SPEC CPU®2017 Floating Point Rate Result

xFusion

FusionServer 1288H V6 (Intel Xeon Gold 5320)

$SPECrate^{®}2017\_fp\_base = 441$

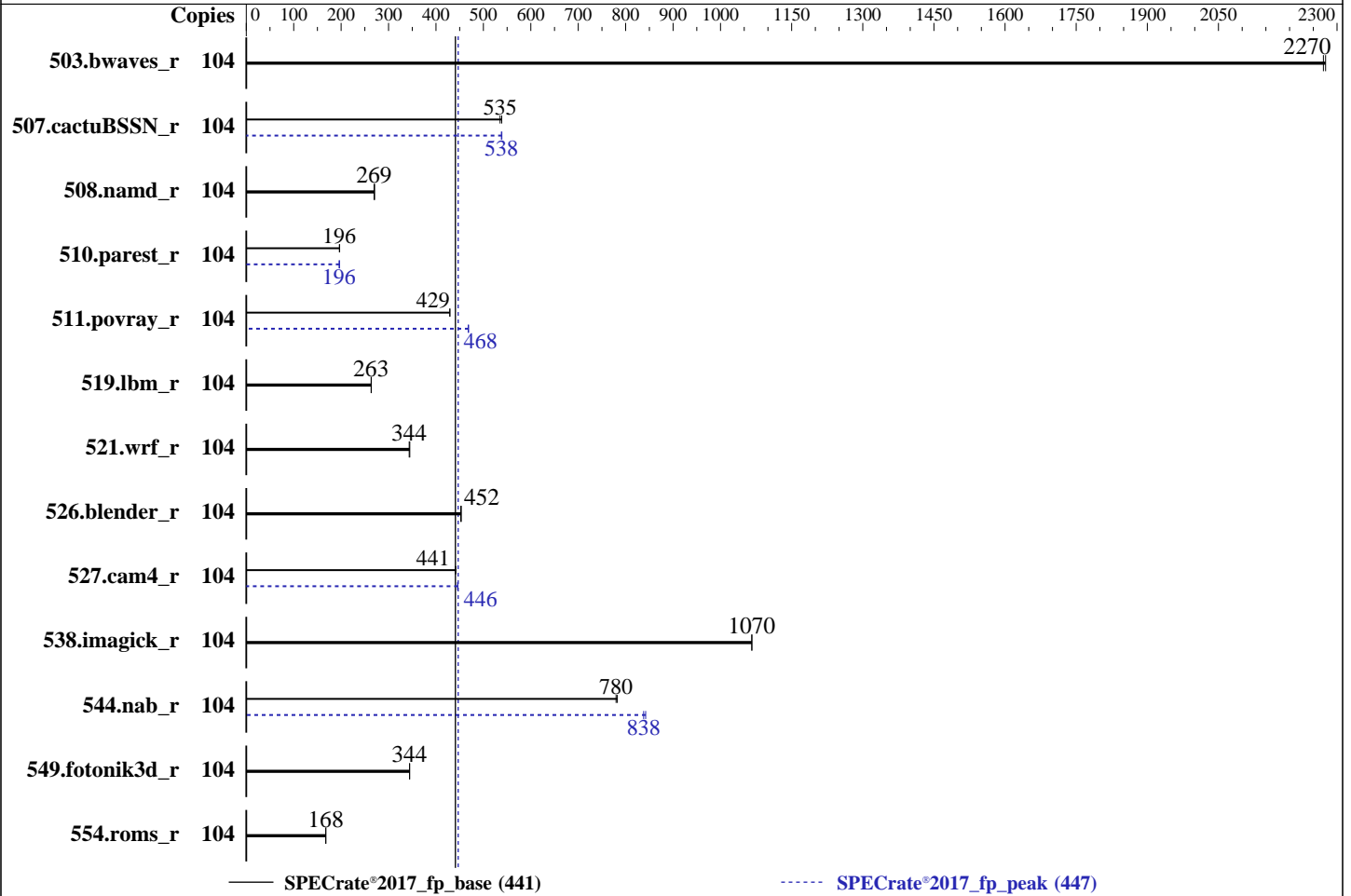$SPECrate^{®}2017\_fp\_peak = 447$

CPU2017 License: 6488
Test Sponsor: xFusion
Tested by: xFusion

Test Date: Jun-2023
Hardware Availability: Apr-2021
Software Availability: Dec-2022

Benchmark	Copies	base	peak
503.bwaves_r	104	2270	
507.cactuBSSN_r	104	535	538
508.namd_r	104	269	
510.parest_r	104	196	196
511.povray_r	104	429	468
519.lbm_r	104	263	
521.wrf_r	104	344	
526.blender_r	104	452	
527.cam4_r	104	441	446
538.imagick_r	104	1070	
544.nab_r	104	780	838
549.fotonik3d_r	104	344	
554.roms_r	104	168	

SPECrate®2017_fp_base (441)   SPECrate®2017_fp_peak (447)

Hardware

CPU Name: Intel Xeon Gold 5320
 Max MHz: 3400
 Nominal: 2200
Enabled: 52 cores, 2 chips, 2 threads/core
Orderable: 1,2 chips
Cache L1: 32 KB I + 48 KB D on chip per core
 L2: 1.25 MB I+D on chip per core
 L3: 39 MB I+D on chip per chip
 Other: None
Memory: 512 GB (16 x 32 GB 2Rx4 PC4-3200AA-R, running at 2933)
Storage: 1 x 1920 GB SATA SSD
Other: None

Software

OS: Red Hat Enterprise Linux release 8.4 (Ootpa)
4.18.0-305.el8.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 1.55 Released May-2023
File System: xfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: 64-bit
Other: jemalloc memory allocator V5.0.1
Power Management: BIOS and OS set to prefer performance at the cost of additional power usage

Standard Performance Evaluation Corporation (info@spec.org)   https://www.spec.org/

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SPECrate®2017_fp_base = 441

SPECrate®2017_fp_peak = 447

CPU2017 License: 6488	**Test Date:** Jun-2023
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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	458	2280	**459**	**2270**			104	458	2280	**459**	**2270**		
507.cactuBSSN_r	104	244	539	**246**	**535**			104	**245**	**538**	244	539		
508.namd_r	104	**367**	**269**	365	271			104	**367**	**269**	365	271		
510.parest_r	104	**1386**	**196**	1382	197			104	**1390**	**196**	1383	197		
511.povray_r	104	566	429	**566**	**429**			104	**519**	**468**	518	469		
519.lbm_r	104	416	264	**416**	**263**			104	416	264	**416**	**263**		
521.wrf_r	104	**678**	**344**	676	345			104	**678**	**344**	676	345		
526.blender_r	104	**350**	**452**	349	453			104	**350**	**452**	349	453		
527.cam4_r	104	412	442	**413**	**441**			104	408	446	**408**	**446**		
538.imagick_r	104	**243**	**1070**	243	1070			104	**243**	**1070**	243	1070		
544.nab_r	104	**224**	**780**	224	782			104	208	842	**209**	**838**		
549.fotonik3d_r	104	**1177**	**344**	1177	344			104	**1177**	**344**	1177	344		
554.roms_r	104	**986**	**168**	985	168			104	**986**	**168**	985	168		
SPECrate®2017_fp_base =		**441**												
SPECrate®2017_fp_peak =		**447**												

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 = "/spec2017-icc2023.0/lib/intel64:/spec2017-icc2023.0/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.
```

(Continued on next page)

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CPU2017 License: 6488
Test Sponsor: xFusion
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Test Date: Jun-2023
Hardware Availability: Apr-2021
Software Availability: Dec-2022

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:
Performance Profile Set to Performance
SNC Set to Enabled SNC2 (2-clusters)

Sysinfo program /spec2017-icc2023.0/bin/sysinfo
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
running on localhost.localdomain Mon Jun 26 05:50:46 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 239 (239-45.el8)
12. Services, from systemctl list-unit-files
13. Linux kernel boot-time arguments, from /proc/cmdline
14. cpupower frequency-info
15. tuned-adm active
16. sysctl
17. /sys/kernel/mm/transparent_hugepage
18. /sys/kernel/mm/transparent_hugepage/khugepaged
19. OS release
20. Kernel self-reported vulnerability status, from /sys/devices/system/cpu/vulnerabilities
21. Disk information
22. /sys/devices/virtual/dmi/id
23. dmidecode
24. BIOS
------------------------------------------------------------


------------------------------------------------------------
1. uname -a
   Linux localhost.localdomain 4.18.0-305.el8.x86_64 #1 SMP Thu Apr 29 08:54:30 EDT 2021 x86_64 x86_64 x86_64
   GNU/Linux


------------------------------------------------------------
2. w
    05:50:46 up 1 min,  1 user,  load average: 0.68, 0.28, 0.10
    USER     TTY      FROM             LOGIN@   IDLE   JCPU   PCPU WHAT
    root     tty1     -                05:50   14.00s  1.52s  0.08s -bash
```

(Continued on next page)

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Platform Notes (Continued)

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

  ----------------------------------------------------------
  4. ulimit -a
    core file size          (blocks, -c) 0
    data seg size           (kbytes, -d) unlimited
    scheduling priority             (-e) 0
    file size               (blocks, -f) unlimited
    pending signals                 (-i) 2060535
    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) 2060535
    virtual memory          (kbytes, -v) unlimited
    file locks                      (-x) unlimited

  ----------------------------------------------------------
  5. sysinfo process ancestry
  /usr/lib/systemd/systemd --switched-root --system --deserialize 18
   login -- root
   -bash
   -bash
   runcpu --define default-platform-flags --copies 104 -c ic2023.0-lin-core-avx512-rate-20221201.cfg --define
     smt-on --define cores=52 --define physicalfirst --define invoke_with_interleave --define drop_caches
     --tune base,peak --iterations 2 -o all fprate
   runcpu --define default-platform-flags --copies 104 --configfile ic2023.0-lin-core-avx512-rate-20221201.cfg
     --define smt-on --define cores=52 --define physicalfirst --define invoke_with_interleave --define
     drop_caches --tune base,peak --iterations 2 --output_format all --nopower --runmode rate --tune base:peak
     --size refrate fprate --nopreenv --note-preenv --logfile
     $SPEC/tmp/CPU2017.043/templogs/preenv.fprate.043.0.log --lognum 043.0 --from_runcpu 2
   specperl $SPEC/bin/sysinfo
  $SPEC = /spec2017-icc2023.0

  ----------------------------------------------------------
  6. /proc/cpuinfo
    model name       : Intel(R) Xeon(R) Gold 5320 CPU @ 2.20GHz
    vendor_id        : GenuineIntel
    cpu family       : 6
    model            : 106
    stepping         : 6
    microcode        : 0xd000363
    bugs             : spectre_v1 spectre_v2 spec_store_bypass swapgs
    cpu cores        : 26
    siblings         : 52
    2 physical ids (chips)
    104 processors (hardware threads)
    physical id 0: core ids 0-25
    physical id 1: core ids 0-25
    physical id 0: apicids 0-51
    physical id 1: apicids 64-115
   Caution: /proc/cpuinfo data regarding chips, cores, and threads is not necessarily reliable, especially for
   virtualized systems.  Use the above data carefully.
```

(Continued on next page)

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CPU2017 License: 6488
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Platform Notes (Continued)

```
     -----------------------------------------------------------
     7. lscpu

     From lscpu from util-linux 2.32.1:
       Architecture:        x86_64
       CPU op-mode(s):      32-bit, 64-bit
       Byte Order:          Little Endian
       CPU(s):              104
       On-line CPU(s) list: 0-103
       Thread(s) per core:  2
       Core(s) per socket:  26
       Socket(s):           2
       NUMA node(s):        4
       Vendor ID:           GenuineIntel
       BIOS Vendor ID:      Intel(R) Corporation
       CPU family:          6
       Model:               106
       Model name:          Intel(R) Xeon(R) Gold 5320 CPU @ 2.20GHz
       BIOS Model name:     Intel(R) Xeon(R) Gold 5320 CPU @ 2.20GHz
       Stepping:            6
       CPU MHz:             2810.852
       BogoMIPS:            4400.00
       Virtualization:      VT-x
       L1d cache:           48K
       L1i cache:           32K
       L2 cache:            1280K
       L3 cache:            39936K
       NUMA node0 CPU(s):   0-12,52-64
       NUMA node1 CPU(s):   13-25,65-77
       NUMA node2 CPU(s):   26-38,78-90
       NUMA node3 CPU(s):   39-51,91-103
       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 pni
                            pclmulqdq dtes64 ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtpr pdcm pcid dca sse4_1
                            sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c rdrand lahf_lm abm
                            3dnowprefetch cpuid_fault epb cat_l3 invpcid_single ssbd mba ibrs ibpb stibp
                            ibrs_enhanced tpr_shadow vnmi flexpriority ept vpid ept_ad fsgsbase tsc_adjust bmi1
                            hle 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 wbnoinvd
                            dtherm ida arat pln pts hwp_epp avx512vbmi umip pku ospke avx512_vbmi2 gfni vaes
                            vpclmulqdq avx512_vnni avx512_bitalg tme avx512_vpopcntdq la57 rdpid fsrm md_clear
                            pconfig flush_l1d arch_capabilities

     -----------------------------------------------------------
     8. numactl --hardware
     NOTE: a numactl 'node' might or might not correspond to a physical chip.
       available: 4 nodes (0-3)
       node 0 cpus: 0-12,52-64
       node 0 size: 128118 MB
       node 0 free: 127598 MB
       node 1 cpus: 13-25,65-77
       node 1 size: 129018 MB
       node 1 free: 128611 MB
       node 2 cpus: 26-38,78-90
       node 2 size: 129018 MB
       node 2 free: 128309 MB
       node 3 cpus: 39-51,91-103
```

(Continued on next page)

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Platform Notes (Continued)

```
   node 3 size: 129015 MB
   node 3 free: 128481 MB
   node distances:
   node   0   1   2   3
     0:  10  11  20  20
     1:  11  10  20  20
     2:  20  20  10  11
     3:  20  20  11  10


   ------------------------------------------------------------
9. /proc/meminfo
   MemTotal:       527534652 kB


   ------------------------------------------------------------
10. who -r
   run-level 3 Jun 26 05:50


   ------------------------------------------------------------
11. Systemd service manager version: systemd 239 (239-45.el8)
   Default Target  Status
   multi-user      running


   ------------------------------------------------------------
12. Services, from systemctl list-unit-files
   STATE       UNIT FILES
   enabled     NetworkManager NetworkManager-dispatcher NetworkManager-wait-online atd auditd autovt@ chronyd
               crond firewalld getty@ import-state irqbalance iscsi iscsi-onboot kdump libstoragemgmt
               loadmodules lvm2-monitor mcelog mdmonitor microcode multipathd nis-domainname
               nvmefc-boot-connections rhsmcertd rsyslog selinux-autorelabel-mark smartd sshd sssd syslog
               sysstat timedatex tuned udisks2 vdo
   disabled    arp-ethers blk-availability chrony-wait console-getty cpupower debug-shell ebtables iprdump
               iprinit iprupdate ipsec iscsid iscsiuio kpatch kvm_stat ledmon nftables nvmf-autoconnect oddjobd
               psacct rdisc rhcd rhsm rhsm-facts serial-getty@ sshd-keygen@ systemd-resolved tcsd
   generated   SystemTap compile-server gcc-toolset-10-stap-server gcc-toolset-10-systemtap
               gcc-toolset-9-stap-server gcc-toolset-9-systemtap scripts startup
   indirect    sssd-autofs sssd-kcm sssd-nss sssd-pac sssd-pam sssd-ssh sssd-sudo
   masked      systemd-timedated


   ------------------------------------------------------------
13. Linux kernel boot-time arguments, from /proc/cmdline
   BOOT_IMAGE=(hd0,gpt3)/boot/vmlinuz-4.18.0-305.el8.x86_64
   root=UUID=711de346-1631-4b60-a626-37488271d525
   ro
   crashkernel=auto
   resume=UUID=d6a3ac10-1ea1-4e42-a80b-54c427bcad19
   rhgb
   quiet


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


   ------------------------------------------------------------
15. tuned-adm active
   No current active profile.
```

(Continued on next page)

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Platform Notes (Continued)

```
       ----------------------------------------------------------------
       16. sysctl
         kernel.numa_balancing              1
         kernel.randomize_va_space          2
         vm.compaction_proactiveness        0
         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+madvise [madvise] never
         enabled         [always] madvise 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_swap           64
         pages_to_scan           4096
         scan_sleep_millisecs    10000


       ----------------------------------------------------------------
       19. OS release
         From /etc/*-release /etc/*-version
         os-release     Red Hat Enterprise Linux 8.4 (Ootpa)
         redhat-release Red Hat Enterprise Linux release 8.4 (Ootpa)
         system-release Red Hat Enterprise Linux release 8.4 (Ootpa)


       ----------------------------------------------------------------
       20. Kernel self-reported vulnerability status, from /sys/devices/system/cpu/vulnerabilities
         itlb_multihit        Not affected
         l1tf                 Not affected
         mds                  Not affected
         meltdown             Not affected
         spec_store_bypass    Mitigation: Speculative Store Bypass disabled via prctl and seccomp
         spectre_v1           Mitigation: usercopy/swapgs barriers and __user pointer sanitization
         spectre_v2           Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling
         srbds                Not affected
         tsx_async_abort      Not affected
       For more information, see the Linux documentation on hardware vulnerabilities, for example
            https://www.kernel.org/doc/html/latest/admin-guide/hw-vuln/index.html


       ----------------------------------------------------------------
```

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Platform Notes (Continued)

```
 21. Disk information
SPEC is set to: /spec2017-icc2023.0
  Filesystem     Type  Size  Used Avail Use% Mounted on
  /dev/sda3      xfs   420G   30G  390G   8% /

 -------------------------------------------------------------
 22. /sys/devices/virtual/dmi/id
     Vendor:        XFUSION
     Product:       1288H V6
     Product Family: Whitley
     Serial:        Serial

 -------------------------------------------------------------
 23. 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:
     16x Samsung M393A4K40DB3-CWE 32 GB 2 rank 3200, configured at 2933


 -------------------------------------------------------------
 24. BIOS
 (This section combines info from /sys/devices and dmidecode.)
    BIOS Vendor:     XFUSION
    BIOS Version:    1.55
    BIOS Date:       05/09/2023
    BIOS Revision:   1.55
```

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


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


==============================================================================================
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
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
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, Fortran | 507.cactuBSSN_r(base, peak)
----------------------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
```

(Continued on next page)

xFusion

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Compiler Version Notes (Continued)

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

(Continued on next page)

SPEC CPU®2017 Floating Point Rate Result

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xFusion

FusionServer 1288H V6 (Intel Xeon Gold 5320)

SPECrate®2017_fp_base = 441

SPECrate®2017_fp_peak = 447

CPU2017 License: 6488
Test Sponsor: xFusion
Tested by: xFusion

Test Date: Jun-2023
Hardware Availability: Apr-2021
Software Availability: Dec-2022

Base Portability Flags (Continued)

508.namd_r: `-DSPEC_LP64`
510.parest_r: `-DSPEC_LP64`
511.povray_r: `-DSPEC_LP64`
519.lbm_r: `-DSPEC_LP64`
521.wrf_r: `-DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian`
526.blender_r: `-DSPEC_LP64 -DSPEC_LINUX -funsigned-char`
527.cam4_r: `-DSPEC_LP64 -DSPEC_CASE_FLAG`
538.imagick_r: `-DSPEC_LP64`
544.nab_r: `-DSPEC_LP64`
549.fotonik3d_r: `-DSPEC_LP64`
554.roms_r: `-DSPEC_LP64`

Base Optimization Flags

C benchmarks:
```
-w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-Wno-implicit-int -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib
```

C++ benchmarks:
```
-w -std=c++14 -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib
```

Fortran benchmarks:
```
-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -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 -xCORE-AVX512 -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-Wno-implicit-int -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 -xCORE-AVX512 -Ofast
-ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -Wno-implicit-int -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib
```

Benchmarks using Fortran, C, and C++:
```
-w -std=c++14 -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast
```

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Standard Performance Evaluation Corporation (info@spec.org)

https://www.spec.org/

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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 -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: `-w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast`
```
-ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -Wno-implicit-int
```

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Peak Optimization Flags (Continued)

544.nab_r (continued):
`-qopt-zmm-usage=high -ljemalloc`
`-L/usr/local/jemalloc64-5.0.1/lib`

C++ benchmarks:

508.namd_r: basepeak = yes

510.parest_r: `-w -std=c++14 -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast`
`-ffast-math -flto -mfpmath=sse -funroll-loops`
`-qopt-mem-layout-trans=4 -ljemalloc`
`-L/usr/local/jemalloc64-5.0.1/lib`

Fortran benchmarks:

503.bwaves_r: basepeak = yes

549.fotonik3d_r: basepeak = yes

554.roms_r: basepeak = yes

Benchmarks using both Fortran and C:

521.wrf_r: basepeak = yes

527.cam4_r: `-w -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast`
`-ffast-math -flto -mfpmath=sse -funroll-loops`
`-qopt-mem-layout-trans=4 -Wno-implicit-int`
`-nostandard-realloc-lhs -align array32byte -auto`
`-ljemalloc -L/usr/local/jemalloc64-5.0.1/lib`

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.profdata`(pass 2) `-xCORE-AVX2`(pass 1)
`-flto -Ofast -xCORE-AVX512 -ffast-math -mfpmath=sse`
`-funroll-loops -qopt-mem-layout-trans=4 -Wno-implicit-int`
`-ljemalloc -L/usr/local/jemalloc64-5.0.1/lib`

526.blender_r: basepeak = yes

Benchmarks using Fortran, C, and C++:
`-w -std=c++14 -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast`
`-ffast-math -flto -mfpmath=sse -funroll-loops`
`-qopt-mem-layout-trans=4 -Wno-implicit-int -nostandard-realloc-lhs`

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Peak Optimization Flags (Continued)

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

```
-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/xFusion-Platform-Settings-ICX-V1.2.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/xFusion-Platform-Settings-ICX-V1.2.xml

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