not affected

run-level 5 Dec 6 23:17

**run-level 5 Dec 6 23:17**

**SPEC is set to:** /mnt/ramdisk/cpu2017-1.1.8-ic2022.1

**Filesystem**  
**Type**  
**Size**  
**Used**  
**Avail**  
**Use%**  
**Mounted on**

tmpfs  
tmpfs 125G 9.6G 116G 8% /mnt/ramdisk

From /sys/devices/virtual/dmi/id

**Vendor:** Dell Inc.

**Product:** PowerEdge MX760c

**Product Family:** PowerEdge

**Serial:** MWCFG04

Additional information from dmidecode 3.3 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 002C0632002C MTC40F2046S1RC48BA1 64 GB 2 rank 4800

(Continued on next page)
Dell Inc.
PowerEdge MX760c (Intel Xeon Platinum 8468)

SPECspeed®2017_fp_base = 322
SPECspeed®2017_fp_peak = 322

Platform Notes (Continued)

BIOS:
  BIOS Vendor: Dell Inc.
  BIOS Version: 0.3.2
  BIOS Date: 11/30/2022
  BIOS Revision: 0.3

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
C               | 619.lbm_s(base, peak) 638.imagick_s(base, peak)
                | 644.nab_s(base, peak)
-----------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
  Version 2022.1.0 Build 20220316
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
-----------------------------------------------------------------------------
==============================================================================
C++, C, Fortran | 607.cactuBSSN_s(base, peak)
-----------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
  Version 2022.1.0 Build 20220316
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
  Version 2022.1.0 Build 20220316
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version
  2022.1.0 Build 20220316
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
-----------------------------------------------------------------------------
==============================================================================
Fortran         | 603.bwaves_s(base, peak) 649.fotonik3d_s(base, peak)
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-----------------------------------------------------------------------------
==============================================================================
Fortran, C      | 621.wrf_s(base, peak) 627.cam4_s(base, peak)
                | 628.pop2_s(base, peak)

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Hardware Availability: Feb-2023  
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Software Availability: Nov-2022

Compiler Version Notes (Continued)

Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2022.1.0 Build 20220316
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2022.1.0 Build 20220316
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.

Base Compiler Invocation

C benchmarks:
icx

Fortran benchmarks:
ifx

Benchmarks using both Fortran and C:
ifx icx

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

Base Portability Flags

603.bwaves_s: -DSPEC_LP64  
607.cactuBSSN_s: -DSPEC_LP64  
619.ibm_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 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math -flto

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

C benchmarks (continued):
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -fiopenmp
-DSPEC_OPENMP -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

Fortran benchmarks:
-m64 -Wl,-z,muldefs -DSPEC_OPENMP -xCORE-AVX512 -Ofast -ffast-math
-ffast-math -flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -fiopenmp
-nostandard-realloc-lhs -align array32byte -auto
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

Benchmarks using both Fortran and C:
-m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math -flto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -fiopenmp
-DSPEC_OPENMP -nostandard-realloc-lhs -align array32byte -auto
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

Benchmarks using Fortran, C, and C++:
-m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math -flto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -fiopenmp
-DSPEC_OPENMP -nostandard-realloc-lhs -align array32byte -auto
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

Peak Compiler Invocation

C benchmarks:
icx

Fortran benchmarks:
ifx

Benchmarks using both Fortran and C:
ifx icx

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

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: basepeak = yes

Fortran benchmarks:


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

Benchmarks using both Fortran and C:

621.wrf_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
http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge-Intel-Xeon-v1.2.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge-Intel-Xeon-v1.2.xml
### SPEC CPU®2017 Floating Point Speed Result

**Dell Inc.**

**PowerEdge MX760c (Intel Xeon Platinum 8468)**

<table>
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**Test Sponsor:** Dell Inc.  
**Tested by:** Dell Inc.  

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