



# SPEC CPU®2017 Floating Point Rate Result

Copyright 2017-2023 Standard Performance Evaluation Corporation

## Fujitsu

PRIMERGY CX2550 M7, Intel Xeon Platinum 8470N, 1.70GHz

SPECrate®2017\_fp\_base = 870

SPECrate®2017\_fp\_peak = Not Run

CPU2017 License: 19

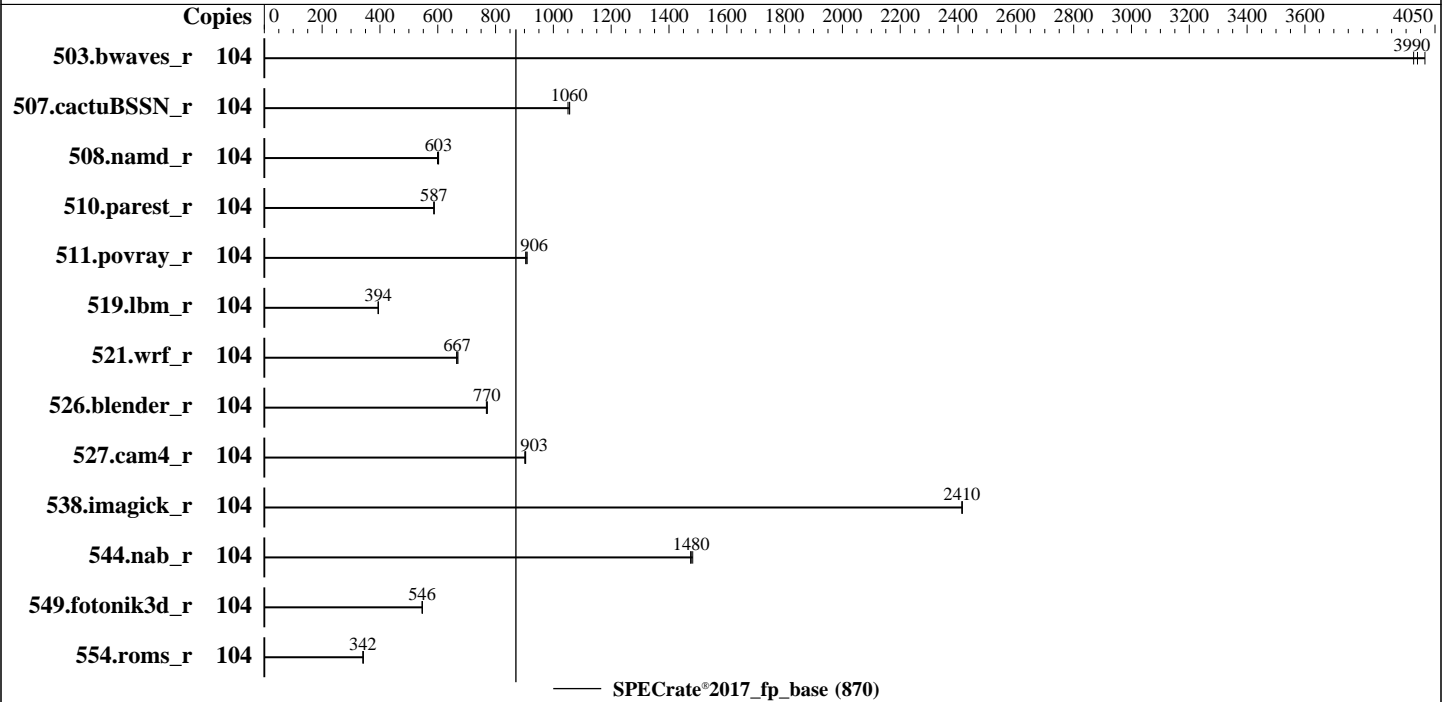
Test Sponsor: Fujitsu

Tested by: Fujitsu

Test Date: May-2023

Hardware Availability: May-2023

Software Availability: Dec-2022



### Hardware

CPU Name: Intel Xeon Platinum 8470N  
 Max MHz: 3600  
 Nominal: 1700  
 Enabled: 104 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: 97.5 MB I+D on chip per chip  
 Other: None  
 Memory: 1 TB (16 x 64 GB 2Rx4 PC5-4800B-R)  
 Storage: 1 x SATA M.2 SSD, 480GB  
 Other: None

### Software

OS: SUSE Linux Enterprise Server 15 SP4 5.14.21-150400.24.33-default  
 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: Fujitsu BIOS Version V1.0.0.0 R1.10.0 for D3988-A1x. Released May-2023 tested as V1.0.0.0 R1.1.0 for D3988-A1x Apr-2023  
 File System: btrfs  
 System State: Run level 3 (multi-user)  
 Base Pointers: 64-bit  
 Peak Pointers: Not Applicable  
 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	104	262	3980	<u>261</u>	<u>3990</u>	260	4020							
507.cactuBSSN_r	104	125	1060	125	1050	<u>125</u>	<u>1060</u>							
508.namd_r	104	<u>164</u>	<u>603</u>	164	603	165	599							
510.parest_r	104	463	588	464	586	<u>463</u>	<u>587</u>							
511.povray_r	104	<u>268</u>	<u>906</u>	267	909	269	904							
519.lbm_r	104	278	394	278	394	<u>278</u>	<u>394</u>							
521.wrf_r	104	348	670	350	665	<u>349</u>	<u>667</u>							
526.blender_r	104	<u>206</u>	<u>770</u>	206	768	205	771							
527.cam4_r	104	202	901	<u>201</u>	<u>903</u>	201	904							
538.imagick_r	104	107	2410	107	2410	<u>107</u>	<u>2410</u>							
544.nab_r	104	<u>119</u>	<u>1480</u>	119	1470	118	1480							
549.fotonik3d_r	104	<u>742</u>	<u>546</u>	742	546	741	547							
554.roms_r	104	483	342	<u>484</u>	<u>342</u>	484	341							

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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/Benchmark/speccpu/lib/intel64:/home/Benchmark/speccpu/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>  
NA: The test sponsor attests, as of date of publication, that CVE-2017-5754 (Meltdown) is mitigated in the system as tested and documented.

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### 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.  
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 configuration:  
Hyper Threading = Disabled  
Package C State limit = C0  
CPU Performance Boost = Aggressive  
SNC (Sub NUMA) = Enable SNC4

Sysinfo program /home/Benchmark/speccpu/bin/sysinfo  
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197  
running on localhost Wed May 24 17:05:36 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 249 (249.11+suse.124.g2bc0b2c447)
12. Failed units, from systemctl list-units --state=failed
13. Services, from systemctl list-unit-files
14. Linux kernel boot-time arguments, from /proc/cmdline
15. cpupower frequency-info
16. sysctl
17. /sys/kernel/mm/transparent\_hugepage
18. /sys/kernel/mm/transparent\_hugepage/khugepaged
19. OS release
20. Disk information
21. /sys/devices/virtual/dmi/id
22. dmidecode
23. BIOS

-----  
1. uname -a  
Linux localhost 5.14.21-150400.24.33-default #1 SMP PREEMPT\_DYNAMIC Fri Nov 4 13:55:06 UTC 2022 (76cfe60)  
x86\_64 x86\_64 x86\_64 GNU/Linux  
-----

2. w  
17:05:37 up 1 min, 1 user, load average: 1.19, 0.74, 0.29  
USER TTY FROM LOGIN@ IDLE JCPU PCPU WHAT

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### Platform Notes (Continued)

```
root      tty1      -                17:05      9.00s  2.47s  0.19s -bash
```

-----  
3. Username

From environment variable \$USER: root

-----  
4. ulimit -a

```
core file size          (blocks, -c) unlimited
data seg size           (kbytes, -d) unlimited
scheduling priority     (-e) 0
file size                (blocks, -f) unlimited
pending signals         (-i) 4125325
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) 4125325
virtual memory          (kbytes, -v) unlimited
file locks              (-x) unlimited
```

-----  
5. sysinfo process ancestry

```
/usr/lib/systemd/systemd --switched-root --system --deserialize 30
login -- root
-bash
-bash
runcpu --nobuild --action validate --define default-platform-flags --define numcopies=104 -c
ic2023.0-lin-sapphirerapids-rate-20221201.cfg --define cores=104 --define physicalfirst --define
invoke_with_interleave --define drop_caches --tune base -o all fprate
runcpu --nobuild --action validate --define default-platform-flags --define numcopies=104 --configfile
ic2023.0-lin-sapphirerapids-rate-20221201.cfg --define cores=104 --define physicalfirst --define
invoke_with_interleave --define drop_caches --tune base --output_format all --nopower --runmode rate
--tune base --size refrate fprate --nopreenv --note-preenv --logfile
$SPEC/tmp/CPU2017.001/templogs/preenv.fprate.001.0.log --lognum 001.0 --from_runcpu 2
specperl $SPEC/bin/sysinfo
$SPEC = /home/Benchmark/speccpu
```

-----  
6. /proc/cpuinfo

```
model name      : Intel(R) Xeon(R) Platinum 8470N
vendor_id       : GenuineIntel
cpu family      : 6
model           : 143
stepping        : 8
microcode       : 0x2b000161
bugs            : spectre_v1 spectre_v2 spec_store_bypass swapgs eibrs_pbrsb
cpu cores       : 52
siblings        : 52
2 physical ids (chips)
104 processors (hardware threads)
physical id 0:  core ids 0-51
physical id 1:  core ids 0-51
physical id 0:  apicids
0,2,4,6,8,10,12,14,16,18,20,22,24,26,28,30,32,34,36,38,40,42,44,46,48,50,52,54,56,58,60,62,64,66,68,70,72
,74,76,78,80,82,84,86,88,90,92,94,96,98,100,102
```

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### Platform Notes (Continued)

physical id 1: apicids  
128,130,132,134,136,138,140,142,144,146,148,150,152,154,156,158,160,162,164,166,168,170,172,174,176,178,180,182,184,186,188,190,192,194,196,198,200,202,204,206,208,210,212,214,216,218,220,222,224,226,228,230  
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 2.37.2:

```
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): 104
On-line CPU(s) list: 0-103
Vendor ID: GenuineIntel
Model name: Intel(R) Xeon(R) Platinum 8470N
CPU family: 6
Model: 143
Thread(s) per core: 1
Core(s) per socket: 52
Socket(s): 2
Stepping: 8
CPU max MHz: 3600.0000
CPU min MHz: 800.0000
BogoMIPS: 3400.00
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
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 cat_l2 cdp_l3
invpcid_single intel_ppin cdp_l2 ssbd mba ibrs ibpb stibp ibrs_enhanced
tpr_shadow vnmi flexpriority ept vpid ept_ad fsgsbase tsc_adjust bmil 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
xsavesopt 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 hwp hwp_act_window hwp_epp hwp_pkg_req 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_lld arch_capabilities
```

```
Virtualization: VT-x
L1d cache: 4.9 MiB (104 instances)
L1i cache: 3.3 MiB (104 instances)
L2 cache: 208 MiB (104 instances)
L3 cache: 195 MiB (2 instances)
NUMA node(s): 8
NUMA node0 CPU(s): 0-12
NUMA node1 CPU(s): 13-25
NUMA node2 CPU(s): 26-38
NUMA node3 CPU(s): 39-51
NUMA node4 CPU(s): 52-64
NUMA node5 CPU(s): 65-77
NUMA node6 CPU(s): 78-90
NUMA node7 CPU(s): 91-103
Vulnerability Itlb multihit: Not affected
```

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### Platform Notes (Continued)

Vulnerability L1tf: Not affected  
 Vulnerability Mds: Not affected  
 Vulnerability Meltdown: Not affected  
 Vulnerability Mmio stale data: Not affected  
 Vulnerability Retbleed: Not affected  
 Vulnerability Spec store bypass: Mitigation; Speculative Store Bypass disabled via prctl and seccomp  
 Vulnerability Spectre v1: Mitigation; usercopy/swaps barriers and \_\_user pointer sanitization  
 Vulnerability Spectre v2: Mitigation; Enhanced IBRS, IBPB conditional, RSB filling, PBRSE-eIBRS SW sequence  
 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	4.9M	12	Data	1	64	1	64
L1i	32K	3.3M	8	Instruction	1	64	1	64
L2	2M	208M	16	Unified	2	2048	1	64
L3	97.5M	195M	15	Unified	3	106496	1	64

8. numactl --hardware

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

```

available: 8 nodes (0-7)
node 0 cpus: 0-12
node 0 size: 128601 MB
node 0 free: 128186 MB
node 1 cpus: 13-25
node 1 size: 129020 MB
node 1 free: 128614 MB
node 2 cpus: 26-38
node 2 size: 128986 MB
node 2 free: 128634 MB
node 3 cpus: 39-51
node 3 size: 129020 MB
node 3 free: 128614 MB
node 4 cpus: 52-64
node 4 size: 129020 MB
node 4 free: 128577 MB
node 5 cpus: 65-77
node 5 size: 129020 MB
node 5 free: 128624 MB
node 6 cpus: 78-90
node 6 size: 129020 MB
node 6 free: 128645 MB
node 7 cpus: 91-103
node 7 size: 128666 MB
node 7 free: 128279 MB
node distances:
node  0  1  2  3  4  5  6  7
0: 10 12 12 12 21 21 21 21
1: 12 10 12 12 21 21 21 21
2: 12 12 10 12 21 21 21 21
3: 12 12 12 10 21 21 21 21
4: 21 21 21 21 10 12 12 12
5: 21 21 21 21 12 10 12 12
6: 21 21 21 21 12 12 10 12
7: 21 21 21 21 12 12 12 10

```

9. /proc/meminfo

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### Platform Notes (Continued)

MemTotal: 1056109464 kB

-----  
10. who -r  
run-level 3 May 24 17:04

-----  
11. Systemd service manager version: systemd 249 (249.11+suse.124.g2bc0b2c447)  
Default Target Status  
multi-user degraded

-----  
12. Failed units, from systemctl list-units --state=failed  
UNIT LOAD ACTIVE SUB DESCRIPTION  
\* sep5.service loaded failed failed systemd script to load sep5 driver at boot time

-----  
13. Services, from systemctl list-unit-files  
STATE UNIT FILES  
enabled ModemManager YaST2-Firstboot YaST2-Second-Stage apparmor auditd bluetooth cron  
display-manager getty@ haveged irqbalance iscsi issue-generator kbdsettings kdump  
kdump-early klog lvm2-monitor nscd postfix purge-kernels rollback rsyslog sep5 smartd sshd  
wicked wickedd-auto4 wickedd-dhcp4 wickedd-dhcp6 wickedd-nanny wpa\_supplicant  
enabled-runtime systemd-remount-fs  
disabled NetworkManager NetworkManager-dispatcher NetworkManager-wait-online accounts-daemon  
appstream-sync-cache autofs autoyast-initscripts blk-availability bluetooth-mesh  
boot-sysctl ca-certificates chrony-wait chronyd console-getty cups cups-browsed  
debug-shell dmraid-activation dnsmasq ebttables exchange-bmc-os-info firewallld gpm  
grub2-once haveged-switch-root ipmi ipmiev d iscsi-init iscsid iscsiio issue-add-ssh-keys  
kexec-load lunmask man-db-create multipathd nfs nfs-blkmap nm-cloud-setup nmb openvpn@  
ostree-remount pppoe pppoe-server rdisc rpcbnd rpmconfigcheck rsyncd rtkit-daemon  
serial-getty@ smartd\_generate\_opts smb snmpd snmptrapd speech-dispatcherd  
systemd-boot-check-no-failures systemd-network-generator systemd-sysext  
systemd-time-wait-sync systemd-timesyncd udisks2 upower wpa\_supplicant@  
indirect pcsd saned@ wickedd

-----  
14. Linux kernel boot-time arguments, from /proc/cmdline  
BOOT\_IMAGE=/boot/vmlinuz-5.14.21-150400.24.33-default  
root=UUID=d977c1aa-2de5-45da-b4b1-9732e87ed311  
splash=silent  
mitigations=auto  
quiet  
security=apparmor  
crashkernel=325M,high  
crashkernel=72M,low

-----  
15. cpupower frequency-info  
analyzing CPU 0:  
current policy: frequency should be within 800 MHz and 3.60 GHz.  
The governor "powersave" may decide which speed to use  
within this range.  
boost state support:  
Supported: yes  
Active: yes

-----  
16. sysctl  
kernel.numa\_balancing 1

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### Platform Notes (Continued)

```

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

```

```

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

```

```

-----
18. /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

```

```

-----
19. OS release
From /etc/*-release /etc/*-version
os-release SUSE Linux Enterprise Server 15 SP4

```

```

-----
20. Disk information
SPEC is set to: /home/Benchmark/speccpu
Filesystem  Type  Size  Used Avail Use% Mounted on
/dev/sda2   btrfs 445G  72G  373G  17% /home

```

```

-----
21. /sys/devices/virtual/dmi/id
Vendor:      FUJITSU
Product:     PRIMERGY CX2550 M7
Product Family: SERVER
Serial:      BBBB000001

```

```

-----
22. dmidecode
Additional information from dmidecode 3.2 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.

```

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## Platform Notes (Continued)

Memory:  
14x Samsung M321R8GA0BB0-CQKEG 64 GB 2 rank 4800  
2x Samsung M321R8GA0BB0-CQKVG 64 GB 2 rank 4800

-----  
23. BIOS  
(This section combines info from /sys/devices and dmidecode.)  
BIOS Vendor: FUJITSU  
BIOS Version: V1.0.0.0 R0.30.0 for D3988-Alx  
BIOS Date: 02/11/2023  
BIOS Revision: 0.30  
Firmware Revision: 2.20

## Compiler Version Notes

-----  
C | 519.lbm\_r(base) 538.imagick\_r(base) 544.nab\_r(base)  
-----

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

-----  
C++ | 508.namd\_r(base) 510.parest\_r(base)  
-----

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

-----  
C++, C | 511.povray\_r(base) 526.blender\_r(base)  
-----

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)  
-----

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) Fortran Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201  
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-----  
Fortran | 503.bwaves\_r(base) 549.fotonik3d\_r(base) 554.roms\_r(base)  
-----

Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201  
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-----  
Fortran, C | 521.wrf\_r(base) 527.cam4\_r(base)  
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(Continued on next page)



# SPEC CPU®2017 Floating Point Rate Result

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## Fujitsu

PRIMERGY CX2550 M7, Intel Xeon Platinum 8470N, 1.70GHz

SPECrate®2017\_fp\_base = 870

SPECrate®2017\_fp\_peak = Not Run

**CPU2017 License:** 19  
**Test Sponsor:** Fujitsu  
**Tested by:** Fujitsu

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

## Compiler Version Notes (Continued)

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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  
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



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## 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  
-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/Fujitsu-Platform-Settings-V1.0-SPR-RevB.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/Fujitsu-Platform-Settings-V1.0-SPR-RevB.xml>



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