SPEC CPU®2017 Floating Point Speed Result

Lenovo Global Technology

ThinkSystem SR650 V3
(2.00 GHz, Intel Xeon Platinum 8480CL)

SPECspeed®2017_fp_base = 348
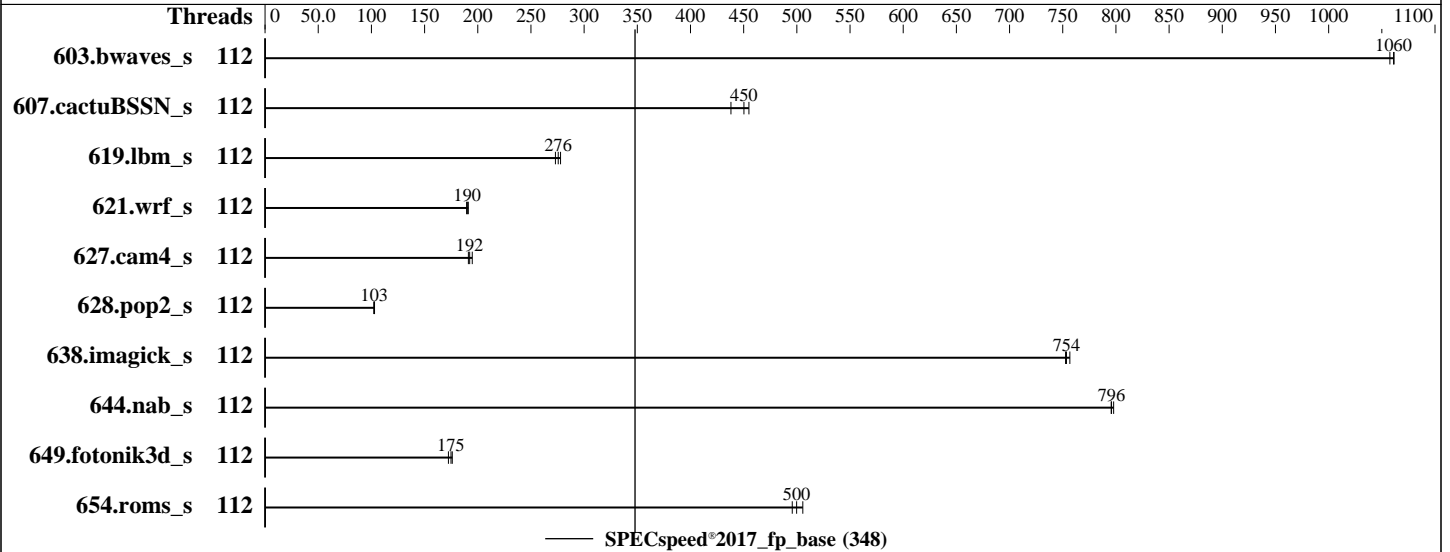
SPECspeed®2017_fp_peak = Not Run

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

Test Date: Sep-2023
Hardware Availability: Nov-2023
Software Availability: May-2023

Threads	Result
603.bwaves_s 112	1060
607.cactuBSSN_s 112	450
619.lbm_s 112	276
621.wrf_s 112	190
627.cam4_s 112	192
628.pop2_s 112	103
638.imagick_s 112	754
644.nab_s 112	796
649.fotonik3d_s 112	175
654.roms_s 112	500

SPECspeed®2017_fp_base (348)

Hardware

CPU Name: Intel Xeon Platinum 8480CL
  Max MHz: 3800
  Nominal: 2000
Enabled: 112 cores, 2 chips
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: 105 MB I+D on chip per chip
  Other: None
Memory: 512 GB (16 x 32 GB 2Rx8 PC5-4800B-R)
Storage: 1 x 960 GB SATA SSD
Other: None

Software

OS: Red Hat Enterprise Linux 9.2 (Plow) (x86_64)
  Kernel 5.14.0-284.11.1.el9_2.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 ESE117F 2.22 released Aug-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	112	**55.6**	**1060**	55.8	1060	55.6	1060							
607.cactuBSSN_s	112	36.6	455	**37.0**	**450**	38.1	438							
619.lbm_s	112	19.2	273	18.9	278	**19.0**	**276**							
621.wrf_s	112	69.2	191	69.8	189	**69.5**	**190**							
627.cam4_s	112	**46.1**	**192**	45.5	195	46.4	191							
628.pop2_s	112	115	103	**116**	**103**	116	102							
638.imagick_s	112	**19.1**	**754**	19.1	757	19.2	753							
644.nab_s	112	21.9	798	22.0	796	**22.0**	**796**							
649.fotonik3d_s	112	51.8	176	**52.1**	**175**	52.9	172							
654.roms_s	112	31.8	496	**31.5**	**500**	31.1	506							

SPECspeed®2017_fp_base =	**348**
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-ic2023.0-2/lib/intel64:/home/cpu2017-1.1.9-ic2023.0-2/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
```

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Platform Notes

```
BIOS configuration:
Operating Mode set to Maximum Performance and then set it to Custom Mode
Hyper-Threading set to Disabled
C-State set to Legacy
AMP Prefetch set to Enable

 Sysinfo program /home/cpu2017-1.1.9-ic2023.0-2/bin/sysinfo
 Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
 running on localhost.localdomain Sun Sep 24 02:15:05 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 252 (252-13.el9_2)
 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. tuned-adm active
 17. sysctl
 18. /sys/kernel/mm/transparent_hugepage
 19. /sys/kernel/mm/transparent_hugepage/khugepaged
 20. OS release
 21. Disk information
 22. /sys/devices/virtual/dmi/id
 23. dmidecode
 24. BIOS
 -----------------------------------------------------------


 -----------------------------------------------------------
 1. uname -a
   Linux localhost.localdomain 5.14.0-284.11.1.el9_2.x86_64 #1 SMP PREEMPT_DYNAMIC Wed Apr 12 10:45:03 EDT
   2023 x86_64 x86_64 x86_64 GNU/Linux


 -----------------------------------------------------------
 2. w
   02:15:05 up 2 min,  1 user,  load average: 0.13, 0.05, 0.01
   USER     TTY        LOGIN@   IDLE   JCPU   PCPU WHAT
   root     tty1       02:14    9.00s  0.79s  0.00s -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
```

(Continued on next page)

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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) 2062596
  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) 2062596
  virtual memory             (kbytes, -v) unlimited
  file locks                      (-x) unlimited


  ------------------------------------------------------------
5. sysinfo process ancestry
 /usr/lib/systemd/systemd rhgb --switched-root --system --deserialize 31
 login -- root
 -bash
 -bash
 runcpu --nobuild --action validate --define default-platform-flags -c
   ic2023.0-lin-sapphirerapids-speed-20221201.cfg --define cores=112 --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=112 --tune base --output_format all --define
   drop_caches --nopower --runmode speed --tune base --size refspeed fpspeed --nopreenv --note-preenv
   --logfile $SPEC/tmp/CPU2017.007/templogs/preenv.fpspeed.007.0.log --lognum 007.0 --from_runcpu 2
 specperl $SPEC/bin/sysinfo
 $SPEC = /home/cpu2017-1.1.9-ic2023.0-2


  ------------------------------------------------------------
6. /proc/cpuinfo
  model name      : Intel(R) Xeon(R) Platinum 8480CL
  vendor_id       : GenuineIntel
  cpu family      : 6
  model           : 143
  stepping        : 7
  microcode       : 0x2b0004b1
  bugs            : spectre_v1 spectre_v2 spec_store_bypass swapgs eibrs_pbrsb
  cpu cores       : 56
  siblings        : 56
  2 physical ids (chips)
  112 processors (hardware threads)
  physical id 0: core ids 0-55
  physical id 1: core ids 0-55
  physical id 0: apicids
  0,2,4,6,8,10,12,14,16,18,20,22,24,26,28,30,32,34,36,38,40,42,44,46,48,50,52,54,56,58,60,62,64,66,68,70,72
  ,74,76,78,80,82,84,86,88,90,92,94,96,98,100,102,104,106,108,110
  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
  80,182,184,186,188,190,192,194,196,198,200,202,204,206,208,210,212,214,216,218,220,222,224,226,228,230,23
  2,234,236,238
 Caution: /proc/cpuinfo data regarding chips, cores, and threads is not necessarily reliable, especially for
 virtualized systems.  Use the above data carefully.


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

(Continued on next page)

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Platform Notes (Continued)

```
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
  BIOS Vendor ID:            Intel(R) Corporation
  Model name:                Intel(R) Xeon(R) Platinum 8480CL
  BIOS Model name:           Intel(R) Xeon(R) Platinum 8480CL
  CPU family:                6
  Model:                     143
  Thread(s) per core:        1
  Core(s) per socket:        56
  Socket(s):                 2
  Stepping:                  7
  CPU max MHz:               3800.0000
  CPU min MHz:               800.0000
  BogoMIPS:                  4000.00
  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 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 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 ibt amx_bf16
                             avx512_fp16 amx_tile amx_int8 flush_l1d arch_capabilities
  L1d cache:                 5.3 MiB (112 instances)
  L1i cache:                 3.5 MiB (112 instances)
  L2 cache:                  224 MiB (112 instances)
  L3 cache:                  210 MiB (2 instances)
  NUMA node(s):              2
  NUMA node0 CPU(s):         0-55
  NUMA node1 CPU(s):         56-111
  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
  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
  Vulnerability Tsx async abort:  Not affected

 From lscpu --cache:
     NAME ONE-SIZE ALL-SIZE WAYS TYPE        LEVEL   SETS PHY-LINE COHERENCY-SIZE
     L1d       48K     5.3M   12 Data            1     64        1             64
```

(Continued on next page)

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Platform Notes (Continued)

```
    L1i         32K     3.5M   8 Instruction    1     64        1           64
    L2           2M     224M  16 Unified        2   2048        1           64
    L3         105M     210M  15 Unified        3 114688        1           64


    -----------------------------------------------------------
    8. numactl --hardware
    NOTE: a numactl 'node' might or might not correspond to a physical chip.
      available: 2 nodes (0-1)
      node 0 cpus: 0-55
      node 0 size: 257699 MB
      node 0 free: 256646 MB
      node 1 cpus: 56-111
      node 1 size: 257991 MB
      node 1 free: 257338 MB
      node distances:
      node   0   1
        0:  10  21
        1:  21  10


    -----------------------------------------------------------
    9. /proc/meminfo
       MemTotal:       528067940 kB


    -----------------------------------------------------------
    10. who -r
       run-level 3 Sep 24 02:14


    -----------------------------------------------------------
    11. Systemd service manager version: systemd 252 (252-13.el9_2)
       Default Target  Status
       multi-user      degraded


    -----------------------------------------------------------
    12. Failed units, from systemctl list-units --state=failed
        UNIT                              LOAD   ACTIVE SUB    DESCRIPTION
      * NetworkManager-wait-online.service loaded failed failed Network Manager Wait Online


    -----------------------------------------------------------
    13. Services, from systemctl list-unit-files
       STATE            UNIT FILES
       enabled          NetworkManager NetworkManager-dispatcher NetworkManager-wait-online atd auditd bluetooth
                        chronyd crond dbus-broker firewalld getty@ insights-client-boot irqbalance iscsi
                        iscsi-onboot kdump libstoragemgmt low-memory-monitor lvm2-monitor mcelog mdmonitor
                        microcode multipathd nis-domainname nvmefc-boot-connections rhsmcertd rsyslog rtkit-daemon
                        selinux-autorelabel-mark smartd sshd sssd systemd-boot-update systemd-network-generator
                        tuned udisks2 upower
       enabled-runtime  systemd-remount-fs
       disabled         arp-ethers blk-availability canberra-system-bootup canberra-system-shutdown
                        canberra-system-shutdown-reboot chrony-wait console-getty cpupower debug-shell
                        dnf-system-upgrade iprdump iprinit iprupdate iscsid iscsiuio kpatch kvm_stat ledmon
                        man-db-restart-cache-update nftables nvmf-autoconnect pesign psacct rdisc rhcd rhsm
                        rhsm-facts rpmdb-rebuild selinux-check-proper-disable 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 systemd-sysupdate
                        systemd-sysupdate-reboot


    -----------------------------------------------------------
    14. Linux kernel boot-time arguments, from /proc/cmdline
       BOOT_IMAGE=(hd3,gpt2)/vmlinuz-5.14.0-284.11.1.el9_2.x86_64
       root=/dev/mapper/rhel-root
```

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Platform Notes (Continued)

```
    ro
    resume=/dev/mapper/rhel-swap
    rd.lvm.lv=rhel/root
    rd.lvm.lv=rhel/swap
    rhgb
    quiet


  ----------------------------------------------------------------
15. cpupower frequency-info
  analyzing CPU 0:
    current policy: frequency should be within 3.80 GHz and 3.80 GHz.
                    The governor "performance" may decide which speed to use
                    within this range.
    boost state support:
      Supported: yes
      Active: yes


  ----------------------------------------------------------------
16. tuned-adm active
  Current active profile: throughput-performance


  ----------------------------------------------------------------
17. 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                   40
  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                    10
  vm.watermark_boost_factor        15000
  vm.watermark_scale_factor        10
  vm.zone_reclaim_mode             0


  ----------------------------------------------------------------
18. /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


  ----------------------------------------------------------------
19. /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)

```
        ----------------------------------------------------------
        20. OS release
          From /etc/*-release /etc/*-version
          os-release      Red Hat Enterprise Linux 9.2 (Plow)
          redhat-release Red Hat Enterprise Linux release 9.2 (Plow)
          system-release Red Hat Enterprise Linux release 9.2 (Plow)


        ----------------------------------------------------------
        21. Disk information
        SPEC is set to: /home/cpu2017-1.1.9-ic2023.0-2
          Filesystem          Type  Size  Used Avail Use% Mounted on
          /dev/mapper/rhel-home xfs   819G   22G  797G   3% /home


        ----------------------------------------------------------
        22. /sys/devices/virtual/dmi/id
            Vendor:         Lenovo
            Product:        ThinkSystem SR650 V3 MB,EGS,DDR5,SH,2U
            Product Family: ThinkSystem
            Serial:         1234567890


        ----------------------------------------------------------
        23. 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:
            8x Samsung M321R4GA3BB0-CQKEG 32 GB 2 rank 4800
            8x Samsung M321R4GA3BB0-CQKVG 32 GB 2 rank 4800


        ----------------------------------------------------------
        24. BIOS
        (This section combines info from /sys/devices and dmidecode.)
            BIOS Vendor:       Lenovo
            BIOS Version:      ESE117F-2.22
            BIOS Date:         08/29/2023
            BIOS Revision:     2.22
            Firmware Revision: 3.11
```

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

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Compiler Version Notes (Continued)

```
==============================================================================
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
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`

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`

Lenovo Global Technology

ThinkSystem SR650 V3
(2.00 GHz, Intel Xeon Platinum 8480CL)

SPECspeed®2017_fp_base =   348

SPECspeed®2017_fp_peak = Not Run

CPU2017 License: 9017		**Test Date:**	Sep-2023
Test Sponsor: Lenovo Global Technology		**Hardware Availability:**	Nov-2023
Tested by: Lenovo Global Technology		**Software Availability:**	May-2023

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-Z.html
http://www.spec.org/cpu2017/flags/Intel-ic2023-official-linux64_revB.2023-10-11.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-Z.xml
http://www.spec.org/cpu2017/flags/Intel-ic2023-official-linux64_revB.2023-10-11.xml

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 2023-09-24 02:15:04-0400.
Report generated on 2023-11-01 08:43:33 by CPU2017 PDF formatter v6716.
Originally published on 2023-11-01.