



# SPEC CPU®2017 Floating Point Rate Result

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## Fujitsu

PRIMERGY RX2540 M7, Intel Xeon Max 9460, 2.20GHz

SPECrate®2017\_fp\_base = 938

SPECrate®2017\_fp\_peak = Not Run

CPU2017 License: 19

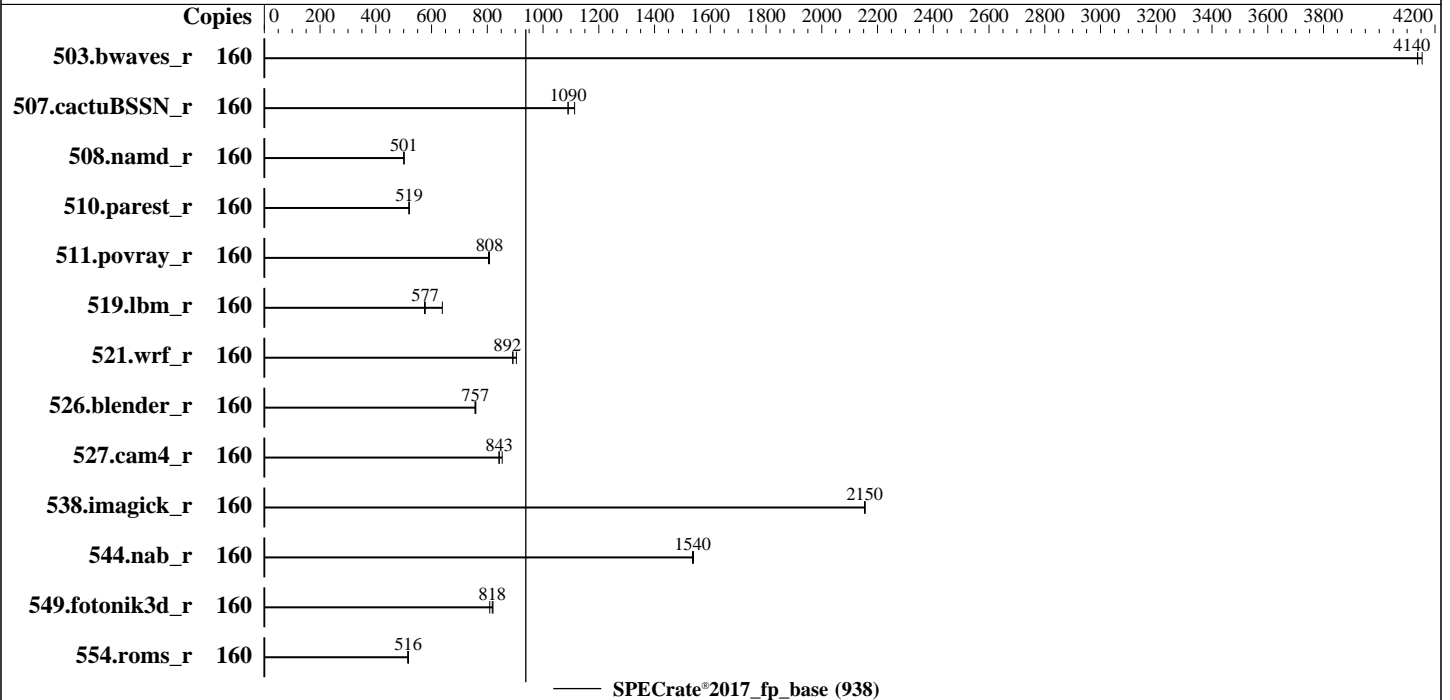
Test Sponsor: Fujitsu

Tested by: Fujitsu

Test Date: Jul-2023

Hardware Availability: Mar-2023

Software Availability: Dec-2022



### Hardware

CPU Name: Intel Xeon Max 9460  
 Max MHz: 3500  
 Nominal: 2200  
 Enabled: 80 cores, 2 chips, 2 threads/core  
 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: 1152 GB (16 x 64 GB 2Rx4 PC5-4800B-R + 2 x 64 GB HBM)  
 Storage: 1 x SATA SSD, 1.92TB  
 Other: None

### Software

OS: SUSE Linux Enterprise Server 15 SP4 5.14.21-150400.22-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 D3983-A1x. Released Mar-2023 tested as V1.0.0.0 R1.1.0 for D3983-A1x Feb-2023  
 File System: xfs  
 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 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	160	386	4150	388	4140	<u>388</u>	<u>4140</u>							
507.cactuBSSN_r	160	182	1110	<u>186</u>	<u>1090</u>	186	1090							
508.namd_r	160	303	501	304	501	<u>304</u>	<u>501</u>							
510.parest_r	160	806	519	<u>806</u>	<u>519</u>	805	520							
511.povray_r	160	<u>463</u>	<u>808</u>	462	808	464	804							
519.lbm_r	160	264	639	<u>292</u>	<u>577</u>	293	575							
521.wrf_r	160	402	891	<u>402</u>	<u>892</u>	396	904							
526.blender_r	160	<u>322</u>	<u>757</u>	321	759	322	756							
527.cam4_r	160	333	842	328	853	<u>332</u>	<u>843</u>							
538.imagick_r	160	185	2160	185	2150	<u>185</u>	<u>2150</u>							
544.nab_r	160	175	1540	175	1540	<u>175</u>	<u>1540</u>							
549.fotonik3d_r	160	771	809	760	820	<u>762</u>	<u>818</u>							
554.roms_r	160	494	514	492	517	<u>492</u>	<u>516</u>							

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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"  
Kernel Boot Parameter set with : nohz\_full=1-159  
cpupower -c all frequency-set -g performance

## Environment Variables Notes

Environment variables set by runcpu before the start of the run:  
LD\_LIBRARY\_PATH = "/home/benchmark/speccpu-1.1.9/lib/intel64:/home/benchmark/speccpu-1.1.9/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>

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## General Notes (Continued)

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 configuration:  
 SNC (Sub NUMA) = Enable SNC4  
 Package C State Limit = C0  
 Volatile Memory Mode = 2LM  
 CPU Performance Boost = Aggressive  
 FAN Control = Full

Sysinfo program /home/benchmark/speccpu-1.1.9/bin/sysinfo  
 Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197  
 running on localhost Wed Jul 12 10:18:50 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 5.14.21-150400.22-default #1 SMP PREEMPT\_DYNAMIC Wed May 11 06:57:18 UTC 2022 (49db222/1p)  
 x86\_64 x86\_64 x86\_64 GNU/Linux
- 

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### Platform Notes (Continued)

```

2. w
  10:18:50 up 2 min,  2 users,  load average: 1.87, 2.83, 1.28
USER  TTY      FROM             LOGIN@   IDLE   JCPU   PCPU   WHAT
root  tty1    -                10:17   8.00s  1.87s  0.09s
/home/benchmark/ptu_v4.0/UNIFIED_SERVER_PTAT_V4.0.0_20230110/ptat -mon -i 5000000 -filter 0x3f -y -ts -csv
-log
root  pts/0   10.118.163.62   10:17   2.00s  0.18s  0.01s vim
ptat_fprate_SAP__2017_withptu_202307121018.txt

```

```

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) 4125213
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) 4125213
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=160 -c
ic2023.0-lin-sapphirerapids-rate-20221201.cfg --define smt-on --define cores=80 --define physicalfirst
--define invoke_with_interleave --define drop_caches --tune base -o all fprate
runcpu --nobuild --action validate --define default-platform-flags --define numcopies=160 --configfile
ic2023.0-lin-sapphirerapids-rate-20221201.cfg --define smt-on --define cores=80 --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-1.1.9

```

```

6. /proc/cpuinfo
model name      : Intel (R) Xeon (R) CPU Max 9460
vendor_id      : GenuineIntel
cpu family     : 6
model          : 143
stepping       : 8
microcode      : 0x2c000120
bugs           : spectre_v1 spectre_v2 spec_store_bypass swapgs
cpu cores      : 40
siblings       : 80

```

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### Platform Notes (Continued)

2 physical ids (chips)  
160 processors (hardware threads)  
physical id 0: core ids 0-39  
physical id 1: core ids 0-39  
physical id 0: apicids 0-79  
physical id 1: apicids 128-207

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):                160
On-line CPU(s) list:   0-159
Vendor ID:             GenuineIntel
Model name:            Intel (R) Xeon (R) CPU Max 9460
CPU family:            6
Model:                143
Thread(s) per core:    2
Core(s) per socket:    40
Socket(s):             2
Stepping:              8
CPU max MHz:           3500.0000
CPU min MHz:           800.0000
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 aperfperf 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 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 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:             3.8 MiB (80 instances)
L1i cache:             2.5 MiB (80 instances)
L2 cache:              160 MiB (80 instances)
L3 cache:              195 MiB (2 instances)
NUMA node(s):         8
NUMA node0 CPU(s):    0-9,80-89
NUMA node1 CPU(s):    10-19,90-99
NUMA node2 CPU(s):    20-29,100-109
NUMA node3 CPU(s):    30-39,110-119
NUMA node4 CPU(s):    40-49,120-129
NUMA node5 CPU(s):    50-59,130-139

```

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### Platform Notes (Continued)

```

NUMA node6 CPU(s):          60-69,140-149
NUMA node7 CPU(s):          70-79,150-159
Vulnerability Itlb multihit: Not affected
Vulnerability Lltf:         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/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	3.8M	12	Data	1	64	1	64
L1i	32K	2.5M	8	Instruction	1	64	1	64
L2	2M	160M	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: 0-9,80-89
node 0 size: 128599 MB
node 0 free: 127762 MB
node 1 cpus: 10-19,90-99
node 1 size: 129018 MB
node 1 free: 128657 MB
node 2 cpus: 20-29,100-109
node 2 size: 129018 MB
node 2 free: 128497 MB
node 3 cpus: 30-39,110-119
node 3 size: 129018 MB
node 3 free: 128671 MB
node 4 cpus: 40-49,120-129
node 4 size: 129018 MB
node 4 free: 128659 MB
node 5 cpus: 50-59,130-139
node 5 size: 129018 MB
node 5 free: 128642 MB
node 6 cpus: 60-69,140-149
node 6 size: 128984 MB
node 6 free: 128617 MB
node 7 cpus: 70-79,150-159
node 7 size: 128649 MB
node 7 free: 128157 MB
node distances:
node  0  1  2  3  4  5  6  7
0:  10  17  17  17  26  26  26  26
1:  17  10  17  17  26  26  26  26
2:  17  17  10  17  26  26  26  26
3:  17  17  17  10  26  26  26  26
4:  26  26  26  26  10  17  17  17
5:  26  26  26  26  17  10  17  17
6:  26  26  26  26  17  17  10  17
7:  26  26  26  26  17  17  17  10

```

9. /proc/meminfo

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### Platform Notes (Continued)

MemTotal: 1056079628 kB

-----  
10. who -r  
run-level 3 Jul 12 10:16

-----  
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 YaST2-Firstboot YaST2-Second-Stage apparmor auditd bluetooth cron display-manager getty@  
havedged 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  
enabled-runtime systemd-remount-fs  
disabled 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 ebttables exchange-bmc-os-info firewallld gpm grub2-once  
havedged-switch-root ipmi ipmievd iscsi-init iscsid iscsiuiio issue-add-ssh-keys kexec-load  
lunmask man-db-create multipathd nfs nfs-blkmap nmb ostree-remount rdisc rpcbind  
rpmconfigcheck rsyncd rtkit-daemon serial-getty@ smartd\_generate\_opts smb snmpd snmptrapd  
speech-dispatcherd systemd-boot-check-no-failures systemd-network-generator systemd-sysex  
systemd-time-wait-sync systemd-timesyncd udisks2 upower  
indirect wickedd

-----  
14. Linux kernel boot-time arguments, from /proc/cmdline  
BOOT\_IMAGE=/boot/vmlinuz-5.14.21-150400.22-default  
root=UUID=0e5beafe-73ba-4cb4-b738-5343b4292867  
splash=silent  
quiet  
security=apparmor  
crashkernel=322M,high  
crashkernel=72M,low  
nohz\_full=1-159  
mitigations=auto

-----  
15. cpupower frequency-info  
analyzing CPU 0:  
current policy: frequency should be within 800 MHz and 3.50 GHz.  
The governor "performance" may decide which speed to use  
within this range.  
boost state support:  
Supported: yes  
Active: yes

-----  
16. sysctl  
kernel.numa\_balancing 1  
kernel.randomize\_va\_space 2

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### Platform Notes (Continued)

```

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+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-1.1.9
Filesystem      Type  Size  Used Avail Use% Mounted on
/dev/sda2       xfs   1.8T  117G  1.7T   7% /

```

```

-----
21. /sys/devices/virtual/dmi/id
Vendor:          FUJITSU
Product:         PRIMERGY RX2540 M7
Product Family: SERVER
Serial:          EWCExxxxxx

```

```

-----
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.
Memory:

```

(Continued on next page)





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### Platform Notes (Continued)

8x Intel 16 GB 1 rank 3200  
2x Samsung M321R8GA0BB0-CQKDG 64 GB 2 rank 4800  
8x Samsung M321R8GA0BB0-CQKEG 64 GB 2 rank 4800  
6x 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 R1.1.0 for D3983-Alx  
BIOS Date: 02/03/2023  
BIOS Revision: 1.1  
Firmware Revision: 2.0

Each Intel Xeon CPU Max processor is configured with 64 GB of High Bandwidth Memory (HBM) in-package. dmidecode is additionally reporting the capacity of the CPU in-package HBM stack as: '8x Intel 16 GB 1 rank 3200'

### 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  
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-----

-----  
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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-----

-----  
C++, C, Fortran | 507.cactuBSSN\_r(base)  
-----  
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-----

-----  
Fortran | 503.bwaves\_r(base) 549.fotonik3d\_r(base) 554.roms\_r(base)  
-----  
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# SPEC CPU®2017 Floating Point Rate Result

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## Fujitsu

PRIMERGY RX2540 M7, Intel Xeon Max 9460, 2.20GHz

SPECrate®2017\_fp\_base = 938

SPECrate®2017\_fp\_peak = Not Run

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

**Test Date:** Jul-2023  
**Hardware Availability:** Mar-2023  
**Software Availability:** Dec-2022

## Compiler Version Notes (Continued)

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

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  
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.  
-----

## 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

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## Base Portability Flags (Continued)

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
-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
```



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**Software Availability:** Dec-2022

The flags files that were used to format this result can be browsed at

<http://www.spec.org/cpu2017/flags/Fujitsu-Platform-Settings-V1.0-SPR-RevC.html>  
<http://www.spec.org/cpu2017/flags/Intel-ic2023-official-linux64.html>

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

<http://www.spec.org/cpu2017/flags/Fujitsu-Platform-Settings-V1.0-SPR-RevC.xml>  
<http://www.spec.org/cpu2017/flags/Intel-ic2023-official-linux64.xml>

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