SPEC CPU®2017 Floating Point Rate Result

Lenovo Global Technology

SPECrate®2017_fp_base = 41.7

ThinkSystem ST50 V2
(3.10 GHz, Intel Xeon E-2324G)
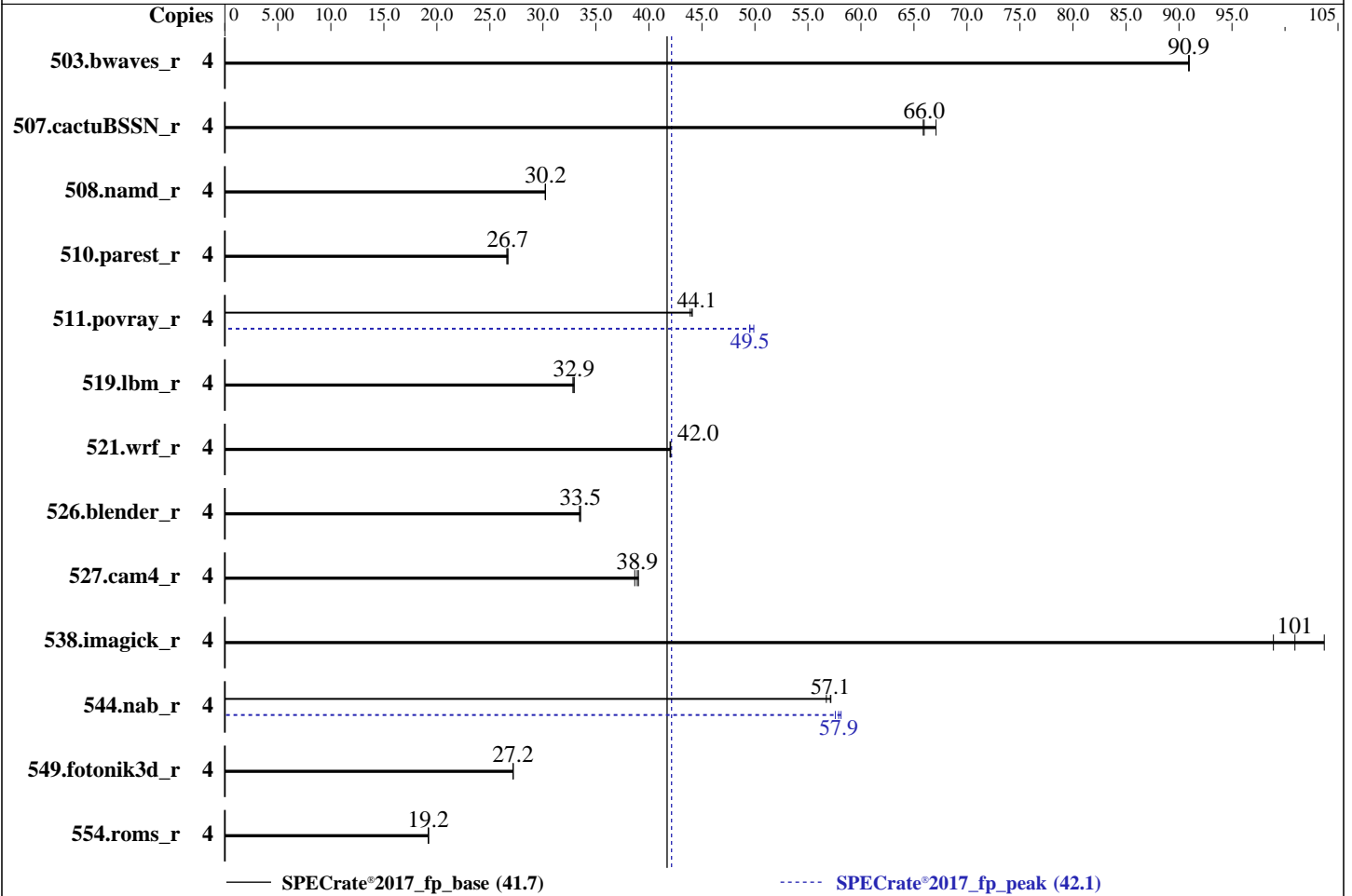
SPECrate®2017_fp_peak = 42.1

CPU2017 License: 9017 **Test Date:** Apr-2022
Test Sponsor: Lenovo Global Technology **Hardware Availability:** Apr-2022
Tested by: Lenovo Global Technology **Software Availability:** May-2021

Benchmark	Copies	Result
503.bwaves_r	4	90.9
507.cactuBSSN_r	4	66.0
508.namd_r	4	30.2
510.parest_r	4	26.7
511.povray_r	4	44.1 / 49.5
519.lbm_r	4	32.9
521.wrf_r	4	42.0
526.blender_r	4	33.5
527.cam4_r	4	38.9
538.imagick_r	4	101
544.nab_r	4	57.1 / 57.9
549.fotonik3d_r	4	27.2
554.roms_r	4	19.2

SPECrate®2017_fp_base (41.7)   SPECrate®2017_fp_peak (42.1)

Hardware

CPU Name: Intel Xeon E-2324G
 Max MHz: 4600
 Nominal: 3100
Enabled: 4 cores, 1 chip
Orderable: 1 chip
Cache L1: 32 KB I + 48 KB D on chip per core
 L2: 512 KB I+D on chip per core
 L3: 8 MB I+D on chip per chip
Other: None
Memory: 64 GB (4 x 16 GB 2Rx8 PC4-3200AA-E, running at 2933)
Storage: 1 x 960 GB SATA SSD
Other: None

Software

OS: Red Hat Enterprise Linux 8.4
 (Ootpa)
 Kernel 4.18.0-305.el8.x86_64
Compiler: C/C++: Version 2021.1 of Intel oneAPI DPC++/C++ Compiler Build 20201113 for Linux;
 Fortran: Version 2021.1 of Intel Fortran Compiler Classic Build 20201112 for Linux;
 C/C++: Version 2021.1 of Intel C/C++ Compiler Classic Build 20201112 for Linux
Parallel: No
Firmware: Lenovo BIOS Version TOE101Q released Mar-2022
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

(Continued on next page)

SPEC CPU®2017 Floating Point Rate Result

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Lenovo Global Technology

ThinkSystem ST50 V2
(3.10 GHz, Intel Xeon E-2324G)

SPECrate®2017_fp_base = 41.7

SPECrate®2017_fp_peak = 42.1

CPU2017 License: 9017	**Test Date:** Apr-2022
Test Sponsor: Lenovo Global Technology	**Hardware Availability:** Apr-2022
Tested by: Lenovo Global Technology	**Software Availability:** May-2021

Software (Continued)

Power Management: BIOS and OS set to prefer performance at the cost of additional power usage

Results Table

Benchmark	Base						Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
503.bwaves_r	4	**441**	**90.9**	441	91.0	441	90.9	4	**441**	**90.9**	441	91.0	441	90.9
507.cactuBSSN_r	4	76.9	65.9	**76.8**	**66.0**	75.5	67.1	4	76.9	65.9	**76.8**	**66.0**	75.5	67.1
508.namd_r	4	126	30.2	**126**	**30.2**	126	30.2	4	126	30.2	**126**	**30.2**	126	30.2
510.parest_r	4	**392**	**26.7**	392	26.7	393	26.6	4	**392**	**26.7**	392	26.7	393	26.6
511.povray_r	4	213	43.9	**212**	**44.1**	212	44.1	4	**189**	**49.5**	187	49.9	189	49.5
519.lbm_r	4	128	32.8	128	32.9	**128**	**32.9**	4	128	32.8	128	32.9	**128**	**32.9**
521.wrf_r	4	213	42.1	213	42.0	**213**	**42.0**	4	213	42.1	213	42.0	**213**	**42.0**
526.blender_r	4	**182**	**33.5**	182	33.5	182	33.5	4	**182**	**33.5**	182	33.5	182	33.5
527.cam4_r	4	179	39.0	**180**	**38.9**	181	38.7	4	179	39.0	**180**	**38.9**	181	38.7
538.imagick_r	4	95.9	104	**98.6**	**101**	101	98.9	4	95.9	104	**98.6**	**101**	101	98.9
544.nab_r	4	**118**	**57.1**	118	57.2	119	56.7	4	**116**	**57.9**	116	58.1	117	57.6
549.fotonik3d_r	4	**573**	**27.2**	573	27.2	573	27.2	4	**573**	**27.2**	573	27.2	573	27.2
554.roms_r	4	331	19.2	**331**	**19.2**	331	19.2	4	331	19.2	**331**	**19.2**	331	19.2

SPECrate®2017_fp_base =	**41.7**
SPECrate®2017_fp_peak =	**42.1**

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

Submit Notes

The taskset mechanism was used to bind copies to processors. The config file option 'submit' was used to generate taskset 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/cpu2017-1.1.8-ic2021.1-revB/lib/intel64:/home/cpu2017-1.1.8-ic202
      1.1-revB/je5.0.1-64"
MALLOC_CONF = "retain:true"

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

SPEC CPU®2017 Floating Point Rate Result

Lenovo Global Technology

ThinkSystem ST50 V2
(3.10 GHz, Intel Xeon E-2324G)

SPECrate®2017_fp_base = 41.7

SPECrate®2017_fp_peak = 42.1

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

Test Date: Apr-2022
Hardware Availability: Apr-2022
Software Availability: May-2021

General Notes

```
 Binaries compiled on a system with 1x Intel Core i9-7980XE CPU + 64GB RAM
 memory using Red Hat Enterprise Linux 8.1
 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:
C State Support set to C1C3C6

 Sysinfo program /home/cpu2017-1.1.8-ic2021.1-revB/bin/sysinfo
 Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acafc64d
 running on localhost.localdomain Thu Apr 28 15:58:34 2022

 SUT (System Under Test) info as seen by some common utilities.
 For more information on this section, see
    https://www.spec.org/cpu2017/Docs/config.html#sysinfo

 From /proc/cpuinfo
    model name : Intel(R) Xeon(R) E-2324G CPU @ 3.10GHz
       1  "physical id"s (chips)
       4 "processors"
    cores, siblings (Caution: counting these is hw and system dependent. The following
    excerpts from /proc/cpuinfo might not be reliable.  Use with caution.)
       cpu cores : 4
       siblings  : 4
       physical 0: cores 0 1 2 3

 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):              4
    On-line CPU(s) list: 0-3
    Thread(s) per core:  1
```

(Continued on next page)

Lenovo Global Technology

SPECrate®2017_fp_base = 41.7

ThinkSystem ST50 V2
(3.10 GHz, Intel Xeon E-2324G)

SPECrate®2017_fp_peak = 42.1

CPU2017 License: 9017   **Test Date:** Apr-2022
Test Sponsor: Lenovo Global Technology   **Hardware Availability:** Apr-2022
Tested by: Lenovo Global Technology   **Software Availability:** May-2021

Platform Notes (Continued)

```
        Core(s) per socket:   4
        Socket(s):            1
        NUMA node(s):         1
        Vendor ID:            GenuineIntel
        BIOS Vendor ID:       Intel(R) Corporation
        CPU family:           6
        Model:                167
        Model name:           Intel(R) Xeon(R) E-2324G CPU @ 3.10GHz
        BIOS Model name:      Intel(R) Xeon(R) E-2324G CPU @ 3.10GHz
        Stepping:             1
        CPU MHz:              2794.666
        CPU max MHz:          4600.0000
        CPU min MHz:          800.0000
        BogoMIPS:             6192.00
        Virtualization:       VT-x
        L1d cache:            48K
        L1i cache:            32K
        L2 cache:             512K
        L3 cache:             8192K
        NUMA node0 CPU(s):    0-3
        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 sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer
    aes xsave avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault epb invpcid_single
    ssbd ibrs ibpb stibp ibrs_enhanced tpr_shadow vnmi flexpriority ept vpid ept_ad
    fsgsbase tsc_adjust bmi1 avx2 smep bmi2 erms invpcid mpx avx512f avx512dq rdseed adx
    smap avx512ifma clflushopt intel_pt avx512cd sha_ni avx512bw avx512vl xsaveopt
    xsavec xgetbv1 xsaves dtherm ida arat pln pts hwp hwp_notify hwp_act_window hwp_epp
    hwp_pkg_req avx512vbmi umip pku ospke avx512_vbmi2 gfni vaes vpclmulqdq avx512_vnni
    avx512_bitalg avx512_vpopcntdq rdpid fsrm md_clear flush_l1d arch_capabilities


  /proc/cpuinfo cache data
     cache size : 8192 KB


  From numactl --hardware
  WARNING: a numactl 'node' might or might not correspond to a physical chip.
    available: 1 nodes (0)
    node 0 cpus: 0 1 2 3
    node 0 size: 63968 MB
    node 0 free: 62345 MB
    node distances:
    node   0
      0:  10


  From /proc/meminfo
```

(Continued on next page)

Lenovo Global Technology

ThinkSystem ST50 V2
(3.10 GHz, Intel Xeon E-2324G)

SPECrate®2017_fp_base = 41.7

SPECrate®2017_fp_peak = 42.1

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

Test Date: Apr-2022
Hardware Availability: Apr-2022
Software Availability: May-2021

Platform Notes (Continued)

```
    MemTotal:       65503460 kB
    HugePages_Total:       0
    Hugepagesize:       2048 kB

 /sbin/tuned-adm active
     Current active profile: throughput-performance

 /sys/devices/system/cpu/cpu*/cpufreq/scaling_governor has
    performance

 /usr/bin/lsb_release -d
    Red Hat Enterprise Linux release 8.4 (Ootpa)

 From /etc/*release* /etc/*version*
    os-release:
       NAME="Red Hat Enterprise Linux"
       VERSION="8.4 (Ootpa)"
       ID="rhel"
       ID_LIKE="fedora"
       VERSION_ID="8.4"
       PLATFORM_ID="platform:el8"
       PRETTY_NAME="Red Hat Enterprise Linux 8.4 (Ootpa)"
       ANSI_COLOR="0;31"
    redhat-release: Red Hat Enterprise Linux release 8.4 (Ootpa)
    system-release: Red Hat Enterprise Linux release 8.4 (Ootpa)
    system-release-cpe: cpe:/o:redhat:enterprise_linux:8.4:ga

 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

 Kernel self-reported vulnerability status:

 CVE-2018-12207 (iTLB Multihit):                   Not affected
 CVE-2018-3620 (L1 Terminal Fault):                Not affected
 Microarchitectural Data Sampling:                 Not affected
 CVE-2017-5754 (Meltdown):                         Not affected
 CVE-2018-3639 (Speculative Store Bypass):         Mitigation: Speculative Store
                                                   Bypass disabled via prctl and
                                                   seccomp
 CVE-2017-5753 (Spectre variant 1):                Mitigation: usercopy/swapgs
                                                   barriers and __user pointer
                                                   sanitization
 CVE-2017-5715 (Spectre variant 2):                Mitigation: Enhanced IBRS, IBPB:
                                                   conditional, RSB filling
 CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
 CVE-2019-11135 (TSX Asynchronous Abort):          Not affected
```

(Continued on next page)

Lenovo Global Technology

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(3.10 GHz, Intel Xeon E-2324G)

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CPU2017 License: 9017
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Tested by: Lenovo Global Technology

Test Date: Apr-2022
Hardware Availability: Apr-2022
Software Availability: May-2021

Platform Notes (Continued)

```
  run-level 3 Apr 27 10:25

  SPEC is set to: /home/cpu2017-1.1.8-ic2021.1-revB
     Filesystem            Type  Size  Used Avail Use% Mounted on
     /dev/mapper/rhel-root xfs   889G   24G  865G   3% /

  From /sys/devices/virtual/dmi/id
     Vendor:         LENOVO
     Product:        7D8JCTO1WW
     Product Family: Lenovo Product
     Serial:         J300ST50V2


  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:
      4x Samsung M391A2K43DB1-CWE 16 GB 2 rank 3200, configured at 2933

  BIOS:
     BIOS Vendor:       LENOVO
     BIOS Version:      TOE101Q
     BIOS Date:         03/16/2022
     BIOS Revision:     1.41
     Firmware Revision: 1.1

  (End of data from sysinfo program)
```

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 2021.1 Build 20201113
Copyright (C) 1985-2020 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 2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
```

(Continued on next page)

SPEC CPU®2017 Floating Point Rate Result

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ThinkSystem ST50 V2
(3.10 GHz, Intel Xeon E-2324G)

SPECrate®2017_fp_base = 41.7

SPECrate®2017_fp_peak = 42.1

CPU2017 License: 9017   **Test Date:** Apr-2022
Test Sponsor: Lenovo Global Technology   **Hardware Availability:** Apr-2022
Tested by: Lenovo Global Technology   **Software Availability:** May-2021

Compiler Version Notes (Continued)

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

================================================================================
C++, C             | 511.povray_r(peak)
--------------------------------------------------------------------------------
Intel(R) C++ Intel(R) 64 Compiler Classic for applications running on
  Intel(R) 64, Version 2021.1 Build 20201112_000000
Copyright (C) 1985-2020 Intel Corporation.  All rights reserved.
Intel(R) C Intel(R) 64 Compiler Classic for applications running on Intel(R)
  64, Version 2021.1 Build 20201112_000000
Copyright (C) 1985-2020 Intel Corporation.  All rights reserved.
--------------------------------------------------------------------------------

================================================================================
C++, C             | 511.povray_r(base) 526.blender_r(base, peak)
--------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
  Version 2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
  Version 2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
--------------------------------------------------------------------------------

================================================================================
C++, C             | 511.povray_r(peak)
--------------------------------------------------------------------------------
Intel(R) C++ Intel(R) 64 Compiler Classic for applications running on
  Intel(R) 64, Version 2021.1 Build 20201112_000000
Copyright (C) 1985-2020 Intel Corporation.  All rights reserved.
Intel(R) C Intel(R) 64 Compiler Classic for applications running on Intel(R)
  64, Version 2021.1 Build 20201112_000000
Copyright (C) 1985-2020 Intel Corporation.  All rights reserved.
--------------------------------------------------------------------------------

================================================================================
C++, C             | 511.povray_r(base) 526.blender_r(base, peak)
--------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
  Version 2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
  Version 2021.1 Build 20201113
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--------------------------------------------------------------------------------

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

(Continued on next page)

Lenovo Global Technology

SPECrate®2017_fp_base = 41.7

ThinkSystem ST50 V2
(3.10 GHz, Intel Xeon E-2324G)

SPECrate®2017_fp_peak = 42.1

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

Test Date: Apr-2022
Hardware Availability: Apr-2022
Software Availability: May-2021

Compiler Version Notes (Continued)

```
C++, C, Fortran | 507.cactuBSSN_r(base, peak)
------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
  Version 2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
  Version 2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
Intel(R) Fortran Intel(R) 64 Compiler Classic for applications running on
  Intel(R) 64, Version 2021.1 Build 20201112_000000
Copyright (C) 1985-2020 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------


==============================================================================
Fortran         | 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak)
                | 554.roms_r(base, peak)
------------------------------------------------------------------------
Intel(R) Fortran Intel(R) 64 Compiler Classic for applications running on
  Intel(R) 64, Version 2021.1 Build 20201112_000000
Copyright (C) 1985-2020 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------


==============================================================================
Fortran, C      | 521.wrf_r(base, peak) 527.cam4_r(base, peak)
------------------------------------------------------------------------
Intel(R) Fortran Intel(R) 64 Compiler Classic for applications running on
  Intel(R) 64, Version 2021.1 Build 20201112_000000
Copyright (C) 1985-2020 Intel Corporation.  All rights reserved.
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
  Version 2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:
icx

C++ benchmarks:
icpx

Fortran benchmarks:
ifort

Benchmarks using both Fortran and C:
ifort icx

(Continued on next page)

Lenovo Global Technology

ThinkSystem ST50 V2
(3.10 GHz, Intel Xeon E-2324G)

SPECrate®2017_fp_base = 41.7

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CPU2017 License: 9017		**Test Date:**	Apr-2022
Test Sponsor:	Lenovo Global Technology	**Hardware Availability:**	Apr-2022
Tested by:	Lenovo Global Technology	**Software Availability:**	May-2021

Base Compiler Invocation (Continued)

Benchmarks using both C and C++:
```
icpx icx
```

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

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 -xCORE-AVX512 -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-mbranches-within-32B-boundaries -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib
```

C++ benchmarks:
```
-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math -flto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-mbranches-within-32B-boundaries -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib
```

Fortran benchmarks:
```
-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ipo -no-prec-div
-qopt-prefetch -ffinite-math-only
-qopt-multiple-gather-scatter-by-shuffles -qopt-mem-layout-trans=4
```

(Continued on next page)

Lenovo Global Technology

ThinkSystem ST50 V2
(3.10 GHz, Intel Xeon E-2324G)

SPECrate®2017_fp_base = 41.7

SPECrate®2017_fp_peak = 42.1

CPU2017 License: 9017		**Test Date:**	Apr-2022
Test Sponsor:	Lenovo Global Technology	**Hardware Availability:**	Apr-2022
Tested by:	Lenovo Global Technology	**Software Availability:**	May-2021

Base Optimization Flags (Continued)

Fortran benchmarks (continued):
```
-nostandard-realloc-lhs -align array32byte -auto
-mbranches-within-32B-boundaries -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 -O3 -ipo
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-multiple-gather-scatter-by-shuffles
-mbranches-within-32B-boundaries -nostandard-realloc-lhs
-align array32byte -auto -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib
```

Benchmarks using both C and C++:
```
-w -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-mbranches-within-32B-boundaries -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib
```

Benchmarks using Fortran, C, and C++:
```
-w -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -O3
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-multiple-gather-scatter-by-shuffles
-mbranches-within-32B-boundaries -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:
```
ifort
```

Benchmarks using both Fortran and C:
```
ifort icx
```

Benchmarks using both C and C++:

(Continued on next page)

Lenovo Global Technology

ThinkSystem ST50 V2
(3.10 GHz, Intel Xeon E-2324G)

SPECrate®2017_fp_base = 41.7

SPECrate®2017_fp_peak = 42.1

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

Test Date: Apr-2022
Hardware Availability: Apr-2022
Software Availability: May-2021

Peak Compiler Invocation (Continued)

511.povray_r: `icpc icc`

526.blender_r: `icpx icx`

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

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 -flto`
`-Ofast -qopt-mem-layout-trans=4`
`-fimf-accuracy-bits=14:sqrt`
`-mbranches-within-32B-boundaries -ljemalloc`
`-L/usr/local/jemalloc64-5.0.1/lib`

C++ benchmarks:

508.namd_r: `basepeak = yes`

510.parest_r: `basepeak = yes`

Fortran benchmarks:

503.bwaves_r: `basepeak = yes`

549.fotonik3d_r: `basepeak = yes`

554.roms_r: `basepeak = yes`

Benchmarks using both Fortran and C:

(Continued on next page)

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Peak Optimization Flags (Continued)

521.wrf_r: basepeak = yes

527.cam4_r: basepeak = yes

Benchmarks using both C and C++:

511.povray_r: -prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX512 -O3
-ipo -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-multiple-gather-scatter-by-shuffles
-qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

526.blender_r: basepeak = yes

Benchmarks using Fortran, C, and C++:

507.cactuBSSN_r: basepeak = yes

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-RocketA-B.html
http://www.spec.org/cpu2017/flags/Intel-ic2021-official-linux64_revA.html

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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-RocketA-B.xml
http://www.spec.org/cpu2017/flags/Intel-ic2021-official-linux64_revA.xml

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

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