



SPEC CPU®2017 Floating Point Rate Result

Copyright 2017-2021 Standard Performance Evaluation Corporation

Supermicro

SuperWorkstation 740GP-TNRT
(X12DPG-QT6 , Intel Xeon Platinum 8368Q)

SPECrate®2017_fp_base = 462

SPECrate®2017_fp_peak = 492

CPU2017 License: 001176

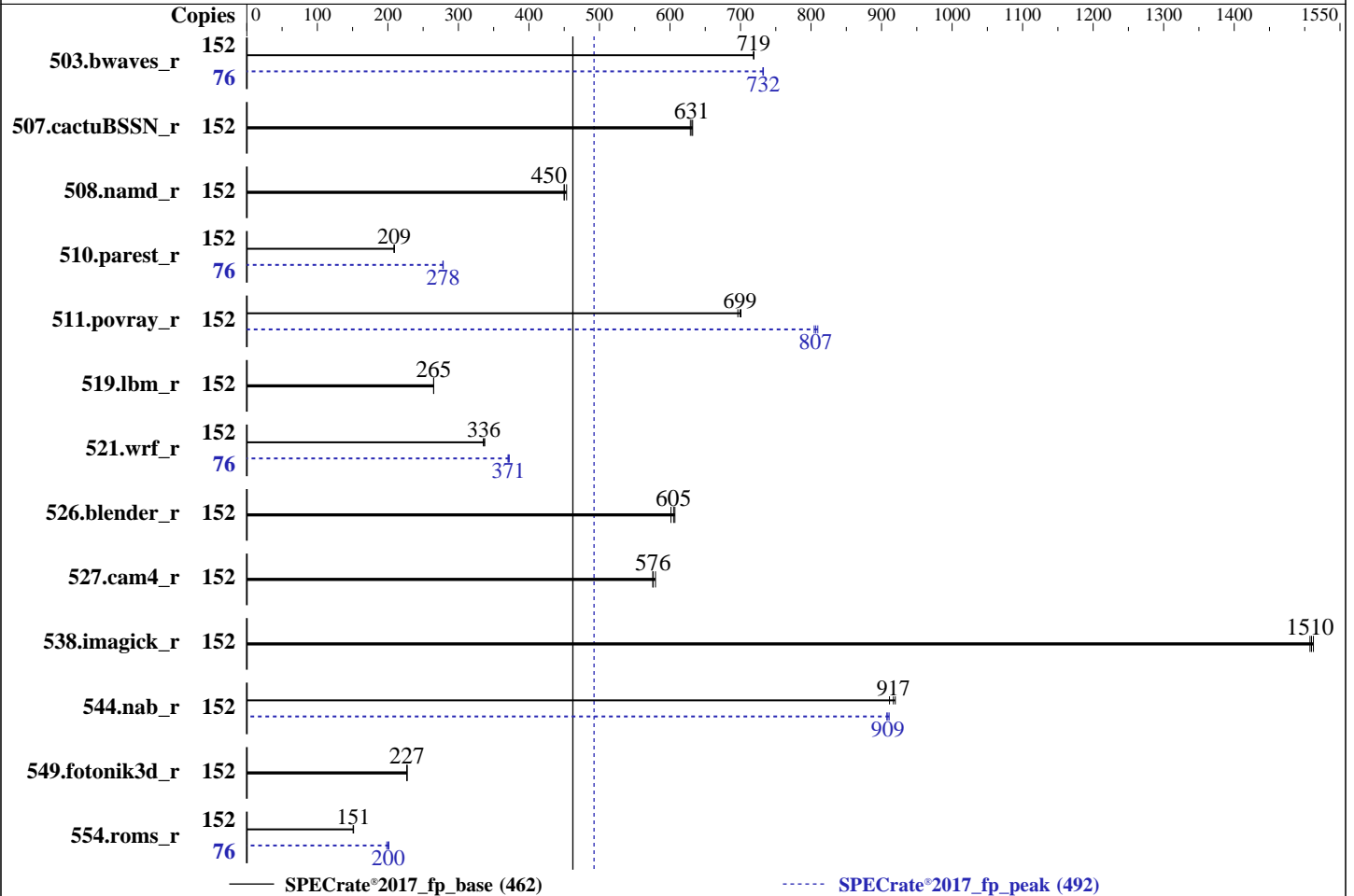
Test Sponsor: Supermicro

Tested by: Supermicro

Test Date: Mar-2021

Hardware Availability: Apr-2021

Software Availability: Mar-2021



Hardware

CPU Name: Intel Xeon Platinum 8368Q
 Max MHz: 3700
 Nominal: 2600
 Enabled: 76 cores, 2 chips, 2 threads/core
 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: 57 MB I+D on chip per chip
 Other: None
 Memory: 512 GB (16 x 32 GB 2Rx4 PC4-3200AA-R)
 Storage: 1 x 512 GB SATA III SSD
 Other: None

Software

OS: Red Hat Enterprise Linux 8.0
 Kernel 4.18.0-80.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: No
 Firmware: Version T20210323095242 released Mar-2021
 File System: xfs
 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 set to prefer performance at the cost of additional power usage



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Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
503.bwaves_r	152	2120	719	<u>2121</u>	<u>719</u>	2122	718	76	1040	733	<u>1041</u>	<u>732</u>	1042	732
507.cactuBSSN_r	152	<u>305</u>	<u>631</u>	304	632	306	629	152	<u>305</u>	<u>631</u>	304	632	306	629
508.namd_r	152	321	450	318	453	<u>321</u>	<u>450</u>	152	321	450	318	453	<u>321</u>	<u>450</u>
510.parest_r	152	1901	209	<u>1901</u>	<u>209</u>	1905	209	76	714	279	<u>715</u>	<u>278</u>	715	278
511.povray_r	152	510	696	<u>507</u>	<u>699</u>	507	701	152	441	804	<u>440</u>	<u>807</u>	438	810
519.lbm_r	152	<u>605</u>	<u>265</u>	605	265	605	265	152	<u>605</u>	<u>265</u>	605	265	605	265
521.wrf_r	152	1015	335	<u>1013</u>	<u>336</u>	1009	337	76	457	372	460	370	<u>459</u>	<u>371</u>
526.blender_r	152	385	601	381	607	<u>383</u>	<u>605</u>	152	385	601	381	607	<u>383</u>	<u>605</u>
527.cam4_r	152	<u>462</u>	<u>576</u>	462	576	459	579	152	<u>462</u>	<u>576</u>	462	576	459	579
538.imagick_r	152	250	1510	251	1510	<u>250</u>	<u>1510</u>	152	250	1510	251	1510	<u>250</u>	<u>1510</u>
544.nab_r	152	<u>279</u>	<u>917</u>	281	911	278	920	152	282	907	281	911	<u>281</u>	<u>909</u>
549.fotonik3d_r	152	<u>2608</u>	<u>227</u>	2610	227	2608	227	152	<u>2608</u>	<u>227</u>	2610	227	2608	227
554.roms_r	152	<u>1599</u>	<u>151</u>	1595	151	1602	151	76	<u>603</u>	<u>200</u>	599	201	609	198

SPECrate®2017_fp_base = **462**

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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 = "/home/cpu2017/lib/intel64:/home/cpu2017/je5.0.1-64"
MALLOC_CONF = "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
Prior to runcpu invocation
Filesystem page cache synced and cleared with:

(Continued on next page)



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General Notes (Continued)

```
sync; echo 3> /proc/sys/vm/drop_caches
runcpu command invoked through numactl i.e.:
numactl --interleave=all runcpu <etc>
```

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.

jemalloc, a general purpose malloc implementation
built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5
sources available from jemalloc.net or <https://github.com/jemalloc/jemalloc/releases>

Platform Notes

BIOS Settings:
Power Technology = Custom
Power Performance Tuning = BIOS Controls EPB
ENERGY_PERF_BIAS_CFG mode = Maximum Performance
Patrol Scrub = Disable
SNC = Enable
LLC dead line alloc = Disable

Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r6538 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2f1c
running on localhost.localdomain Sun Mar 28 01:34:52 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) Platinum 8368Q CPU @ 2.60GHz
2 "physical id"s (chips)
152 "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 : 38
siblings : 76
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
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

From lscpu:

(Continued on next page)



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Platform Notes (Continued)

```

Architecture:          x86_64
CPU op-mode(s):        32-bit, 64-bit
Byte Order:             Little Endian
CPU(s):                 152
On-line CPU(s) list:   0-151
Thread(s) per core:    2
Core(s) per socket:    38
Socket(s):              2
NUMA node(s):          4
Vendor ID:              GenuineIntel
CPU family:             6
Model:                  106
Model name:             Intel(R) Xeon(R) Platinum 8368Q CPU @ 2.60GHz
Stepping:               6
CPU MHz:                3300.000
CPU max MHz:            3700.0000
CPU min MHz:            800.0000
BogoMIPS:               5200.00
Virtualization:         VT-x
L1d cache:              48K
L1i cache:              32K
L2 cache:               1280K
L3 cache:               58368K
NUMA node0 CPU(s):     0-18,76-94
NUMA node1 CPU(s):     19-37,95-113
NUMA node2 CPU(s):     38-56,114-132
NUMA node3 CPU(s):     57-75,133-151
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
aperfmpperf pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16
xtpr 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 ssbd
mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vnmi flexpriority ept vpid fsgsbase
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
avx512v1 xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total
cqm_mbm_local wbnoinvd dtherm ida arat pln pts avx512vbmi umip pku ospke
avx512_vbmi2 gfni vaes vpclmulqdq avx512_vnni avx512_bitalg tme avx512_vpopcntdq
la57 rdpid pconfig flush_lld arch_capabilities

```

```
/proc/cpuinfo cache data
cache size : 58368 KB
```

```
From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a
physical chip.
available: 4 nodes (0-3)
```

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Platform Notes (Continued)

```

node 0 cpus: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 76 77 78 79 80 81 82 83 84
85 86 87 88 89 90 91 92 93 94
node 0 size: 128760 MB
node 0 free: 109666 MB
node 1 cpus: 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 95 96 97 98 99
100 101 102 103 104 105 106 107 108 109 110 111 112 113
node 1 size: 128565 MB
node 1 free: 113724 MB
node 2 cpus: 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 114 115 116 117
118 119 120 121 122 123 124 125 126 127 128 129 130 131 132
node 2 size: 128992 MB
node 2 free: 114273 MB
node 3 cpus: 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 133 134 135 136
137 138 139 140 141 142 143 144 145 146 147 148 149 150 151
node 3 size: 129012 MB
node 3 free: 114370 MB
node distances:
node   0   1   2   3
  0:  10  20  20  20
  1:  20  10  20  20
  2:  20  20  10  20
  3:  20  20  20  10

```

```

From /proc/meminfo
MemTotal:      527698252 kB
HugePages_Total:      0
Hugepagesize:    2048 kB

```

```

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

```

```

/sys/devices/system/cpu/cpu*/cpufreq/scaling_governor has
performance

```

```

From /etc/*release* /etc/*version*
os-release:
NAME="Red Hat Enterprise Linux"
VERSION="8.0 (Ootpa)"
ID="rhel"
ID_LIKE="fedora"
VERSION_ID="8.0"
PLATFORM_ID="platform:el8"
PRETTY_NAME="Red Hat Enterprise Linux 8.0 (Ootpa)"
ANSI_COLOR="0;31"
redhat-release: Red Hat Enterprise Linux release 8.0 (Ootpa)
system-release: Red Hat Enterprise Linux release 8.0 (Ootpa)
system-release-cpe: cpe:/o:redhat:enterprise_linux:8.0:ga

```

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Platform Notes (Continued)

```
uname -a:
Linux localhost.localdomain 4.18.0-80.el8.x86_64 #1 SMP Wed Mar 13 12:02:46 UTC 2019
x86_64 x86_64 x86_64 GNU/Linux
```

Kernel self-reported vulnerability status:

CVE-2018-12207 (iTLB Multihit):	No status reported
CVE-2018-3620 (L1 Terminal Fault):	Not affected
Microarchitectural Data Sampling:	No status reported
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: __user pointer sanitization
CVE-2017-5715 (Spectre variant 2):	Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling
CVE-2020-0543 (Special Register Buffer Data Sampling):	No status reported
CVE-2019-11135 (TSX Asynchronous Abort):	No status reported

```
run-level 3 Mar 27 17:28
```

```
SPEC is set to: /home/cpu2017
Filesystem      Type  Size  Used Avail Use% Mounted on
/dev/mapper/rhel-home xfs   410G  332G   79G  81% /home
```

```
From /sys/devices/virtual/dmi/id
Vendor:          Supermicro
Product:         Super Server
Product Family: Family
Serial:          0123456789
```

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 SK Hynix HMA84GR7CJR4N-XN 32 GB 2 rank 3200
```

```
BIOS:
BIOS Vendor:     American Megatrends International, LLC.
BIOS Version:    T20210323095242
BIOS Date:       03/23/2021
BIOS Revision:   5.22
```

(End of data from sysinfo program)



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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 2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
=====

=====
C++ | 508.namd_r(base, peak) 510.parest_r(base, peak)
=====

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=====

=====
C++, C | 511.povray_r(peak)
=====

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)
=====

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Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
=====

=====
C++, C | 511.povray_r(peak)
=====

Intel(R) C++ Intel(R) 64 Compiler Classic for applications running on
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Intel(R) C Intel(R) 64 Compiler Classic for applications running on Intel(R)
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C++, C | 511.povray_r(base) 526.blender_r(base, peak)
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=====
C++, C, Fortran | 507.cactuBSSN_r(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 | 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak)
| 554.roms_r(base, peak)
=====

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

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Intel(R) C Intel(R) 64 Compiler Classic for applications running on Intel(R)
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Compiler Version Notes (Continued)

=====
Fortran, C | 521.wrf_r(base) 527.cam4_r(base, peak)
=====

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=====

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

Base Compiler Invocation

C benchmarks:
icx

C++ benchmarks:
icpx

Fortran benchmarks:
ifort

(Continued on next page)



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Base Compiler Invocation (Continued)

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
```

Base Optimization Flags

C benchmarks:

```
-w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX2 -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-AVX2 -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-AVX2 -O3 -ipo -no-prec-div  
-qopt-prefetch -ffinite-math-only
```

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Software Availability: Mar-2021

Base Optimization Flags (Continued)

Fortran benchmarks (continued):

```
-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-AVX2 -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-AVX2 -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-AVX2 -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
```

Peak Compiler Invocation

C benchmarks:

```
icx
```

C++ benchmarks:

```
icpx
```

Fortran benchmarks:

```
ifort
```

Benchmarks using both Fortran and C:

```
521.wrf_r: ifort icc
```

(Continued on next page)



SPEC CPU®2017 Floating Point Rate Result

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Supermicro

SuperWorkstation 740GP-TNRT
(X12DPG-QT6 , Intel Xeon Platinum 8368Q)

SPECrate®2017_fp_base = 462

SPECrate®2017_fp_peak = 492

CPU2017 License: 001176
Test Sponsor: Supermicro
Tested by: Supermicro

Test Date: Mar-2021
Hardware Availability: Apr-2021
Software Availability: Mar-2021

Peak Compiler Invocation (Continued)

527.cam4_r: 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

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-AVX2 -flto
-Ofast -qopt-mem-layout-trans=4
-fimf-accuracy-bits=14:sqrt
-mbranches-within-32B-boundaries -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-AVX2 -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: -w -m64 -Wl,-z,muldefs -xCORE-AVX2 -O3 -ipo
-no-prec-div -qopt-prefetch -ffinite-math-only

(Continued on next page)



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Peak Optimization Flags (Continued)

503.bwaves_r (continued):

```
-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
```

549.fotonik3d_r: basepeak = yes

554.roms_r: Same as 503.bwaves_r

Benchmarks using both Fortran and C:

```
521.wrf_r: -prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX2 -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  
-nostandard-realloc-lhs -align array32byte -auto  
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

527.cam4_r: basepeak = yes

Benchmarks using both C and C++:

```
511.povray_r: -prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX2 -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

http://www.spec.org/cpu2017/flags/Intel-ic2021-official-linux64_revA.html

<http://www.spec.org/cpu2017/flags/Supermicro-Platform-Settings-V1.2-CLX-revH.2021-04-14.html>

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

<http://www.spec.org/cpu2017/flags/Supermicro-Platform-Settings-V1.2-CLX-revH.2021-04-14.xml>



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