



SPEC CPU®2017 Floating Point Rate Result

Copyright 2017-2024 Standard Performance Evaluation Corporation

Fujitsu

PRIMERGY RX2540 M7, Intel Xeon Gold 5515+,
3.20GHz

SPECrate®2017_fp_base = 283

SPECrate®2017_fp_peak = Not Run

CPU2017 License: 19

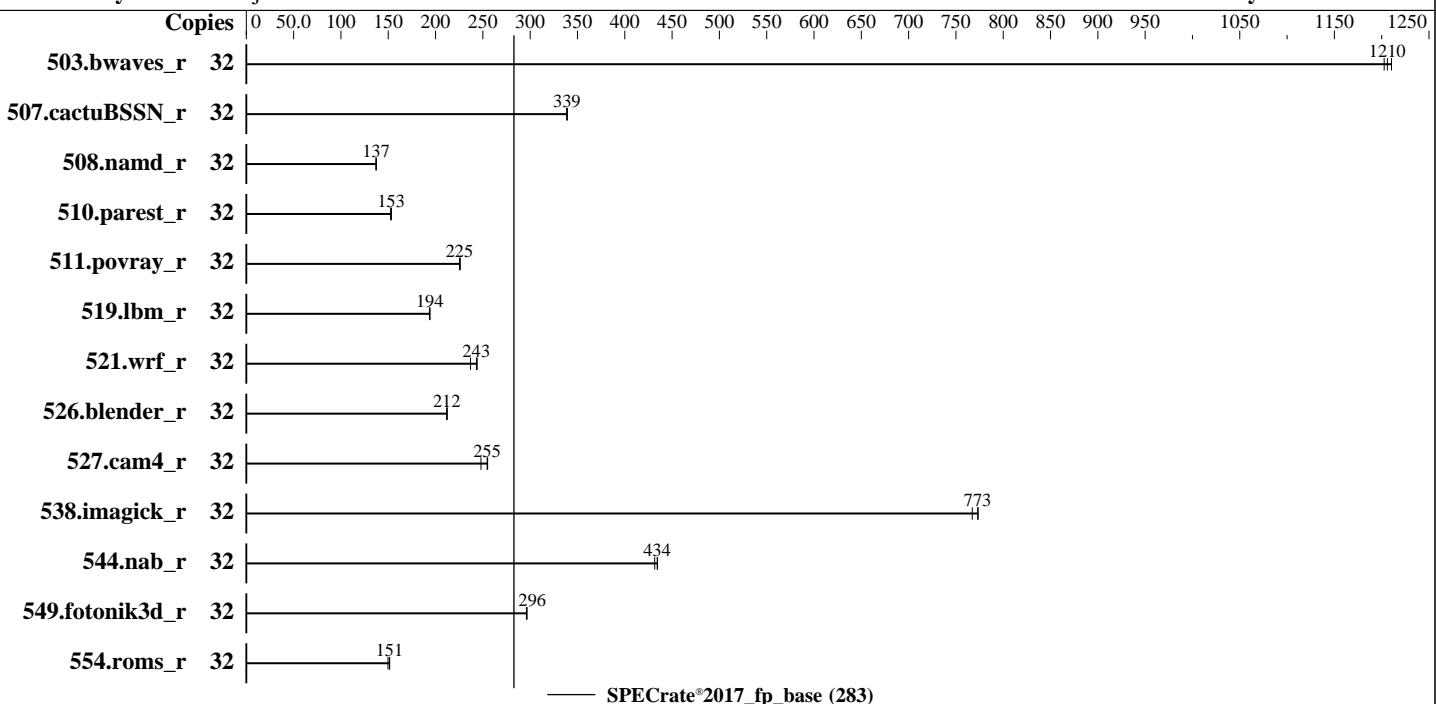
Test Sponsor: Fujitsu

Tested by: Fujitsu

Test Date: Apr-2024

Hardware Availability: Apr-2024

Software Availability: Dec-2023



Hardware

CPU Name: Intel Xeon Gold 5515+
Max MHz: 4100
Nominal: 3200
Enabled: 16 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: 22.5 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, 960GB
Other: CPU Cooling: Air

Software

OS: SUSE Linux Enterprise Server 15 SP5 5.14.21-150500.53-default
Compiler: C/C++: Version 2024.0.2 of Intel oneAPI DPC++/C++ Compiler for Linux;
Fortran: Version 2024.0.2 of Intel Fortran Compiler for Linux;
Parallel: No
Firmware: Fujitsu BIOS Version V1.0.0.0 R2.4.0 for D3983-A1x. Released Apr-2024 tested as V1.0.0.0 R2.1.2 for D3983-A1x Dec-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 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	32	267	1200	265	1210	266	1210							
507.cactusBSSN_r	32	120	339	120	339	119	339							
508.namd_r	32	222	137	222	137	222	137							
510.parest_r	32	547	153	549	153	546	153							
511.povray_r	32	330	226	331	225	332	225							
519.lbm_r	32	174	194	174	194	174	194							
521.wrf_r	32	303	237	294	244	295	243							
526.blender_r	32	230	212	230	212	230	212							
527.cam4_r	32	219	255	226	248	220	255							
538.imagick_r	32	103	773	104	767	103	773							
544.nab_r	32	125	432	124	435	124	434							
549.fotonik3d_r	32	421	296	421	296	420	297							
554.roms_r	32	336	151	336	152	340	150							

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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-24.0/lib/intel64:/home/benchmark/speccpu-24.0/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>

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:

Intel Virtualization Technology = Disabled

Utilization Profile = Unbalanced

CPU Performance Boost = Aggressive

SNC (Sub NUMA) = Enable SNC2

Fan Control = Full

Sysinfo program /home/benchmark/speccpu-24.0/bin/sysinfo
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
running on localhost Thu Apr 25 16:28:27 2024

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

Table of contents

1. uname -a
2. w
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10. who -r
11. Systemd service manager version: systemd 249 (249.16+suse.171.gdad0071f15)
12. Services, from systemctl list-unit-files
13. Linux kernel boot-time arguments, from /proc/cmdline
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15. sysctl
16. /sys/kernel/mm/transparent_hugepage
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 5.14.21-150500.53-default #1 SMP PREEMPT_DYNAMIC Wed May 10 07:56:26 UTC 2023 (b630043)
x86_64 x86_64 x86_64 GNU/Linux

2. w
16:28:27 up 6:06, 1 user, load average: 0.19, 10.33, 21.94
USER TTY FROM LOGIN@ IDLE JCPU PCPU WHAT

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Platform Notes (Continued)

```
root      tty1      -          10:23   6:04m  2.92s  0.61s -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) 4125136  
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) 4125136  
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=32 -c  
  ic2024.0.2-lin-sapphirerapids-rate-20231213.cfg --define smt-on --define cores=16 --define physicalfirst  
  --define invoke_with_interleave --define drop_caches --tune base -o all fprate  
runcpu --nobuild --action validate --define default-platform-flags --define numcopies=32 --configfile  
  ic2024.0.2-lin-sapphirerapids-rate-20231213.cfg --define smt-on --define cores=16 --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-24.0
```

```
-----  
6. /proc/cpuinfo  
model name          : INTEL(R) XEON(R) GOLD 5515+  
vendor_id           : GenuineIntel  
cpu family          : 6  
model               : 207  
stepping             : 2  
microcode           : 0x210001a0  
bugs                : spectre_v1 spectre_v2 spec_store_bypass swapgs eibrss_pbrss  
cpu cores            : 8  
siblings             : 16  
2 physical ids (chips)  
32 processors (hardware threads)  
physical id 0: core ids 0-7  
physical id 1: core ids 0-7  
physical id 0: apicids 0-15  
physical id 1: apicids 128-143
```

Caution: /proc/cpuinfo data regarding chips, cores, and threads is not necessarily reliable, especially for

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Platform Notes (Continued)

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): 32
On-line CPU(s) list: 0-31
Vendor ID: GenuineIntel
Model name: INTEL(R) XEON(R) GOLD 5515+
CPU family: 6
Model: 207
Thread(s) per core: 2
Core(s) per socket: 8
Socket(s): 2
Stepping: 2
CPU max MHz: 4100.0000
CPU min MHz: 800.0000
BogoMIPS: 6400.00
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 noopl xtopology
      nonstop_tsc cpuid aperf mperf tsc_known_freq pni pclmulqdq dtes64 monitor
      ds_cpl 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_13 cat_12 cdp_13 invpcid_single
      cdp_12 ssbd mba ibrs ibpb stibp ibrs_enhanced 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 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_vpocntdq la57 rdpid bus_lock_detect cldemote movdiri movdir64b
      enqcmd fsrm md_clear serialize tsxldtrk pconfig arch_lbr avx512_fp16
      amx_tile flush_ll1d arch_capabilities
L1d cache: 768 KiB (16 instances)
L1i cache: 512 KiB (16 instances)
L2 cache: 32 MiB (16 instances)
L3 cache: 45 MiB (2 instances)
NUMA node(s): 4
NUMA node0 CPU(s): 0-3,16-19
NUMA node1 CPU(s): 4-7,20-23
NUMA node2 CPU(s): 8-11,24-27
NUMA node3 CPU(s): 12-15,28-31
Vulnerability Itlb multihit: Not affected
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/swapgs barriers and __user pointer sanitization
Vulnerability Spectre v2: Mitigation; Enhanced IBRS, IBPB conditional, RSB filling, PBRSB-eIBRS SW sequence
Vulnerability Srbds: Not affected
```

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Platform Notes (Continued)

Vulnerability Tsx async abort: Not affected

```
From lscpu --cache:
  NAME ONE-SIZE ALL-SIZE WAYS TYPE      LEVEL   SETS PHY-LINE COHERENCY-SIZE
  L1d     48K    768K   12 Data          1       64        1           64
  L1i     32K    512K    8 Instruction   1       64        1           64
  L2      2M     32M    16 Unified       2      2048        1           64
  L3    22.5M   45M    15 Unified       3     24576        1           64
```

8. numactl --hardware

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

```
available: 4 nodes (0-3)
node 0 cpus: 0-3,16-19
node 0 size: 257624 MB
node 0 free: 256982 MB
node 1 cpus: 4-7,20-23
node 1 size: 258011 MB
node 1 free: 257458 MB
node 2 cpus: 8-11,24-27
node 2 size: 258045 MB
node 2 free: 257464 MB
node 3 cpus: 12-15,28-31
node 3 size: 257631 MB
node 3 free: 257105 MB
node distances:
node  0  1  2  3
  0: 10 12 21 21
  1: 12 10 21 21
  2: 21 21 10 12
  3: 21 21 12 10
```

9. /proc/meminfo

```
MemTotal: 1056065280 kB
```

10. who -r

```
run-level 3 Apr 25 10:22
```

11. Systemd service manager version: systemd 249 (249.16+suse.171.gdad0071f15)

```
Default Target  Status
multi-user      running
```

12. Services, from systemctl list-unit-files

```
STATE          UNIT FILES
enabled        YaST2-Firstboot YaST2-Second-Stage apparmor auditd cron display-manager firewalld getty@ 
                irqbalance issue-generator kbdsettings kdump kdump-early klog lvm2-monitor nsqd postfix
                purge-kernels rollback rsyslog sep5 smartd sshd systemd-pstore wicked wickedd-auto4
                wickedd-dhcp4 wickedd-dhcp6 wickedd-nanny
enabled-runtime systemdr remount-fs
disabled       autofs autoyast-initscripts blk-availability boot-sysctl ca-certificates chrony-wait
                chronyd console-getty cups cups-browsed debug-shell ebttables exchange-bmc-os-info gpm
                grub2-once haveged-switch-root ipmi ipmievrd issue-add-ssh-keys kexec-load lunmask
                man-db-create multipathd nfs nfs-blkmap rpcbind rpmconfigcheck rsyncd serial-getty@
                smartd_generate_opts snmpd snmptrapd systemd-boot-check-no-failures
                systemd-network-generator systemd-sysext systemd-time-wait-sync systemd-timesyncd
                vncserver@
```

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Platform Notes (Continued)

indirect wickedd

```
-----  
13. Linux kernel boot-time arguments, from /proc/cmdline  
    BOOT_IMAGE=/boot/vmlinuz-5.14.21-150500.53-default  
    root=UUID=27cb8c0f-67b2-4941-ac3d-ea0cbaa02bdf  
    splash=silent  
    mitigations=auto  
    quiet  
    security=apparmor  
    crashkernel=402M,high  
    crashkernel=72M,low  
  
-----  
14. cpupower frequency-info  
    analyzing CPU 0:  
        current policy: frequency should be within 800 MHz and 4.10 GHz.  
            The governor "powersave" may decide which speed to use  
            within this range.  
        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
```

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Platform Notes (Continued)

scan_sleep_millisecs 10000

18. OS release
From /etc/*-release /etc/*-version
os-release SUSE Linux Enterprise Server 15 SP5

19. Disk information
SPEC is set to: /home/benchmark/speccpu-24.0
Filesystem Type Size Used Avail Use% Mounted on
/dev/sdal btrfs 892G 111G 781G 13% /home

20. /sys/devices/virtual/dmi/id
Vendor: FUJITSU
Product: PRIMERGY RX2540 M7
Product Family: SERVER
Serial: EWCEXXXXXX

21. dmidecode
Additional information from dmidecode 3.4 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:
2x Samsung M321R8GA0BB0-CQKDG 64 GB 2 rank 4800
14x Samsung M321R8GA0BB0-CQKVG 64 GB 2 rank 4800

22. BIOS
(This section combines info from /sys/devices and dmidecode.)
BIOS Vendor: FUJITSU
BIOS Version: V1.0.0.0 R2.1.2 for D3983-A1x
BIOS Date: 12/21/2023
BIOS Revision: 2.1
Firmware Revision: 2.38

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 2024.0.2 Build 20231213
Copyright (C) 1985-2023 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 2024.0.2 Build 20231213
Copyright (C) 1985-2023 Intel Corporation. All rights reserved.

=====

C++, C | 511.povray_r(base) 526.blender_r(base)

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Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2024.0.2 Build 20231213
Copyright (C) 1985-2023 Intel Corporation. All rights reserved.

=====
C++, C, Fortran | 507.cactuBSSN_r(base)

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2024.0.2 Build 20231213
Copyright (C) 1985-2023 Intel Corporation. All rights reserved.

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2024.0.2 Build 20231213
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Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2024.0.2 Build 20231213
Copyright (C) 1985-2023 Intel Corporation. All rights reserved.

=====
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 2024.0.2 Build 20231213
Copyright (C) 1985-2023 Intel Corporation. All rights reserved.

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

Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2024.0.2 Build 20231213
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Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2024.0.2 Build 20231213
Copyright (C) 1985-2023 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



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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 -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
```

(Continued on next page)



SPEC CPU®2017 Floating Point Rate Result

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Fujitsu

PRIMERGY RX2540 M7, Intel Xeon Gold 5515+,
3.20GHz

SPECrate®2017_fp_base = 283

SPECrate®2017_fp_peak = Not Run

CPU2017 License: 19

Test Sponsor: Fujitsu

Tested by: Fujitsu

Test Date: Apr-2024

Hardware Availability: Apr-2024

Software Availability: Dec-2023

Base Optimization Flags (Continued)

Benchmarks using both C and C++ (continued):

```
-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 -futto -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/Fujitsu-Platform-Settings-V1.0-EMR-RevD.html>
<http://www.spec.org/cpu2017/flags/Intel-ic2024-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-EMR-RevD.xml>
<http://www.spec.org/cpu2017/flags/Intel-ic2024-official-linux64.xml>

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

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