



# SPEC CPU®2017 Floating Point Rate Result

Copyright 2017-2023 Standard Performance Evaluation Corporation

## Dell Inc.

SPECrate®2017\_fp\_base = 1630

### PowerEdge R860 (Intel Xeon Platinum 8460H)

SPECrate®2017\_fp\_peak = 1710

CPU2017 License: 6573

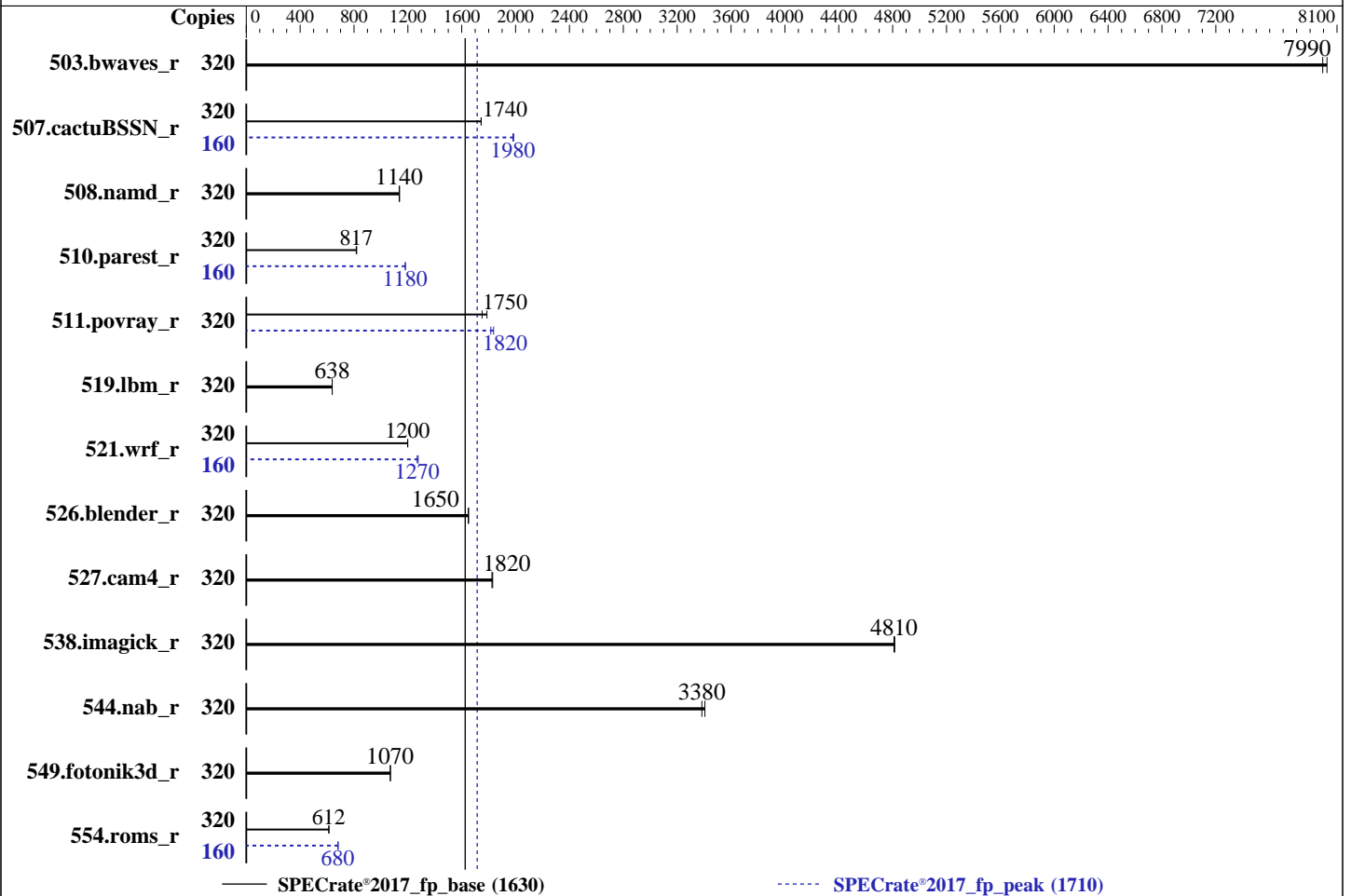
Test Date: Mar-2023

Test Sponsor: Dell Inc.

Hardware Availability: May-2023

Tested by: Dell Inc.

Software Availability: Dec-2022



### Hardware

CPU Name: Intel Xeon Platinum 8460H  
 Max MHz: 3800  
 Nominal: 2200  
 Enabled: 160 cores, 4 chips, 2 threads/core  
 Orderable: 2,4 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: 2 TB (32 x 64 GB 2Rx4 PC5-4800B-R)  
 Storage: 160 GB on tmpfs  
 Other: None

### Software

OS: Red Hat Enterprise Linux 9.0 (Plow)  
 5.14.0-70.13.1.el9\_0.x86\_64  
 Compiler: C/C++: Version 2023.0 of Intel oneAPI DPC++/C++ Compiler for Linux;  
 Fortran: Version 2023.0 of Intel Fortran Compiler for Linux;  
 Parallel: No  
 Firmware: Version 1.4.0 released Mar-2023  
 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.



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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	320	400	8030	<b>401</b>	<b>7990</b>			320	400	8030	<b>401</b>	<b>7990</b>		
507.cactuBSSN_r	320	<b>232</b>	<b>1740</b>	232	1740			160	102	1990	<b>102</b>	<b>1980</b>		
508.namd_r	320	<b>268</b>	<b>1140</b>	267	1140			320	<b>268</b>	<b>1140</b>	267	1140		
510.parest_r	320	1021	820	<b>1025</b>	<b>817</b>			160	<b>355</b>	<b>1180</b>	354	1180		
511.povray_r	320	<b>427</b>	<b>1750</b>	418	1790			320	<b>411</b>	<b>1820</b>	407	1840		
519.lbm_r	320	529	638	<b>529</b>	<b>638</b>			320	529	638	<b>529</b>	<b>638</b>		
521.wrf_r	320	598	1200	<b>598</b>	<b>1200</b>			160	281	1280	<b>282</b>	<b>1270</b>		
526.blender_r	320	295	1650	<b>296</b>	<b>1650</b>			320	295	1650	<b>296</b>	<b>1650</b>		
527.cam4_r	320	<b>307</b>	<b>1820</b>	306	1830			320	<b>307</b>	<b>1820</b>	306	1830		
538.imagick_r	320	165	4820	<b>165</b>	<b>4810</b>			320	165	4820	<b>165</b>	<b>4810</b>		
544.nab_r	320	<b>159</b>	<b>3380</b>	158	3410			320	<b>159</b>	<b>3380</b>	158	3410		
549.fotonik3d_r	320	1164	1070	<b>1167</b>	<b>1070</b>			320	1164	1070	<b>1167</b>	<b>1070</b>		
554.roms_r	320	827	615	<b>830</b>	<b>612</b>			160	372	683	<b>374</b>	<b>680</b>		

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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 =
    "/mnt/ramdisk/cpu2017-1.1.9-ic2023.0/lib/intel64:/mnt/ramdisk/cpu2017-1.1.9-ic2023.0/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  
Prior to runcpu invocation  
Filesystem page cache synced and cleared with:  
sync; echo 3> /proc/sys/vm/drop\_caches  
runcpu command invoked through numactl i.e.:  
numactl --interleave=all runcpu <etc>  
jemalloc, a general purpose malloc implementation

(Continued on next page)



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## General Notes (Continued)

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>

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 160 GB ramdisk created with the cmd: "mount -t tmpfs -o size=160G tmpfs /mnt/ramdisk"

## Platform Notes

BIOS settings:

```

    ADDDC Setting : Disabled
    DIMM Self Healing on
    Uncorrectable Memory Error : Disabled
    DCU Streamer Prefetcher : Disabled
    Sub NUMA Cluster : 4-way Clustering
    LLC Prefetch : Disabled
    Dead Line LLC Alloc : Disabled
    Optimizer Mode : Enabled

    System Profile : Custom
    CPU Power Management : Maximum Performance
    CIE : Disabled
    C States : Autonomous
    Memory Patrol Scrub : Disabled
    Energy Efficiency Policy : Performance
    PCI ASPM L1 Link
    Power Management : Disabled

```

Sysinfo program /mnt/ramdisk/cpu2017-1.1.9-ic2023.0/bin/sysinfo  
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197  
running on localhost.localdomain Wed Mar 29 11:19:25 2023

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

-----  
Table of contents  
-----

1. uname -a
2. w
3. Username
4. ulimit -a
5. sysinfo process ancestry
6. /proc/cpuinfo
7. lscpu
8. numactl --hardware
9. /proc/meminfo
10. who -r
11. Systemd service manager version: systemd 250 (250-6.e19\_0)
12. Services, from systemctl list-unit-files
13. Linux kernel boot-time arguments, from /proc/cmdline
14. cpupower frequency-info
15. sysctl
16. /sys/kernel/mm/transparent\_hugepage

(Continued on next page)



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## Platform Notes (Continued)

```

17. /sys/kernel/mm/transparent_hugepage/khugepaged
18. OS release
19. Disk information
20. /sys/devices/virtual/dmi/id
21. dmidecode
22. BIOS

```

```

-----
1. uname -a
Linux localhost.localdomain 5.14.0-70.13.1.el9_0.x86_64 #1 SMP PREEMPT Thu Apr 14 12:42:38 EDT 2022 x86_64
x86_64 x86_64 GNU/Linux

```

```

-----
2. w
 11:19:25 up 4:19, 1 user, load average: 169.69, 279.48, 302.04
USER      TTY      LOGIN@   IDLE   JCPU   PCPU WHAT
root      :l          07:01   ?xdm?  42:37  0.00s /usr/libexec/gdm-x-session --register-session --run-script
gnome-session

```

```

-----
3. Username
From environment variable $USER: root

```

```

-----
4. ulimit -a
real-time non-blocking time (microseconds, -R) unlimited
core file size (blocks, -c) 0
data seg size (kbytes, -d) unlimited
scheduling priority (-e) 0
file size (blocks, -f) unlimited
pending signals (-i) 8254044
max locked memory (kbytes, -l) 64
max memory size (kbytes, -m) unlimited
open files (-n) 1024
pipe size (512 bytes, -p) 8
POSIX message queues (bytes, -q) 819200
real-time priority (-r) 0
stack size (kbytes, -s) unlimited
cpu time (seconds, -t) unlimited
max user processes (-u) 8254044
virtual memory (kbytes, -v) unlimited
file locks (-x) unlimited

```

```

-----
5. sysinfo process ancestry
/usr/lib/systemd/systemd rhgb --switched-root --system --deserialize 31
/usr/lib/systemd/systemd --user
/usr/libexec/gnome-terminal-server
bash
/bin/bash ./DELL_rate.sh
/bin/bash ./dell-run-main.sh rate
/bin/bash ./dell-run-main.sh rate
/bin/bash ./dell-run-speccpu.sh rate --define DL-BIOSinc=Dell-BIOS_Xeon-4.inc --define DL-BIOS-adddcD=1
--define DL-BIOS-SNC=4 --output_format csv,html,pdf,txt
/bin/bash ./dell-run-speccpu.sh rate --define DL-BIOSinc=Dell-BIOS_Xeon-4.inc --define DL-BIOS-adddcD=1
--define DL-BIOS-SNC=4 --output_format csv,html,pdf,txt
runcpu --nobuild --action validate --define default-platform-flags --define numcopies=320 -c
ic2023.0-lin-sapphirerapids-rate-20221201.cfg --define smt-on --define cores=160 --define physicalfirst
--define invoke_with_interleave --define drop_caches --tune base,peak -o all --iterations 2 --define

```

(Continued on next page)



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## Platform Notes (Continued)

```
DL-BIOSinc=Dell-BIOS_Xeon-4.inc --define DL-BIOS-adddcD=1 --define DL-BIOS-SNC=4 --output_format
csv,html,pdf,txt fprate
runcpu --nobuild --action validate --define default-platform-flags --define numcopies=320 --configfile
ic2023.0-lin-sapphirerapids-rate-20221201.cfg --define smt-on --define cores=160 --define physicalfirst
--define invoke_with_interleave --define drop_caches --tune base,peak --output_format all --iterations 2
--define DL-BIOSinc=Dell-BIOS_Xeon-4.inc --define DL-BIOS-adddcD=1 --define DL-BIOS-SNC=4 --output_format
csv,html,pdf,txt --nopower --runmode rate --tune base:peak --size refrate fprate --nopreenv --note-preenv
--logfile $SPEC/tmp/CPU2017.002/temlogs/preenv.fprate.002.0.log --lognum 002.0 --from_runcpu 2
specperl $SPEC/bin/sysinfo
$SPEC = /mnt/ramdisk/cpu2017-1.1.9-ic2023.0
```

```
6. /proc/cpuinfo
model name      : Intel(R) Xeon(R) Platinum 8460H
vendor_id      : GenuineIntel
cpu family     : 6
model          : 143
stepping       : 8
microcode      : 0x2b0001b0
bugs           : spectre_v1 spectre_v2 spec_store_bypass swapgs
cpu cores      : 40
siblings       : 80
4 physical ids (chips)
320 processors (hardware threads)
physical id 0: core ids 0-39
physical id 1: core ids 0-39
physical id 2: core ids 0-39
physical id 3: core ids 0-39
physical id 0: apicids 0-79
physical id 1: apicids 128-207
physical id 2: apicids 256-335
physical id 3: apicids 384-463
Caution: /proc/cpuinfo data regarding chips, cores, and threads is not necessarily reliable, especially for
virtualized systems. Use the above data carefully.
```

```
7. lscpu

From lscpu from util-linux 2.37.4:
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):                320
On-line CPU(s) list:  0-319
Vendor ID:             GenuineIntel
BIOS Vendor ID:       Intel
Model name:            Intel(R) Xeon(R) Platinum 8460H
BIOS Model name:      Intel(R) Xeon(R) Platinum 8460H
CPU family:            6
Model:                 143
Thread(s) per core:   2
Core(s) per socket:   40
Socket(s):             4
Stepping:              8
BogoMIPS:              4400.00
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 bts rep_good nopl xtopology
nonstop_tsc cpuid aperfmperf tsc_known_freq pni pclmulqdq dtes64 monitor
```

(Continued on next page)



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### Platform Notes (Continued)

ds\_cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtpr pdcn 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 tpr\_shadow  
vmi flexpriority ept vpid ept\_ad fsgsbase tsc\_adjust bmi1 avx2 smep bmi2  
erms invpcid cqm rdt\_a avx512f avx512dq rdseed adx smap avx512ifma  
clflushopt clwb intel\_pt avx512cd sha\_ni avx512bw avx512vl xsaveopt xsavec  
xgetbv1 xsaves cqm\_llc cqm\_occup\_llc cqm\_mbm\_total cqm\_mbm\_local  
split\_lock\_detect avx\_vnni avx512\_bf16 wbnoinvd dtherm ida arat pln pts  
avx512vbmi umip pku ospke waitpkg avx512\_vbmi2 gfni vaes vpclmulqdq  
avx512\_vnni avx512\_bitalg tme avx512\_vpopcntdq la57 rdpid bus\_lock\_detect  
cldemote movdiri movdir64b enqcmd fsrm md\_clear serialize tsxldtrk pconfig  
arch\_lbr avx512\_fp16 amx\_tile flush\_llid arch\_capabilities

**Virtualization:**

VT-x  
L1d cache: 7.5 MiB (160 instances)  
L1i cache: 5 MiB (160 instances)  
L2 cache: 320 MiB (160 instances)  
L3 cache: 420 MiB (4 instances)  
NUMA node(s): 16  
NUMA node0 CPU(s): 0, 8, 16, 24, 32, 40, 48, 56, 64, 72, 160, 168, 176, 184, 192, 200, 208, 216, 224, 232  
NUMA node1 CPU(s): 80, 88, 96, 104, 112, 120, 128, 136, 144, 152, 240, 248, 256, 264, 272, 280, 288, 296, 304, 3  
12  
NUMA node2 CPU(s): 4, 12, 20, 28, 36, 44, 52, 60, 68, 76, 164, 172, 180, 188, 196, 204, 212, 220, 228, 236  
NUMA node3 CPU(s): 84, 92, 100, 108, 116, 124, 132, 140, 148, 156, 244, 252, 260, 268, 276, 284, 292, 300, 308,  
316  
NUMA node4 CPU(s): 1, 9, 17, 25, 33, 41, 49, 57, 65, 73, 161, 169, 177, 185, 193, 201, 209, 217, 225, 233  
NUMA node5 CPU(s): 81, 89, 97, 105, 113, 121, 129, 137, 145, 153, 241, 249, 257, 265, 273, 281, 289, 297, 305, 3  
13  
NUMA node6 CPU(s): 5, 13, 21, 29, 37, 45, 53, 61, 69, 77, 165, 173, 181, 189, 197, 205, 213, 221, 229, 237  
NUMA node7 CPU(s): 85, 93, 101, 109, 117, 125, 133, 141, 149, 157, 245, 253, 261, 269, 277, 285, 293, 301, 309,  
317  
NUMA node8 CPU(s): 2, 10, 18, 26, 34, 42, 50, 58, 66, 74, 162, 170, 178, 186, 194, 202, 210, 218, 226, 234  
NUMA node9 CPU(s): 82, 90, 98, 106, 114, 122, 130, 138, 146, 154, 242, 250, 258, 266, 274, 282, 290, 298, 306, 3  
14  
NUMA node10 CPU(s): 6, 14, 22, 30, 38, 46, 54, 62, 70, 78, 166, 174, 182, 190, 198, 206, 214, 222, 230, 238  
NUMA node11 CPU(s): 86, 94, 102, 110, 118, 126, 134, 142, 150, 158, 246, 254, 262, 270, 278, 286, 294, 302, 310,  
318  
NUMA node12 CPU(s): 3, 11, 19, 27, 35, 43, 51, 59, 67, 75, 163, 171, 179, 187, 195, 203, 211, 219, 227, 235  
NUMA node13 CPU(s): 83, 91, 99, 107, 115, 123, 131, 139, 147, 155, 243, 251, 259, 267, 275, 283, 291, 299, 307, 3  
15  
NUMA node14 CPU(s): 7, 15, 23, 31, 39, 47, 55, 63, 71, 79, 167, 175, 183, 191, 199, 207, 215, 223, 231, 239  
NUMA node15 CPU(s): 87, 95, 103, 111, 119, 127, 135, 143, 151, 159, 247, 255, 263, 271, 279, 287, 295, 303, 311,  
319  
Vulnerability Itlb multihit: Not affected  
Vulnerability L1tf: Not affected  
Vulnerability Mds: Not affected  
Vulnerability Meltdown: Not affected  
Vulnerability Spec store bypass: Mitigation; Speculative Store Bypass disabled via prctl  
Vulnerability Spectre v1: Mitigation; usercopy/swaps 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	7.5M	12	Data	1	64	1	64
L1i	32K	5M	8	Instruction	1	64	1	64
L2	2M	320M	16	Unified	2	2048	1	64
L3	105M	420M	15	Unified	3	114688	1	64

(Continued on next page)



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## Platform Notes (Continued)

8. numactl --hardware

NOTE: a numactl 'node' might or might not correspond to a physical chip.

```

available: 16 nodes (0-15)
node 0 cpus: 0,8,16,24,32,40,48,56,64,72,160,168,176,184,192,200,208,216,224,232
node 0 size: 128343 MB
node 0 free: 122918 MB
node 1 cpus: 80,88,96,104,112,120,128,136,144,152,240,248,256,264,272,280,288,296,304,312
node 1 size: 129019 MB
node 1 free: 128139 MB
node 2 cpus: 4,12,20,28,36,44,52,60,68,76,164,172,180,188,196,204,212,220,228,236
node 2 size: 129019 MB
node 2 free: 128156 MB
node 3 cpus: 84,92,100,108,116,124,132,140,148,156,244,252,260,268,276,284,292,300,308,316
node 3 size: 129019 MB
node 3 free: 128136 MB
node 4 cpus: 1,9,17,25,33,41,49,57,65,73,161,169,177,185,193,201,209,217,225,233
node 4 size: 129019 MB
node 4 free: 121404 MB
node 5 cpus: 81,89,97,105,113,121,129,137,145,153,241,249,257,265,273,281,289,297,305,313
node 5 size: 129019 MB
node 5 free: 128161 MB
node 6 cpus: 5,13,21,29,37,45,53,61,69,77,165,173,181,189,197,205,213,221,229,237
node 6 size: 129019 MB
node 6 free: 127417 MB
node 7 cpus: 85,93,101,109,117,125,133,141,149,157,245,253,261,269,277,285,293,301,309,317
node 7 size: 129019 MB
node 7 free: 128148 MB
node 8 cpus: 2,10,18,26,34,42,50,58,66,74,162,170,178,186,194,202,210,218,226,234
node 8 size: 129019 MB
node 8 free: 128140 MB
node 9 cpus: 82,90,98,106,114,122,130,138,146,154,242,250,258,266,274,282,290,298,306,314
node 9 size: 129019 MB
node 9 free: 128163 MB
node 10 cpus: 6,14,22,30,38,46,54,62,70,78,166,174,182,190,198,206,214,222,230,238
node 10 size: 129019 MB
node 10 free: 128125 MB
node 11 cpus: 86,94,102,110,118,126,134,142,150,158,246,254,262,270,278,286,294,302,310,318
node 11 size: 129019 MB
node 11 free: 128101 MB
node 12 cpus: 3,11,19,27,35,43,51,59,67,75,163,171,179,187,195,203,211,219,227,235
node 12 size: 129019 MB
node 12 free: 127947 MB
node 13 cpus: 83,91,99,107,115,123,131,139,147,155,243,251,259,267,275,283,291,299,307,315
node 13 size: 129019 MB
node 13 free: 128158 MB
node 14 cpus: 7,15,23,31,39,47,55,63,71,79,167,175,183,191,199,207,215,223,231,239
node 14 size: 128983 MB
node 14 free: 128125 MB
node 15 cpus: 87,95,103,111,119,127,135,143,151,159,247,255,263,271,279,287,295,303,311,319
node 15 size: 128990 MB
node 15 free: 127655 MB
node distances:
node  0  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15
0:  10 12 12 12 21 21 21 21 21 21 21 21 21 21 21 21
1:  12 10 12 12 21 21 21 21 21 21 21 21 21 21 21 21
2:  12 12 10 12 21 21 21 21 21 21 21 21 21 21 21 21
3:  12 12 12 10 21 21 21 21 21 21 21 21 21 21 21 21
4:  21 21 21 21 10 12 12 12 21 21 21 21 21 21 21 21
5:  21 21 21 21 12 10 12 12 21 21 21 21 21 21 21 21

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(Continued on next page)





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### Platform Notes (Continued)

6:	21	21	21	21	12	12	10	12	21	21	21	21	21	21	21	21
7:	21	21	21	21	12	12	12	10	21	21	21	21	21	21	21	21
8:	21	21	21	21	21	21	21	21	10	12	12	12	21	21	21	21
9:	21	21	21	21	21	21	21	21	12	10	12	12	21	21	21	21
10:	21	21	21	21	21	21	21	21	12	12	10	12	21	21	21	21
11:	21	21	21	21	21	21	21	21	12	12	12	10	21	21	21	21
12:	21	21	21	21	21	21	21	21	21	21	21	21	10	12	12	12
13:	21	21	21	21	21	21	21	21	21	21	21	21	12	10	12	12
14:	21	21	21	21	21	21	21	21	21	21	21	21	12	12	10	12
15:	21	21	21	21	21	21	21	21	21	21	21	21	12	12	12	10

```
9. /proc/meminfo
MemTotal:      2113098540 kB
```

```
10. who -r
run-level 5 Mar 29 07:00
```

```
11. Systemd service manager version: systemd 250 (250-6.el9_0)
Default Target Status
graphical      running
```

```
12. Services, from systemctl list-unit-files
STATE UNIT FILES
enabled ModemManager NetworkManager NetworkManager-dispatcher NetworkManager-wait-online
accounts-daemon atd auditd avahi-daemon bluetooth chronyd crond cups dbus-broker gdm
getty@ insights-client-boot irqbalance iscsi iscsi-onboot kdump libstoragemgmt lm_sensors
low-memory-monitor lvm2-monitor mcelog mdmonitor microcode multipathd nis-domainname
nvme-fc-boot-connections ostree-remount pmcmod pmie pmlogger power-profiles-daemon
qemu-guest-agent rhsmcertd rpcbind rsyslog rtkit-daemon selinux-autorelabel-mark smartd
sshd sssd switcheroo-control sysstat systemd-network-generator udisks2 upower vgauthd
virtqemud vmtoolsd
enabled-runtime systemd-remount-fs
disabled arp-ethers autofs blk-availability brlty canberra-system-bootup canberra-system-shutdown
canberra-system-shutdown-reboot chrony-wait cni-dhcp console-getty cpupower cups-browsed
dbus-daemon debug-shell dnsmasq dovecot fancontrol fcoe firewallld grafana-server gssproxy
httpd httpd@ ibacm iprdump iprinit ipupdate ipsec iscsid iscsiui kpatch kvm_stat ledmon
libvirt-guests libvirt d lldpad man-db-restart-cache-update named named-chroot nfs-blkmap
nfs-server nftables nmb numad nvme-fc-autoconnect pmfind pmie_farm pmlogger_farm pmproxy
podman podman-auto-update podman-restart postfix powertop psacct ras-mc-ctl rasdaemon
rdisc rhcd rhsm rhsm-facts rpmdm-rebuild rrdcached saslauthd serial-getty@ smb snmpd
snmptrapd spamassassin speech-dispatcher srp_daemon srp_daemon_port@ sshd-keygen@
systemd-boot-check-no-failures systemd-nspawn@ systemd-pstore systemd-sysext target
targetclid tog-pegasus trace-cmd virtinterfaced virtnetworkd virtnodevdev virtnwfilterd
virtproxyd virtsecret virtstoraged vsftpd wpa_supplicant
indirect pcsd spice-vdagentd sssd-autofs sssd-kcm sssd-nss sssd-pac sssd-pam sssd-ssh sssd-sudo
virtlockd virtlogd vsftpd@
```

```
13. Linux kernel boot-time arguments, from /proc/cmdline
BOOT_IMAGE=(hd0,gpt2)/vmlinuz-5.14.0-70.13.1.el9_0.x86_64
root=/dev/mapper/rhel-root
ro
resume=/dev/mapper/rhel-swap
rd.lvm.lv=rhel/root
rd.lvm.lv=rhel/swap
rhgb
```

(Continued on next page)





# SPEC CPU®2017 Floating Point Rate Result

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PowerEdge R860 (Intel Xeon Platinum 8460H)

SPECrate®2017\_fp\_peak = 1710

CPU2017 License: 6573

Test Sponsor: Dell Inc.

Tested by: Dell Inc.

Test Date: Mar-2023

Hardware Availability: May-2023

Software Availability: Dec-2022

## Platform Notes (Continued)

quiet

```

-----
14. cpupower frequency-info
analyzing CPU 0:
  Unable to determine current policy
  boost state support:
    Supported: yes
    Active: yes

-----
15. sysctl
kernel.numa_balancing          1
kernel.randomize_va_space      2
vm.compaction_proactiveness     20
vm.dirty_background_bytes       0
vm.dirty_background_ratio       10
vm.dirty_bytes                  0
vm.dirty_expire_centisecs       3000
vm.dirty_ratio                  20
vm.dirty_writeback_centisecs    500
vm.dirtytime_expire_seconds     43200
vm.extfrag_threshold            500
vm.min_unmapped_ratio           1
vm.nr_hugepages                 0
vm.nr_hugepages_mempolicy        0
vm.nr_overcommit_hugepages      0
vm.swappiness                    60
vm.watermark_boost_factor       15000
vm.watermark_scale_factor        10
vm.zone_reclaim_mode            0

-----
16. /sys/kernel/mm/transparent_hugepage
defrag          always defer defer+madvise [madvise] never
enabled         [always] madvise never
hpage_pmd_size 2097152
shmem_enabled   always within_size advise [never] deny force

-----
17. /sys/kernel/mm/transparent_hugepage/khugepaged
alloc_sleep_millisecs  60000
defrag                  1
max_ptes_none          511
max_ptes_shared        256
max_ptes_swap          64
pages_to_scan          4096
scan_sleep_millisecs   10000

-----
18. OS release
From /etc/*-release /etc/*-version
os-release      Red Hat Enterprise Linux 9.0 (Plow)
redhat-release  Red Hat Enterprise Linux release 9.0 (Plow)
system-release  Red Hat Enterprise Linux release 9.0 (Plow)

-----
19. Disk information
SPEC is set to: /mnt/ramdisk/cpu2017-1.1.9-ic2023.0
Filesystem      Type  Size  Used Avail Use% Mounted on

```

(Continued on next page)



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## Platform Notes (Continued)

tmpfs tmpfs 160G 4.2G 156G 3% /mnt/ramdisk

20. /sys/devices/virtual/dmi/id  
Vendor: Dell Inc.  
Product: PowerEdge R860  
Product Family: PowerEdge  
Serial: 1234567

21. dmidecode  
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:  
18x 00AD00B300AD HMC94MEBRA123N 64 GB 2 rank 4800  
14x 00AD063200AD HMC94MEBRA109N 64 GB 2 rank 4800

22. BIOS  
(This section combines info from /sys/devices and dmidecode.)  
BIOS Vendor: Dell Inc.  
BIOS Version: 1.4.0  
BIOS Date: 03/15/2023  
BIOS Revision: 1.4

## 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 2023.0.0 Build 20221201  
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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 2023.0.0 Build 20221201  
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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 2023.0.0 Build 20221201  
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Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201  
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=====  
C++, C, Fortran | 507.cactuBSSN\_r(base, peak)  
-----  
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Test Sponsor: Dell Inc.  
Tested by: Dell Inc.

Test Date: Mar-2023  
Hardware Availability: May-2023  
Software Availability: Dec-2022

## Compiler Version Notes (Continued)

Copyright (C) 1985-2022 Intel Corporation. All rights reserved.  
Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201  
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=====  
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 2023.0.0 Build 20221201  
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.

=====  
Fortran, C | 521.wrf\_r(base, peak) 527.cam4\_r(base, peak)  
=====

Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201  
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Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201  
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## Base 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

## Base Portability Flags

503.bwaves\_r: -DSPEC\_LP64  
507.cactuBSSN\_r: -DSPEC\_LP64  
508.namd\_r: -DSPEC\_LP64  
510.parest\_r: -DSPEC\_LP64

(Continued on next page)



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Tested by: Dell Inc.

Test Date: Mar-2023

Hardware Availability: May-2023

Software Availability: Dec-2022

## Base Portability Flags (Continued)

```
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 -xsapphirerapids -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-Wno-implicit-int -mprefer-vector-width=512 -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib
```

### C++ benchmarks:

```
-w -std=c++14 -m64 -Wl,-z,muldefs -xsapphirerapids -Ofast
-ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -mprefer-vector-width=512 -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib
```

### Fortran benchmarks:

```
-w -m64 -Wl,-z,muldefs -xsapphirerapids -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 Fortran and C:

```
-w -m64 -std=c11 -Wl,-z,muldefs -xsapphirerapids -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-Wno-implicit-int -mprefer-vector-width=512 -nostandard-realloc-lhs
-align array32byte -auto -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib
```

### Benchmarks using both C and C++:

```
-w -std=c++14 -m64 -std=c11 -Wl,-z,muldefs -xsapphirerapids -Ofast
-ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -Wno-implicit-int -mprefer-vector-width=512
-ljemalloc -L/usr/local/jemalloc64-5.0.1/lib
```

### Benchmarks using Fortran, C, and C++:

```
-w -m64 -std=c++14 -std=c11 -Wl,-z,muldefs -xsapphirerapids -Ofast
```

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Tested by: Dell Inc.

Test Date: Mar-2023

Hardware Availability: May-2023

Software Availability: Dec-2022

## Base Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++ (continued):

```
-ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -Wno-implicit-int -mprefer-vector-width=512
-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

## 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: basepeak = yes

(Continued on next page)



# SPEC CPU®2017 Floating Point Rate Result

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Tested by: Dell Inc.

Test Date: Mar-2023

Hardware Availability: May-2023

Software Availability: Dec-2022

## Peak Optimization Flags (Continued)

C++ benchmarks:

508.namd\_r: basepeak = yes

```
510.parest_r: -w -std=c++14 -m64 -Wl,-z,muldefs -xsapphirerapids
-Ofast -ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -mprefer-vector-width=512
-ljemalloc -L/usr/local/jemalloc64-5.0.1/lib
```

Fortran benchmarks:

503.bwaves\_r: basepeak = yes

549.fotonik3d\_r: basepeak = yes

```
554.roms_r: -w -m64 -Wl,-z,muldefs -xsapphirerapids -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 Fortran and C:

```
521.wrf_r: -w -m64 -std=c11 -Wl,-z,muldefs -xsapphirerapids -Ofast
-ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -Wno-implicit-int
-mprefer-vector-width=512 -nostandard-realloc-lhs
-align array32byte -auto -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib
```

527.cam4\_r: basepeak = yes

Benchmarks using both C and C++:

```
511.povray_r: -w -std=c++14 -m64 -std=c11 -Wl,-z,muldefs
-fprofile-generate(pass 1)
-fprofile-use=default.profddata(pass 2) -xCORE-AVX2(pass 1)
-flto -Ofast -xCORE-AVX512 -ffast-math -mfpmath=sse
-funroll-loops -qopt-mem-layout-trans=4 -Wno-implicit-int
-mprefer-vector-width=512 -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib
```

526.blender\_r: basepeak = yes

Benchmarks using Fortran, C, and C++:

```
-w -m64 -std=c++14 -std=c11 -Wl,-z,muldefs -xsapphirerapids -Ofast
```

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## Peak Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++ (continued):

```
-ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -Wno-implicit-int -mprefer-vector-width=512
-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

<http://www.spec.org/cpu2017/flags/Intel-ic2023-official-linux64.html>

<http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge-Intel-Xeon-v1.3.html>

You can also download the XML flags sources by saving the following links:

<http://www.spec.org/cpu2017/flags/Intel-ic2023-official-linux64.xml>

<http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge-Intel-Xeon-v1.3.xml>

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