SPEC CPU®2017 Floating Point Rate Result

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Lenovo Global Technology

SPECrate®2017_fp_base = 647

ThinkSystem ST650 V3
(2.20 GHz, Intel Xeon Gold 5520+)
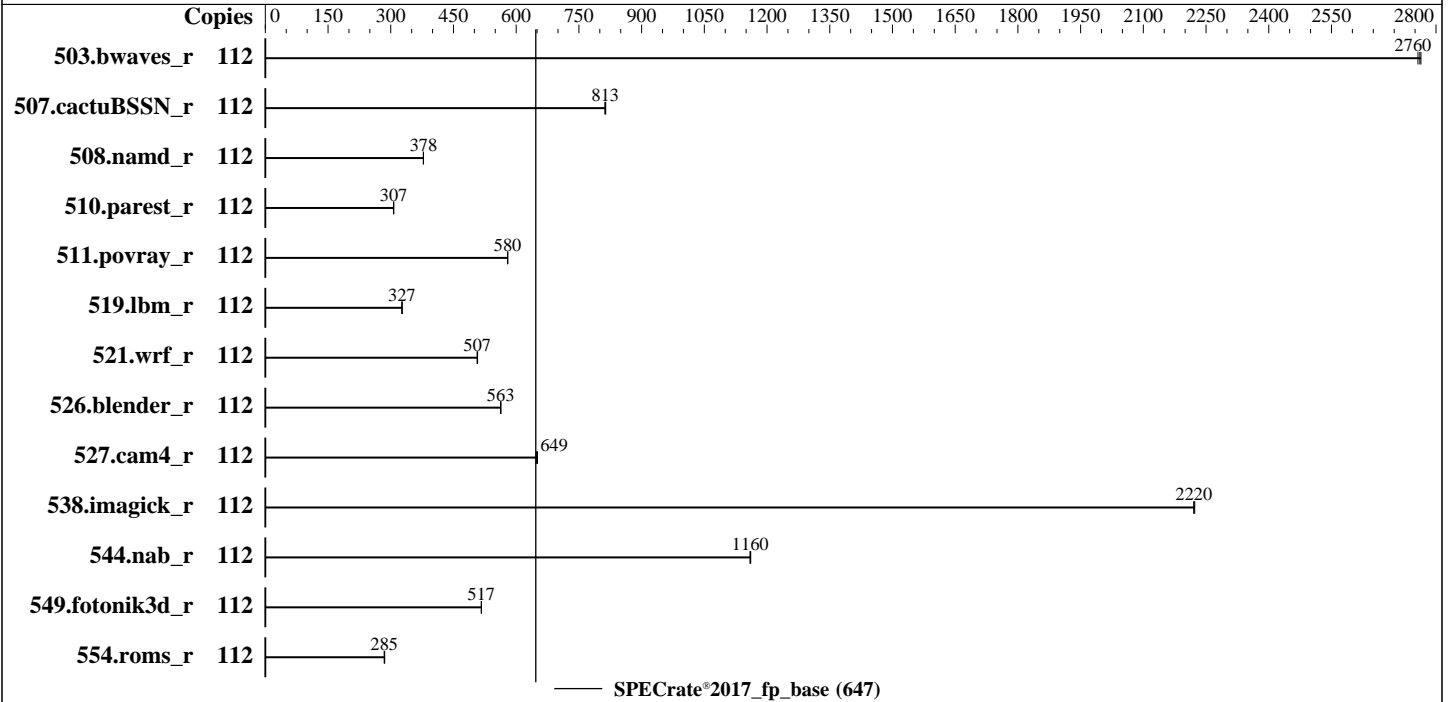
SPECrate®2017_fp_peak = Not Run

CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Tested by: Lenovo Global Technology

Test Date: Jun-2024
Hardware Availability: Jun-2024
Software Availability: Mar-2024

Benchmark	Copies	Result
503.bwaves_r	112	2760
507.cactuBSSN_r	112	813
508.namd_r	112	378
510.parest_r	112	307
511.povray_r	112	580
519.lbm_r	112	327
521.wrf_r	112	507
526.blender_r	112	563
527.cam4_r	112	649
538.imagick_r	112	2220
544.nab_r	112	1160
549.fotonik3d_r	112	517
554.roms_r	112	285

SPECrate®2017_fp_base (647)

Hardware

CPU Name: Intel Xeon Gold 5520+
 Max MHz: 4000
 Nominal: 2200
Enabled: 56 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:   52.5 MB I+D on chip per chip
 Other: None
Memory: 1 TB (16 x 64 GB 2Rx4 PC5-5600B-R, running at 4800)
Storage: 1 x 480 GB SATA SSD
Other: CPU Cooling: Air

Software

OS: SUSE Linux Enterprise Server 15 SP5
   Kernel 5.14.21-150500.53-default
Compiler: C/C++: Version 2024.1 of Intel oneAPI DPC++/C++ Compiler for Linux;
   Fortran: Version 2024.1 of Intel Fortran Compiler for Linux;
Parallel: No
Firmware: Lenovo BIOS Version USE127C 4.20 released Apr-2024
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

Standard Performance Evaluation Corporation (info@spec.org)

https://www.spec.org/

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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	112	406	2760	407	2760	**407**	**2760**							
507.cactuBSSN_r	112	175	812	**174**	**813**	174	814							
508.namd_r	112	281	378	**281**	**378**	282	378							
510.parest_r	112	**955**	**307**	954	307	956	307							
511.povray_r	112	**451**	**580**	451	579	451	580							
519.lbm_r	112	361	327	361	327	**361**	**327**							
521.wrf_r	112	494	508	495	507	**495**	**507**							
526.blender_r	112	**303**	**563**	303	563	303	563							
527.cam4_r	112	302	648	**302**	**649**	301	651							
538.imagick_r	112	**125**	**2220**	125	2220	125	2220							
544.nab_r	112	**162**	**1160**	162	1160	163	1160							
549.fotonik3d_r	112	844	517	**845**	**517**	845	517							
554.roms_r	112	626	284	623	286	**625**	**285**							
SPECrate®2017_fp_base =			**647**											
SPECrate®2017_fp_peak =			Not Run											

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/cpu2017-1.1.9-ic2024.1/lib/intel64:/home/cpu2017-1.1.9-ic2024.1/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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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:
Choose Operating Mode set to Maximum Performance and then set it to Custom Mode
C-States set to Legacy
SNC set to SNC2
LLC Prefetch set to Disabled
AMP Prefetch set to Enable

 Sysinfo program /home/cpu2017-1.1.9-ic2024.1/bin/sysinfo
 Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
 running on localhost Tue Jun 11 22:40:55 2024

 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 (249.16+suse.171.gdad0071f15)
 12. Services, from systemctl list-unit-files
 13. Linux kernel boot-time arguments, from /proc/cmdline
 14. cpupower frequency-info
 15. sysctl
 16. /sys/kernel/mm/transparent_hugepage
 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
   22:40:55 up 4 min,  1 user,  load average: 0.08, 0.03, 0.01
    USER     TTY      FROM             LOGIN@   IDLE   JCPU   PCPU WHAT
```

(Continued on next page)

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Platform Notes (Continued)

```
   root     tty1         -                22:39   39.00s  0.83s  0.01s sh
   Run503-compliant-ic2024.1-lin-sapphirerapids-ratefp-base-smt-on-20240308.sh

   ------------------------------------------------------------
   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) 4126973
     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) 4126973
     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
    /bin/bash ./run_ST650V3_EMR_new.sh
    sh Run503-compliant-ic2024.1-lin-sapphirerapids-ratefp-base-smt-on-20240308.sh
    runcpu --nobuild --action validate --define default-platform-flags --define numcopies=112 -c
      ic2024.1-lin-sapphirerapids-rate-20240308.cfg --define smt-on --define cores=56 --define physicalfirst
      --define invoke_with_interleave --define drop_caches --tune base -o all fprate
    runcpu --nobuild --action validate --define default-platform-flags --define numcopies=112 --configfile
      ic2024.1-lin-sapphirerapids-rate-20240308.cfg --define smt-on --define cores=56 --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/CPU2017.066/templogs/preenv.fprate.066.0.log --lognum 066.0 --from_runcpu 2
    specperl $SPEC/bin/sysinfo
    $SPEC = /home/cpu2017-1.1.9-ic2024.1


   ------------------------------------------------------------
   6. /proc/cpuinfo
       model name       : INTEL(R) XEON(R) GOLD 5520+
       vendor_id        : GenuineIntel
       cpu family       : 6
       model            : 207
       stepping         : 2
       microcode        : 0x21000230
       bugs             : spectre_v1 spectre_v2 spec_store_bypass swapgs eibrs_pbrsb
       cpu cores        : 28
       siblings         : 56
       2 physical ids (chips)
       112 processors (hardware threads)
       physical id 0: core ids 0-27
       physical id 1: core ids 0-27
       physical id 0: apicids 0-55
```

(Continued on next page)

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Platform Notes (Continued)

```
    physical id 1: apicids 128-183
  Caution: /proc/cpuinfo data regarding chips, cores, and threads is not necessarily reliable, especially for
  virtualized systems.  Use the above data carefully.


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

  From lscpu from util-linux 2.37.4:
    Architecture:             x86_64
    CPU op-mode(s):           32-bit, 64-bit
    Address sizes:            46 bits physical, 57 bits virtual
    Byte Order:               Little Endian
    CPU(s):                   112
    On-line CPU(s) list:      0-111
    Vendor ID:                GenuineIntel
    Model name:               INTEL(R) XEON(R) GOLD 5520+
    CPU family:               6
    Model:                    207
    Thread(s) per core:       2
    Core(s) per socket:       28
    Socket(s):                2
    Stepping:                 2
    BogoMIPS:                 4400.00
    Flags:                    fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36
                              clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtscp
                              lm constant_tsc art arch_perfmon pebs bts rep_good nopl xtopology
                              nonstop_tsc cpuid aperfmperf tsc_known_freq pni pclmulqdq dtes64 monitor
                              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 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 avx_vnni avx512_bf16 wbnoinvd dtherm ida arat pln pts
                              avx512vbmi umip pku ospke waitpkg avx512_vbmi2 gfni vaes vpclmulqdq
                              avx512_vnni avx512_bitalg tme avx512_vpopcntdq la57 rdpid bus_lock_detect
                              cldemote movdiri movdir64b enqcmd fsrm md_clear serialize tsxldtrk pconfig
                              arch_lbr avx512_fp16 amx_tile flush_l1d arch_capabilities
    Virtualization:           VT-x
    L1d cache:                2.6 MiB (56 instances)
    L1i cache:                1.8 MiB (56 instances)
    L2 cache:                 112 MiB (56 instances)
    L3 cache:                 105 MiB (2 instances)
    NUMA node(s):             4
    NUMA node0 CPU(s):        0-13,56-69
    NUMA node1 CPU(s):        14-27,70-83
    NUMA node2 CPU(s):        28-41,84-97
    NUMA node3 CPU(s):        42-55,98-111
    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
```

(Continued on next page)

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Platform Notes (Continued)

```
  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     2.6M  12 Data             1    64       1             64
    L1i       32K     1.8M   8 Instruction      1    64       1             64
    L2         2M     112M  16 Unified          2  2048       1             64
    L3      52.5M     105M  15 Unified          3 57344       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: 0-13,56-69
  node 0 size: 257706 MB
  node 0 free: 256844 MB
  node 1 cpus: 14-27,70-83
  node 1 size: 258006 MB
  node 1 free: 257335 MB
  node 2 cpus: 28-41,84-97
  node 2 size: 258040 MB
  node 2 free: 257429 MB
  node 3 cpus: 42-55,98-111
  node 3 size: 258019 MB
  node 3 free: 257415 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:      1056535964 kB

  -----------------------------------------------------------
10. who -r
   run-level 3 Jun 11 22:36

  -----------------------------------------------------------
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 getty@ irqbalance issue-generator
                   kbdsettings klog lvm2-monitor nscd postfix purge-kernels rollback rsyslog smartd sshd
                   systemd-pstore wicked wickedd wickedd-auto4 wickedd-dhcp4 wickedd-dhcp6 wickedd-nanny
   enabled-runtime systemd-remount-fs
   disabled        autofs autoyast-initscripts blk-availability boot-sysctl ca-certificates chrony-wait
                   chronyd console-getty cups cups-browsed debug-shell ebtables exchange-bmc-os-info
                   firewalld gpm grub2-once haveged haveged-switch-root hwloc-dump-hwdata ipmi ipmievd
                   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
```

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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=d1343b23-a61e-463a-96fe-4b32a83e08cb
    splash=silent
    mitigations=auto
    quiet
    security=apparmor

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


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

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

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

  ----------------------------------------------------------
  18. OS release
```

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Platform Notes (Continued)

```
   From /etc/*-release /etc/*-version
   os-release SUSE Linux Enterprise Server 15 SP5


  --------------------------------------------------------------
  19. Disk information
  SPEC is set to: /home/cpu2017-1.1.9-ic2024.1
    Filesystem     Type  Size  Used Avail Use% Mounted on
    /dev/sda3      xfs   445G   43G  403G  10% /


  --------------------------------------------------------------
  20. /sys/devices/virtual/dmi/id
      Vendor:         Lenovo
      Product:        ThinkSystem ST650 V3
      Product Family: ThinkSystem
      Serial:         MDSN00110D


  --------------------------------------------------------------
  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:
      12x Samsung M321R8GA0PB0-CWMKH 64 GB 2 rank 5600, configured at 4800
      4x Samsung M321R8GA0PB0-CWMXH 64 GB 2 rank 5600, configured at 4800


  --------------------------------------------------------------
  22. BIOS
  (This section combines info from /sys/devices and dmidecode.)
      BIOS Vendor:       Lenovo
      BIOS Version:      USE127C-4.20
      BIOS Date:         04/10/2024
      BIOS Revision:     4.20
      Firmware Revision: 5.10
```

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 2024.1.0 Build 20240308
Copyright (C) 1985-2024 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 2024.1.0 Build 20240308
Copyright (C) 1985-2024 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 2024.1.0 Build 20240308
Copyright (C) 1985-2024 Intel Corporation. All rights reserved.
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2024.1.0 Build 20240308
Copyright (C) 1985-2024 Intel Corporation. All rights reserved.
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(Continued on next page)

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Compiler Version Notes (Continued)

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

================================================================================
C++, C, Fortran | 507.cactuBSSN_r(base)
--------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2024.1.0 Build 20240308
Copyright (C) 1985-2024 Intel Corporation. All rights reserved.
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2024.1.0 Build 20240308
Copyright (C) 1985-2024 Intel Corporation. All rights reserved.
Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2024.1.0 Build 20240308
Copyright (C) 1985-2024 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 2024.1.0 Build 20240308
Copyright (C) 1985-2024 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 2024.1.0 Build 20240308
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Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2024.1.0 Build 20240308
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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
```

SPEC CPU®2017 Floating Point Rate Result

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Lenovo Global Technology

ThinkSystem ST650 V3
(2.20 GHz, Intel Xeon Gold 5520+)

SPECrate®2017_fp_base =   647

SPECrate®2017_fp_peak = Not Run

CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Tested by: Lenovo Global Technology

Test Date: Jun-2024
Hardware Availability: Jun-2024
Software Availability: Mar-2024

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)

Standard Performance Evaluation Corporation (info@spec.org)

https://www.spec.org/

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CPU2017 License: 9017		**Test Date:**	Jun-2024
Test Sponsor:	Lenovo Global Technology	**Hardware Availability:**	Jun-2024
Tested by:	Lenovo Global Technology	**Software Availability:**	Mar-2024

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 -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/Lenovo-Platform-SPECcpu2017-Flags-V1.2-Eaglestream-AA.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/Lenovo-Platform-SPECcpu2017-Flags-V1.2-Eaglestream-AA.xml
http://www.spec.org/cpu2017/flags/Intel-ic2024-official-linux64.xml

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

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