Dell Inc. PowerEdge MX760c (Intel Xeon Platinum 8461V)

<table>
<thead>
<tr>
<th>SPECrate\textsuperscript{®}2017\textunderscore fp\textunderscore base</th>
<th>Dell Inc.</th>
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</thead>
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**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 8461V  
- **Max MHz:** 3700  
- **Nominal:** 2200  
- **Enabled:** 48 cores, 1 chip, 2 threads/core  
- **Orderable:** 1 chip  
- **Cache L1:** 32 KB I + 48 KB D on chip per core  
- **Cache L2:** 2 MB I+D on chip per core  
- **Cache L3:** 97.5 MB I+D on chip per chip  
- **Other:** None  
- **Memory:** 512 GB (8 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:** No  
- **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.

---

**503.bwaves\textunderscore r**  
**507.caetuBSSN\textunderscore r**  
**508.namd\textunderscore r**  
**510.parest\textunderscore r**  
**511.povray\textunderscore r**  
**519.lbm\textunderscore r**  
**521.wrf\textunderscore r**  
**526.blender\textunderscore r**  
**527.cam4\textunderscore r**  
**538.imagick\textunderscore r**  
**544.nab\textunderscore r**  
**549.fotonik3d\textunderscore r**  
**554.roms\textunderscore r**
SPEC CPU®2017 Floating Point Rate Result

Dell Inc.

PowerEdge MX760c (Intel Xeon Platinum 8461V)

SPECrater®2017_fp_base = 419
SPECrater®2017_fp_peak = 448

CPU2017 License: 6573  
Test Sponsor: Dell Inc.  
Tested by: Dell Inc.

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

Results Table

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</tr>
</tbody>
</table>

SPECrater®2017_fp_base = 419
SPECrater®2017_fp_peak = 448

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/ramdisk/cpu2017-1.1.8-ic2022.1/lib/intel64:/mnt/ramdisk/cpu2017-1.1.8-ic2022.1/je5.0.1-64"
MALLOC_CONF = "retain:true"

General Notes

Binaries compiled on a system with 2x Intel Xeon Platinum 8280M CPU + 384GB RAM memory using Red Hat Enterprise Linux 8.4
Transparent Huge Pages enabled by default

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

Dell Inc.

PowerEdge MX760c (Intel Xeon Platinum 8461V)

SPECrate®2017_fp_base = 419
SPECrate®2017_fp_peak = 448

CPU2017 License: 6573
Test Sponsor: Dell Inc.
Tested by: Dell Inc.

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

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 numaclt 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 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
Sub NUMA Cluster : 4-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 Thu Dec 8 07:42:58 2022

SUT (System Under Test) info as seen by some common utilities.
Dell Inc.

PowerEdge MX760c (Intel Xeon Platinum 8461V)

SPEC®CPU2017 Floating Point Rate Result

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Dell Inc.

PowerEdge MX760c (Intel Xeon Platinum 8461V)

CPU2017 License: 6573
Test Sponsor: Dell Inc.
Tested by: Dell Inc.

SPECrate®2017_fp_base = 419
SPECrate®2017_fp_peak = 448

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

Platform Notes (Continued)

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 8461V
1 "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
siblings : 96
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

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: 2
Core(s) per socket: 48
Socket(s): 1
NUMA node(s): 4
Vendor ID: GenuineIntel
BIOS Vendor ID: Intel
CPU family: 6
Model: 143
Model name: Intel(R) Xeon(R) Platinum 8461V
BIOS Model name: Intel(R) Xeon(R) Platinum 8461V
Stepping: 8
CPU MHz: 2200.000
BogoMIPS: 4400.00
L1d cache: 48K
L1i cache: 32K
L2 cache: 2048K
L3 cache: 99840K
NUMA node0 CPU(s):
0,2,4,6,8,10,12,14,16,18,20,22,24,26,28,30,32,34,36,38,40,42,44,46,72,74,76,78,80,82,84,86,88,90,92,94
NUMA node1 CPU(s):
1,3,5,7,9,11,13,15,17,19,21,23,25,27,29,31,33,35,37,39,41,43,45,47,73,75,77,79,81,83,85,87,89,91,93,95
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
(Continued on next page)
## Dell Inc. PowerEdge MX760c (Intel Xeon Platinum 8461V)

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### Platform Notes (Continued)

```
lm constant_tsc art arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid aperf perf tsc_known_freq pni pclmulqdq dtes64 monitor ds_cpl smx est tm2 sse3 sdbg fma cx16 xtrr 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_l2 ssbd mba ibrs ibpb stibp ibrs_enhanced fs.gsbase tsc_adjust bmi1 avx2 amep bml2 erms invpcid cmq rdt_a avx512f avx512dq rdseed adx smap avx512ifma clflushopt clwb intel_pt avx512cd sha ni avx512bw avx512vl xsaveopt xsaves cqm xgetbv1 xsavec cmq llc cqm_occuc llc cmq_mmb_total cmq_mmb_local split_lock_detect avx_vnni avx512 bf16 wbnoinvd dtherm ida arat pni pts hfi avx512vbmi umip pku ospke waitpkg avx512_vbmi2 gfni vaes vpcm uldqdq avx512_vnni avx512_bitalg tme avx512_vpocntdq la57 rdpid bus_lock_detect cldemote movdir64b enqcmd fse 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: 99840 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 2 4 6 8 10 12 14 16 18 20 22 48 50 52 54 56 58 60 62 64 66 68 70
  node 0 size: 128215 MB
  node 0 free: 114343 MB
  node 1 cpus: 24 26 28 30 32 34 36 38 40 42 44 46 72 74 76 78 80 82 84 86 88 90 92 94
  node 1 size: 129018 MB
  node 1 free: 119741 MB
  node 2 cpus: 1 3 5 7 9 11 13 15 17 19 21 23 49 51 53 55 57 59 61 63 65 67 69 71
  node 2 size: 129018 MB
  node 2 free: 111580 MB
  node 3 cpus: 25 27 29 31 33 35 37 39 41 43 45 47 73 75 77 79 81 83 85 87 89 91 93 95
  node 3 size: 128974 MB
  node 3 free: 118800 MB
  node distances:
    node 0 1 2 3
    0: 10 12 12 12
    1: 12 10 12 12
    2: 12 12 12 12
    3: 12 12 12 12
```

```
From /proc/meminfo
MemTotal: 527592204 KB
HugePages_Total: 0
Hugepagesize: 2048 KB
```

```
/sbin/tuned-adm active
  Current active profile: throughput-performance
```

(Continued on next page)
**Dell Inc.**

**PowerEdge MX760c (Intel Xeon Platinum 8461V)**

<table>
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</tr>
</tbody>
</table>

**Platform Notes (Continued)**

From /etc/*release* /etc/*version*

```
NAME="Red Hat Enterprise Linux"
VERSION="8.7 (Ootpa)"
ID="rhel"
ID_LIKE="fedora"
VERSION_ID="8.7"
PLATFORM_ID="platform:el8"
PRETTY_NAME="Red Hat Enterprise Linux 8.7 (Ootpa)"
ANSI_COLOR="0;31"
redhat-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

```
runt-level 5 Dec 8 03:02
```

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

```
Filesystem Type Size Used Avail Use% Mounted on
tmpfs tmpfs 125G 43G 83G 35% /mnt/ramdisk
```

```
From /sys/devices/virtual/dmi/id
Vendor: Dell Inc.
Product: PowerEdge MX760c
Product Family: PowerEdge
```

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

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:
- 8x 002C0632002C MTC40F2046S1RC48BA1 64 GB 2 rank 4800

**Compiler Version Notes**

```
==--------------------------------------------------------------------------==
| C                              | 519.lbm_r(base, peak) 538.imagick_r(base, peak)                           |
|                               | 544.nab_r(base, peak)                                              |

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2022.1.0 Build 20220316
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==--------------------------------------------------------------------------==
| C++                            | 508.namd_r(base, peak) 510.parest_r(base, peak)                       |

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2022.1.0 Build 20220316
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==--------------------------------------------------------------------------==
| C++, C                         | 511.povray_r(base, peak) 526.blender_r(base, peak)                     |

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2022.1.0 Build 20220316
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```

(Continued on next page)
### Compiler Version Notes (Continued)

C++, C, Fortran | 507.cactuBSSN_r(base, peak)

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Intel (R) oneAPI DPC++/C++ Compiler for applications running on Intel (R) 64, Version 2022.1.0 Build 20220316
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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 | 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak) 554.roms_r(base, peak)

Intel (R) Fortran Compiler for applications running on Intel (R) 64, Version 2022.1.0 Build 20220316
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Base Compiler Invocation

C benchmarks:
icx

C++ benchmarks:
icpx

Fortran benchmarks:
ifx

(Continued on next page)
Base Compiler Invocation (Continued)

Benchmarks using both Fortran and C:
ifx icx

Benchmarks using both C and C++:
icpx icx

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

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

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 -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 -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

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

(Continued on next page)
Dell Inc.
PowerEdge MX760c (Intel Xeon Platinum 8461V)

SPEC CPU®2017 Floating Point Rate Result

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PowerEdge MX760c (Intel Xeon Platinum 8461V)

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Base Optimization Flags (Continued)

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
-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 -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
-nostandard-realloc-lhs -align array32byte -auto -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

Peak Compiler Invocation

C benchmarks:
icx

C++ benchmarks:
icpx

Fortran benchmarks:	ifx

Benchmarks using both Fortran and C:	ifx icx

Benchmarks using both C and C++:
icpx icx

Benchmarks using Fortran, C, and C++:
icpx icx ifx
Dell Inc.

PowerEdge MX760c (Intel Xeon Platinum 8461V)  

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

<table>
<thead>
<tr>
<th>CPU2017 License</th>
<th>Dell Inc.</th>
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<tbody>
<tr>
<td>Test Date</td>
<td>Dec-2022</td>
</tr>
<tr>
<td>Hardware Availability</td>
<td>Feb-2023</td>
</tr>
<tr>
<td>Test Sponsor</td>
<td>Dell Inc.</td>
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<tr>
<td>Software Availability</td>
<td>Nov-2022</td>
</tr>
<tr>
<td>Tested by</td>
<td>Dell Inc.</td>
</tr>
</tbody>
</table>

**SPECrater®2017_fp_base = 419**

**SPECrater®2017_fp_peak = 448**

---

**Peak Portability Flags**

Same as Base Portability Flags

---

**Peak Optimization Flags**

C benchmarks:

519.lbm_r: basepeak = yes

538.imagick_r: basepeak = yes

544.nab_r: -w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math -flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -qopt-zmm-usage=high -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib

C++ benchmarks:

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 -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib

Fortran benchmarks:

503.bwaves_r: basepeak = yes

549.fotonik3d_r: basepeak = yes


Benchmarks using both Fortran and C:


(Continued on next page)
### Dell Inc.

PowerEdge MX760c (Intel Xeon Platinum 8461V)

<table>
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<tr>
<th>SPECrate®2017 fp_base = 419</th>
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</table>

**CPU2017 License:** 6573  
**Test Sponsor:** Dell Inc.  
**Test Date:** Dec-2022

**Tested by:** Dell Inc.  
**Hardware Availability:** Feb-2023  
**Software Availability:** Nov-2022

#### Peak Optimization Flags (Continued)

527.cam4_r: basepeak = yes

Benchmarks using both C and C++:

511.povray_r: basepeak = yes

526.blender_r: basepeak = yes

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`  
- `-nostandard-realloc-lhs`  
- `-align array32byte`  
- `-auto -ljemalloc`  
- `-L/usr/local/jemalloc64-5.0.1/lib`

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: