Dell Inc.  
PowerEdge R660 (Intel Xeon Platinum 8468)  

SPEC Speed®2017_fp_base = 322  
SPECspeed®2017_fp_peak = 322

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

<table>
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<tr>
<td>603.bwaves_s 96</td>
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<tr>
<td>607.cactuBSSN_s 96</td>
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<tr>
<td>619.ibm_s 96</td>
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<td>628.pop2_s 96</td>
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<td>638.imagick_s 96</td>
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<td>644.nab_s 96</td>
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<tr>
<td>649.fotonik3d_s</td>
</tr>
<tr>
<td>654.roms_s</td>
</tr>
</tbody>
</table>

**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  
- **L2:** 2 MB I+D on chip per core  
- **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:** SUSE Linux Enterprise Server 15 SP4  
  5.14.21-150400.22-default  
- **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 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.
Dell Inc.

PowerEdge R660 (Intel Xeon Platinum 8468)

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

Results Table

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<td>483</td>
<td>32.4</td>
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SPECspeed®2017_fp_base = 322
SPECspeed®2017_fp_peak = 322

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/cpu2017-1.1.8-ic2022.1/lib/intel64:/mnt/ramdisk/cpu2017-1.1.8-ic2022.1/je5.0.1-64"
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 Sun Dec 4 01:20:42 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)
**SPEC CPU®2017 Floating Point Speed Result**

**Dell Inc.**

**PowerEdge R660 (Intel Xeon Platinum 8468)**

**SPECspeed®2017_fp_base = 322**

**SPECspeed®2017_fp_peak = 322**

---

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

---

**Platform Notes (Continued)**

siblings : 48  
physical 0: cores 0 1 2 3 4 5 6 7 8 9 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 4 5 6 7 8 9 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 2.37.2`:

```
Architecture:                    x86_64  
CPU op-mode(s):                  32-bit, 64-bit  
Address sizes:                   46 bits physical, 57 bits virtual  
Byte Order:                      Little Endian  
CPU(s):                          96  
On-line CPU(s) list:             0-95  
Vendor ID:                       GenuineIntel  
Model name:                      Intel(R) Xeon(R) Platinum 8468  
CPU family:                      6  
Model:                           143  
Thread(s) per core:              1  
Core(s) per socket:              48  
Socket(s):                       2  
Stepping:                        8  
BogoMIPS:                        4200.00  
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 rep_good nopl xtopology nonstop_tsc cpuid aperfmperf tsc_known_freq pni pclmulqdq dtes64 ds_cpl smx est tm2 ssse3 sdbg fma cx16 xtrnpdcm pcid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault ebpxcat_l3 cat2l2 cdpl3 invpcid_single cdpl3 ssbd mba ibrs ibpb stibp ibrs_enhanced fsgbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm cqm rdt_a avx512f avx512dq rdseed adx smap avx512ifma clflushopt clwb intel_pt avx512cd sha ni avx512bw avx512vl xsaveopt xsavec xsaveopt xsave vfpvlqsg dcz saveeav xgetbv1 xsaves cram2 l1c qm_occup llc qm_mb_total qm_mbMB_local split_lock_detect avx_vnni avx512_bf16 wbnoinpvd dtherm ida arat pln pts avx512vbmi umip pku ospke waitpkg avx512vbmi2 gfini vaes vpcmmlqdq avx512_vnni avx512_bitalg tme avx512_vpopcntdq la57 rdpid bus_lock_detect cldemote movdiri movdir64b encmd ms master serialize tsxidtrk pconfi arch_iabr avx512_fp16 amx_tile flush_lld arch_capabilities  
```

L1d cache:                       4.5 MiB (96 instances)  
L1i cache:                       3 MiB (96 instances)  
L2 cache:                        192 MiB (96 instances)  
L3 cache:                        210 MiB (2 instances)  
NUMA node(s):                    4  
NUMA node0 CPU(s):               0-23  
NUMA node1 CPU(s):               24-47  
NUMA node2 CPU(s):               48-71  
NUMA node3 CPU(s):               72-95  
Vulnerability Itlb multihit:     Not affected

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

Dell Inc.
PowerEdge R660 (Intel Xeon Platinum 8468)

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

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

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

Platform Notes (Continued)

Vulnerability L1tf: Not affected
Vulnerability Mds: Not affected
Vulnerability Meltdown: Not affected
Vulnerability Spec store bypass: Mitigation; Speculative Store Bypass disabled via prctl and seccomp
Vulnerability Spectre v1: Mitigation; usercopy/swapgs barriers and __user pointer sanitization
Vulnerability Spectre v2: Mitigation; Enhanced IBRS, IBPB conditional, RSB filling
Vulnerability Srbds: Not affected
Vulnerability Tsx async abort: Not affected

From lscpu --cache:
NAME ONE-SIZE ALL-SIZE WAYS TYPE LEVEL SETS PHY-LINE COHERENCY-SIZE
L1d 48K 4.5M 12 Data 1 64 1 64
L1i 32K 3M 8 Instruction 1 64 1 64
L2 2M 192M 16 Unified 2 2048 1 64
L3 105M 210M 15 Unified 3 114688 1 64

/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 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
node 0 size: 257494 MB
node 0 free: 256899 MB
node 1 cpus: 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
node 1 size: 258041 MB
node 1 free: 257894 MB
node 2 cpus: 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71
node 2 size: 258007 MB
node 2 free: 256793 MB
node 3 cpus: 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95
node 3 size: 258012 MB
node 3 free: 243628 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: 1056313692 kB
  HugePages_Total: 0

(Continued on next page)
Dell Inc.  PowerEdge R660 (Intel Xeon Platinum 8468)  SPECspeed®2017_fp_base = 322
SPECspeed®2017_fp_peak = 322

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

Platform Notes (Continued)

Hugepagesize: 2048 kB

From /etc/*release* /etc/*version*
  os-release:
    NAME="SLES"
    VERSION="15-SP4"
    VERSION_ID="15.4"
    PRETTY_NAME="SUSE Linux Enterprise Server 15 SP4"
    ID="sles"
    ID_LIKE="suse"
    ANSI_COLOR="0;32"
    CPE_NAME="cpe:/o:suse:sles:15:sp4"

uname -a:
    Linux localhost 5.14.21-150400.22-default #1 SMP PREEMPT_DYNAMIC Wed May 11 06:57:18
    UTC 2022 (49db222) 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):
  Bypass disabled via prctl and seccomp
CVE-2017-5753 (Spectre variant 1):
  Mitigation: usercopy/swapsgs
  barriers and __user pointer sanitation
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

run-level 3 Dec 3 22:37

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 R660
  Product Family: PowerEdge
  Serial: SLR6603

Additional information from dmidecode 3.2 follows. WARNING: Use caution when you

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

## Dell Inc.

**PowerEdge R660 (Intel Xeon Platinum 8468)**

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### CPU2017 License:
6573

### Test Date:
Dec-2022

### Hardware Availability:
Feb-2023

### Test Sponsor:
Dell Inc.

### Test Date:
Dec-2022

### Software Availability:
Jun-2022

### Tested by:
Dell Inc.

### Platform Notes (Continued)

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 002C00B3002C MTC40F2046S1RC48BA1 64 GB 2 rank 4800

#### 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.
```

```
Fortran            | 603.bwaves_s(base, peak) 649.fotonik3d_s(base, peak) 654.roms_s(base, peak)
--------------------|-----------------------------------------------
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.
```

(Continued on next page)
Dell Inc. PowerEdge R660 (Intel Xeon Platinum 8468)

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Dell Inc.

PowerEdge R660 (Intel Xeon Platinum 8468)

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

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

Compiler Version Notes (Continued)

==============================================================================
Fortran, C
| 621.wrf_s(base, peak) 627.cam4_s(base, peak)
| 628.pop2_s(base, peak)
==============================================================================
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.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 R660 (Intel Xeon Platinum 8468)**

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<td>Jun-2022</td>
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</table>

#### Base Optimization Flags

**C benchmarks:**
- `-m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math -flto`
- `-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -fioopenmp`
- `-DSPEC_OPENMP -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc`

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

#### Peak CompilerInvocation

**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:

603.bwaves_s: -m64 -Wl, -z, mldeffs -DSPEC_OPENMP -xCORE-AVX512 -Ofast
-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
649.fotonik3d_s: basepeak = yes
654.roms_s: basepeak = yes

Benchmarks using both Fortran and C:

621.wrf_s: basepeak = yes
627.cam4_s: basepeak = yes
628.pop2_s: basepeak = yes

Benchmarks using Fortran, C, and C++:

607.cactusBSSN_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
### Dell Inc.

**PowerEdge R660 (Intel Xeon Platinum 8468)**  

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**SPECspeed**

- **SPECspeed**\(^\text{®} 2017\) \(_\text{fp\_base} = 322\)
- **SPECspeed**\(^\text{®} 2017\) \(_\text{fp\_peak} = 322\)

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

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For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

Tested with SPEC CPU\(^\text{®} 2017\) v1.1.8 on 2022-12-04 02:20:41-0500.

Report generated on 2023-01-17 18:42:42 by CPU2017 PDF formatter v6442.

Originally published on 2023-01-17.