SPEC CPU®2017 Floating Point Speed Result

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Lenovo Global Technology

$SPECspeed®2017\_fp\_base =$ 337

ThinkSystem SR850 V3
(2.10 GHz, Intel Xeon Platinum 8454H)

$SPECspeed®2017\_fp\_peak =$ Not Run

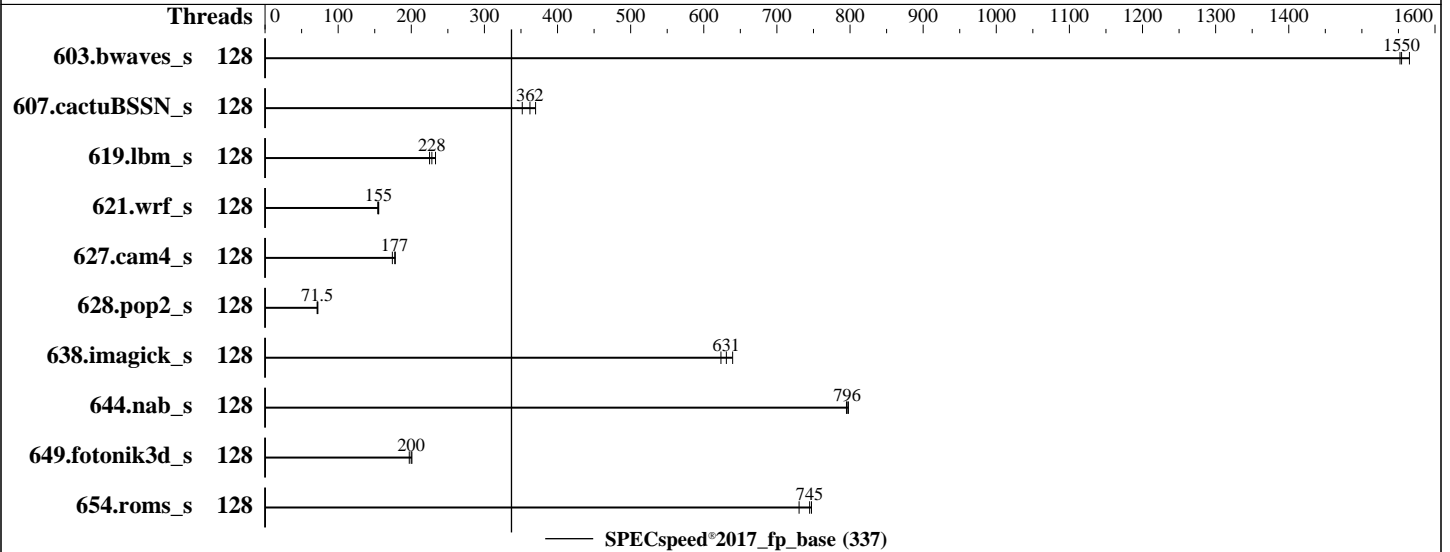**CPU2017 License:** 9017
Test Sponsor: Lenovo Global Technology
Tested by: Lenovo Global Technology

Test Date: Aug-2023
Hardware Availability: Jun-2023
Software Availability: Dec-2022

Threads		Value
603.bwaves_s	128	1550
607.cactuBSSN_s	128	362
619.lbm_s	128	228
621.wrf_s	128	155
627.cam4_s	128	177
628.pop2_s	128	71.5
638.imagick_s	128	631
644.nab_s	128	796
649.fotonik3d_s	128	200
654.roms_s	128	745

(Axis: 0 100 200 300 400 500 600 700 800 900 1000 1100 1200 1300 1400 1500 1600)

—— SPECspeed®2017_fp_base (337)

Hardware

CPU Name: Intel Xeon Platinum 8454H
 Max MHz: 3400
 Nominal: 2100
Enabled: 128 cores, 4 chips
Orderable: 2,4 chips
Cache L1: 32 KB I + 48 KB D on chip per core
 L2: 2 MB I+D on chip per core
 L3: 82.5 MB I+D on chip per chip
 Other: None
Memory: 2 TB (32 x 64 GB 2Rx4 PC5-4800B-R)
Storage: 1 x 960 GB M.2 NVME SSD
Other: None

Software

OS: Red Hat Enterprise Linux 9.1 (Plow) (x86_64)
 Kernel 5.14.0-162.6.1.el9_1.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: Yes
Firmware: Lenovo BIOS Version RSE105E 1.10 released May-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 and OS set to prefer performance at the cost
 of additional power usage

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Results Table

Benchmark	Base							Peak						
	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
603.bwaves_s	128	**38.0**	**1550**	38.0	1550	37.7	1570							
607.cactuBSSN_s	128	**46.0**	**362**	45.1	370	47.4	352							
619.lbm_s	128	**23.0**	**228**	23.3	225	22.5	233							
621.wrf_s	128	**85.2**	**155**	85.8	154	85.2	155							
627.cam4_s	128	49.8	178	50.9	174	**50.0**	**177**							
628.pop2_s	128	**166**	**71.5**	164	72.3	166	71.4							
638.imagick_s	128	22.6	639	23.1	623	**22.9**	**631**							
644.nab_s	128	21.9	798	**21.9**	**796**	22.0	795							
649.fotonik3d_s	128	46.2	197	**45.6**	**200**	45.4	201							
654.roms_s	128	21.6	730	21.1	747	**21.1**	**745**							

SPECspeed®2017_fp_base =   **337**

SPECspeed®2017_fp_peak =   **Not Run**

Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

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:
KMP_AFFINITY = "granularity=fine,compact"
LD_LIBRARY_PATH = "/home/cpu2017-1.1.9-ic2023.0/lib/intel64:/home/cpu2017-1.1.9-ic2023.0/je5.0.1-64"
MALLOC_CONF = "retain:true"
OMP_STACKSIZE = "192M"
```

General Notes

```
 Binaries compiled on a system with 2x Intel Xeon Platinum 8280M CPU + 384GB RAM
 memory using Redhat Enterprise Linux 8.0
 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
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:
 Choose Operating Mode set to Maximum Performance and then set it to Custom Mode
```

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Platform Notes (Continued)

```
C-States set to Legacy
Hyper-Threading set to Disabled
Adjacent Cache Prefetch set to Disabled
AMP Prefetch set to Enable
CPU P-state Control set to Autonomous
DCU Streamer Prefetcher set to Disabled

 Sysinfo program /home/cpu2017-1.1.9-ic2023.0/bin/sysinfo
 Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
 running on localhost.localdomain Mon Aug 28 15:34:44 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 250 (250-12.el9_1)
 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.localdomain 5.14.0-162.6.1.el9_1.x86_64 #1 SMP PREEMPT_DYNAMIC Fri Sep 30 07:36:03 EDT 2022
   x86_64 x86_64 x86_64 GNU/Linux

 -----------------------------------------------------------
 2. w
    15:34:44 up 0 min,  1 user,  load average: 0.36, 0.11, 0.04
   USER     TTY        LOGIN@   IDLE   JCPU   PCPU WHAT
   root     tty1       15:34   12.00s  1.14s  0.01s -bash

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

 -----------------------------------------------------------
 4. ulimit -a
   real-time non-blocking time  (microseconds, -R) unlimited
   core file size              (blocks, -c) 0
```

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Platform Notes (Continued)

```
     data seg size              (kbytes, -d) unlimited
     scheduling priority               (-e) 0
     file size                  (blocks, -f) unlimited
     pending signals                   (-i) 8255701
     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) 8255701
     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 -c
          ic2023.0-lin-sapphirerapids-speed-20221201.cfg --define cores=128 --tune base -o all --define drop_caches
          fpspeed
         runcpu --nobuild --action validate --define default-platform-flags --configfile
          ic2023.0-lin-sapphirerapids-speed-20221201.cfg --define cores=128 --tune base --output_format all --define
          drop_caches --nopower --runmode speed --tune base --size refspeed fpspeed --nopreenv --note-preenv
          --logfile $SPEC/tmp/CPU2017.121/templogs/preenv.fpspeed.121.0.log --lognum 121.0 --from_runcpu 2
          specperl $SPEC/bin/sysinfo
    $SPEC = /home/cpu2017-1.1.9-ic2023.0


    ------------------------------------------------------------
    6. /proc/cpuinfo
       model name      : Intel(R) Xeon(R) Platinum 8454H
       vendor_id       : GenuineIntel
       cpu family      : 6
       model           : 143
       stepping        : 8
       microcode       : 0x2b0001b0
       bugs            : spectre_v1 spectre_v2 spec_store_bypass swapgs eibrs_pbrsb
       cpu cores       : 32
       siblings        : 32
       4 physical ids (chips)
       128 processors (hardware threads)
       physical id 0: core ids 0-31
       physical id 1: core ids 0-31
       physical id 2: core ids 0-31
       physical id 3: core ids 0-31
       physical id 0: apicids
       0,2,4,6,8,10,12,14,16,18,20,22,24,26,28,30,32,34,36,38,40,42,44,46,48,50,52,54,56,58,60,62
       physical id 1: apicids
       128,130,132,134,136,138,140,142,144,146,148,150,152,154,156,158,160,162,164,166,168,170,172,174,176,178,1
       80,182,184,186,188,190
       physical id 2: apicids
       256,258,260,262,264,266,268,270,272,274,276,278,280,282,284,286,288,290,292,294,296,298,300,302,304,306,3
       08,310,312,314,316,318
       physical id 3: apicids
       384,386,388,390,392,394,396,398,400,402,404,406,408,410,412,414,416,418,420,422,424,426,428,430,432,434,4
       36,438,440,442,444,446
```

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Platform Notes (Continued)

```
    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):                        128
      On-line CPU(s) list:           0-127
      Vendor ID:                     GenuineIntel
      BIOS Vendor ID:                Intel(R) Corporation
      Model name:                    Intel(R) Xeon(R) Platinum 8454H
      BIOS Model name:               Intel(R) Xeon(R) Platinum 8454H
      CPU family:                    6
      Model:                         143
      Thread(s) per core:            1
      Core(s) per socket:            32
      Socket(s):                     4
      Stepping:                      8
      BogoMIPS:                      4200.00
      Flags:                         fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36
                                     clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtscp
                                     lm constant_tsc art arch_perfmon pebs bts rep_good nopl xtopology
                                     nonstop_tsc cpuid aperfmperf tsc_known_freq pni pclmulqdq dtes64 monitor
                                     ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtpr pdcm pcid dca sse4_1
                                     sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c rdrand
                                     lahf_lm abm 3dnowprefetch cpuid_fault epb cat_l3 cat_l2 cdp_l3
                                     invpcid_single intel_ppin cdp_l2 ssbd mba ibrs ibpb stibp ibrs_enhanced
                                     tpr_shadow vnmi flexpriority ept vpid ept_ad fsgsbase tsc_adjust bmi1 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 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 amx_bf16 avx512_fp16 amx_tile amx_int8 flush_l1d
                                     arch_capabilities
      Virtualization:                VT-x
      L1d cache:                     6 MiB (128 instances)
      L1i cache:                     4 MiB (128 instances)
      L2 cache:                      256 MiB (128 instances)
      L3 cache:                      330 MiB (4 instances)
      NUMA node(s):                  4
      NUMA node0 CPU(s):             0-31
      NUMA node1 CPU(s):             32-63
      NUMA node2 CPU(s):             64-95
      NUMA node3 CPU(s):             96-127
      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
      Vulnerability Spectre v1:      Mitigation; usercopy/swapgs barriers and __user pointer sanitization
```

(Continued on next page)

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Platform Notes (Continued)

```
  Vulnerability Spectre v2:         Mitigation; Enhanced IBRS, IBPB conditional, RSB filling, PBRSB-eIBRS SW
                                    sequence
  Vulnerability Srbds:              Not affected
  Vulnerability Tsx async abort:    Not affected

  From lscpu --cache:
      NAME ONE-SIZE ALL-SIZE WAYS TYPE          LEVEL   SETS PHY-LINE COHERENCY-SIZE
      L1d       48K       6M   12 Data             1     64        1             64
      L1i       32K       4M    8 Instruction      1     64        1             64
      L2         2M     256M   16 Unified          2   2048        1             64
      L3      82.5M     330M   15 Unified          3  90112        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: 0-31
  node 0 size: 515750 MB
  node 0 free: 514693 MB
  node 1 cpus: 32-63
  node 1 size: 516088 MB
  node 1 free: 515311 MB
  node 2 cpus: 64-95
  node 2 size: 516050 MB
  node 2 free: 515314 MB
  node 3 cpus: 96-127
  node 3 size: 516075 MB
  node 3 free: 515045 MB
  node distances:
  node   0   1   2   3
    0:  10  21  21  21
    1:  21  10  21  21
    2:  21  21  10  21
    3:  21  21  21  10

  -------------------------------------------------------------
9. /proc/meminfo
   MemTotal:       2113499924 kB

  -------------------------------------------------------------
10. who -r
   run-level 3 Aug 28 15:34

  -------------------------------------------------------------
11. Systemd service manager version: systemd 250 (250-12.el9_1)
  Default Target  Status
  multi-user      starting

  -------------------------------------------------------------
12. Failed units, from systemctl list-units --state=failed
    UNIT                  LOAD   ACTIVE SUB    DESCRIPTION
  * systemd-sysctl.service loaded failed failed Apply Kernel Variables

  -------------------------------------------------------------
13. Services, from systemctl list-unit-files
  STATE           UNIT FILES
  enabled         NetworkManager NetworkManager-dispatcher NetworkManager-wait-online auditd crond
                  dbus-broker getty@ irqbalance kdump low-memory-monitor mdmonitor microcode nis-domainname
                  rhsmcertd rsyslog rtkit-daemon selinux-autorelabel-mark sshd sssd
                  systemd-network-generator udisks2 upower
```

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Platform Notes (Continued)

```
   enabled-runtime  systemd-remount-fs
   disabled         canberra-system-bootup canberra-system-shutdown canberra-system-shutdown-reboot
                    console-getty cpupower debug-shell firewalld kvm_stat man-db-restart-cache-update nftables
                    pesign rdisc rhsm rhsm-facts rpmdb-rebuild serial-getty@ sshd-keygen@
                    systemd-boot-check-no-failures systemd-pstore systemd-sysext
   indirect         sssd-autofs sssd-kcm sssd-nss sssd-pac sssd-pam sssd-ssh sssd-sudo

  ----------------------------------------------------------
  14. Linux kernel boot-time arguments, from /proc/cmdline
    BOOT_IMAGE=(hd0,gpt3)/boot/vmlinuz-5.14.0-162.6.1.el9_1.x86_64
    root=UUID=43a7f1b1-66b0-456a-8c3f-451305a00281
    ro
    resume=UUID=58de1c40-542f-453b-bb6a-6bbd3510660a

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

  ----------------------------------------------------------
  16. 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

  ----------------------------------------------------------
  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_shared           256
    max_ptes_swap              64
    pages_to_scan            4096
    scan_sleep_millisecs    10000
```

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Platform Notes (Continued)

```
----------------------------------------------------------------
19. OS release
  From /etc/*-release /etc/*-version
  os-release     Red Hat Enterprise Linux 9.1 (Plow)
  redhat-release Red Hat Enterprise Linux release 9.1 (Plow)
  system-release Red Hat Enterprise Linux release 9.1 (Plow)

----------------------------------------------------------------
20. Disk information
SPEC is set to: /home/cpu2017-1.1.9-ic2023.0
  Filesystem     Type  Size  Used Avail Use% Mounted on
  /dev/nvme0n1p4 xfs   819G   16G  804G   2% /home

----------------------------------------------------------------
21. /sys/devices/virtual/dmi/id
    Vendor:         Lenovo
    Product:        ThinkSystem SR850 V3
    Product Family: ThinkSystem
    Serial:         None

----------------------------------------------------------------
22. dmidecode
  Additional information from dmidecode 3.3 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:
    21x SK Hynix HMCG94AEBRA102N 64 GB 2 rank 4800
    4x SK Hynix HMCG94AEBRA109N 64 GB 2 rank 4800
    7x SK Hynix HMCG94AEBRA123N 64 GB 2 rank 4800


----------------------------------------------------------------
23. BIOS
(This section combines info from /sys/devices and dmidecode.)
    BIOS Vendor:      Lenovo
    BIOS Version:     RSE105E-1.10
    BIOS Date:        05/12/2023
    BIOS Revision:    1.10
    Firmware Revision: 1.10
```

Compiler Version Notes

```
==============================================================================
C            | 619.lbm_s(base) 638.imagick_s(base) 644.nab_s(base)
------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------


==============================================================================
C++, C, Fortran | 607.cactuBSSN_s(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.
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
```

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Compiler Version Notes (Continued)

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

==============================================================================
Fortran       | 603.bwaves_s(base) 649.fotonik3d_s(base) 654.roms_s(base)
------------------------------------------------------------------------------
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    | 621.wrf_s(base) 627.cam4_s(base) 628.pop2_s(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
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------------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:
`icx`

Fortran benchmarks:
`ifx`

Benchmarks using both Fortran and C:
`ifx icx`

Benchmarks using Fortran, C, and C++:
`icpx icx ifx`

Base Portability Flags

603.bwaves_s: `-DSPEC_LP64`
607.cactuBSSN_s: `-DSPEC_LP64`
619.lbm_s: `-DSPEC_LP64`
621.wrf_s: `-DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian`
627.cam4_s: `-DSPEC_LP64 -DSPEC_CASE_FLAG`
628.pop2_s: `-DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian`
`-assume byterecl`
638.imagick_s: `-DSPEC_LP64`
644.nab_s: `-DSPEC_LP64`
649.fotonik3d_s: `-DSPEC_LP64`
654.roms_s: `-DSPEC_LP64`

SPEC CPU®2017 Floating Point Speed Result
Copyright 2017-2023 Standard Performance Evaluation Corporation

Lenovo Global Technology

ThinkSystem SR850 V3
(2.10 GHz, Intel Xeon Platinum 8454H)

SPECspeed®2017_fp_base =   337

SPECspeed®2017_fp_peak = Not Run

CPU2017 License:	9017	**Test Date:**	Aug-2023
Test Sponsor:	Lenovo Global Technology	**Hardware Availability:**	Jun-2023
Tested by:	Lenovo Global Technology	**Software Availability:**	Dec-2022

Base Optimization Flags

C benchmarks:
```
-m64 -std=c11 -Wl,-z,muldefs -xsapphirerapids -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -fiopenmp
-DSPEC_OPENMP -Wno-implicit-int -mprefer-vector-width=512
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

Fortran benchmarks:
```
-m64 -Wl,-z,muldefs -DSPEC_OPENMP -xsapphirerapids -Ofast
-ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -fiopenmp -nostandard-realloc-lhs
-align array32byte -auto -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

Benchmarks using both Fortran and C:
```
-m64 -std=c11 -Wl,-z,muldefs -xsapphirerapids -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -fiopenmp
-DSPEC_OPENMP -Wno-implicit-int -mprefer-vector-width=512
-nostandard-realloc-lhs -align array32byte -auto
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

Benchmarks using Fortran, C, and C++:
```
-m64 -std=c++14 -std=c11 -Wl,-z,muldefs -xsapphirerapids -Ofast
-ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -fiopenmp -DSPEC_OPENMP -Wno-implicit-int
-mprefer-vector-width=512 -nostandard-realloc-lhs -align array32byte
-auto -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

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-X.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/Lenovo-Platform-SPECcpu2017-Flags-V1.2-Eaglestream-X.xml
http://www.spec.org/cpu2017/flags/Intel-ic2023-official-linux64.xml

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

Tested with SPEC CPU®2017 v1.1.9 on 2023-08-28 03:34:43-0400.
Report generated on 2023-09-13 14:54:48 by CPU2017 PDF formatter v6716.
Originally published on 2023-09-13.