SPEC CPU®2017 Floating Point Rate Result

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ASUSTeK Computer Inc.

ASUS ESC8000 G4(Z11PG-D24) Server System
(2.70 GHz, Intel Xeon Platinum 8280L)

SPECrate®2017_fp_base = 299
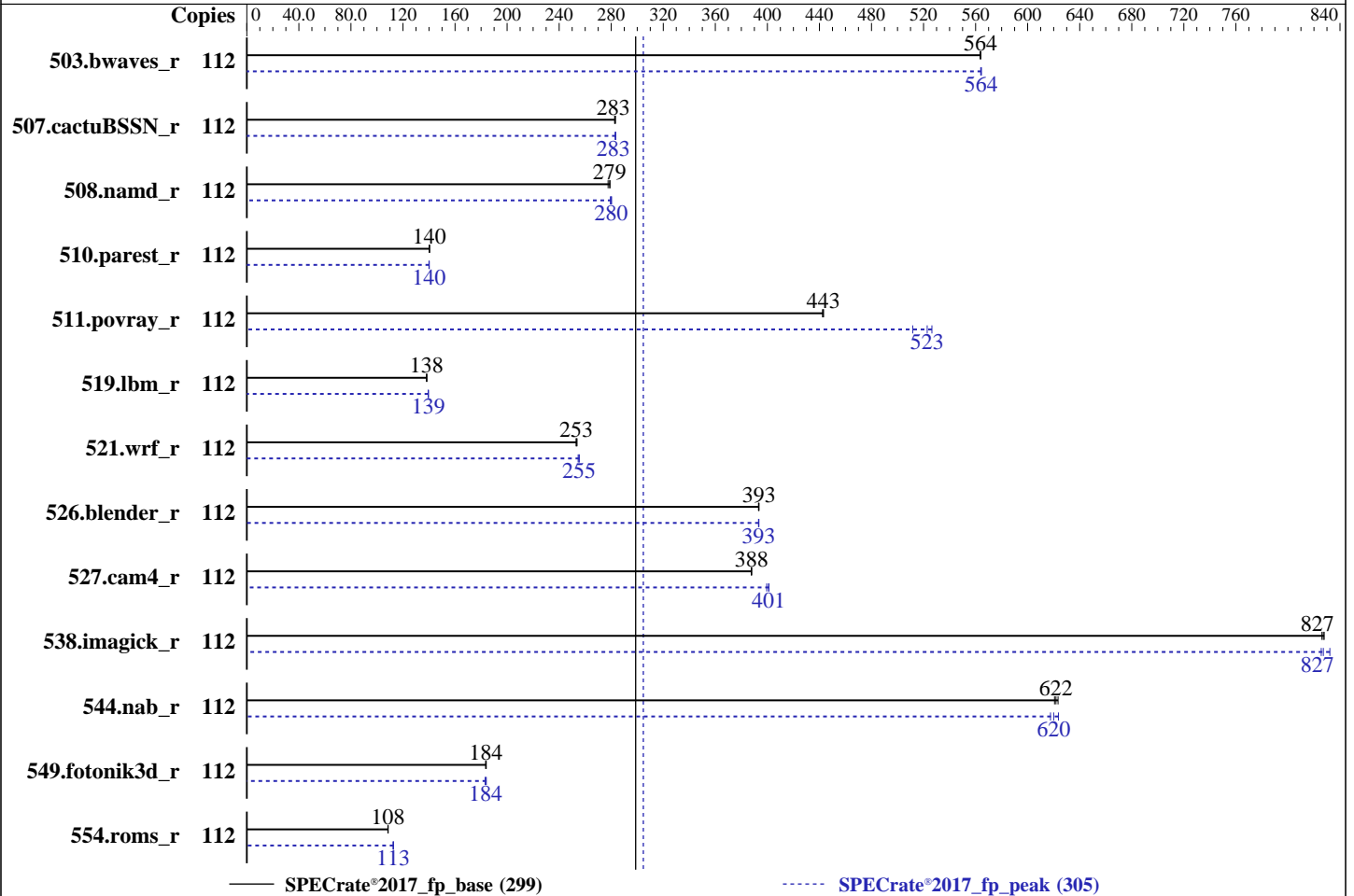
SPECrate®2017_fp_peak = 305

CPU2017 License: 9016

Test Sponsor: ASUSTeK Computer Inc.

Tested by: ASUSTeK Computer Inc.

Test Date: Apr-2019

Hardware Availability: Apr-2019

Software Availability: Nov-2018

Benchmark	Copies	base	peak
503.bwaves_r	112	564	564
507.cactuBSSN_r	112	283	283
508.namd_r	112	279	280
510.parest_r	112	140	140
511.povray_r	112	443	523
519.lbm_r	112	138	139
521.wrf_r	112	253	255
526.blender_r	112	393	393
527.cam4_r	112	388	401
538.imagick_r	112	827	827
544.nab_r	112	622	620
549.fotonik3d_r	112	184	184
554.roms_r	112	108	113

SPECrate®2017_fp_base (299)

SPECrate®2017_fp_peak (305)

Hardware

CPU Name: Intel Xeon Platinum 8280L

Max MHz: 4000

Nominal: 2700

Enabled: 56 cores, 2 chips, 2 threads/core

Orderable: 1,2 chips

Cache L1: 32 KB I + 32 KB D on chip per core

L2: 1 MB I+D on chip per core

L3: 38.5 MB I+D on chip per chip

Other: None

Memory: 768 GB (24 x 32 GB 2Rx4 PC4-2933Y-R)

Storage: 1 x 240 GB SATA SSD

Other: None

Software

OS: SUSE Linux Enterprise Server 12 (x86_64) SP3 Kernel 4.4.120-94.17-default

Compiler: C/C++: Version 19.0.1.144 of Intel C/C++ Compiler Build 20181018 for Linux; Fortran: Version 19.0.1.144 of Intel Fortran Compiler Build 20181018 for Linux

Parallel: No

Firmware: Version 5102 released Feb-2019

File System: xfs

System State: Run level 3 (multi-user)

Base Pointers: 64-bit

Peak Pointers: 64-bit

Other: None

Power Management: --

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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	1993	563	1991	564	**1992**	**564**	112	1990	564	1992	564	**1990**	**564**
507.cactuBSSN_r	112	**501**	**283**	502	283	500	283	112	500	283	**500**	**283**	501	283
508.namd_r	112	383	278	**382**	**279**	381	279	112	380	280	381	279	**380**	**280**
510.parest_r	112	2087	140	**2088**	**140**	2089	140	112	**2092**	**140**	2090	140	2094	140
511.povray_r	112	590	443	591	442	**590**	**443**	112	497	526	**500**	**523**	511	512
519.lbm_r	112	854	138	854	138	**854**	**138**	112	**846**	**139**	846	139	847	139
521.wrf_r	112	991	253	989	254	**991**	**253**	112	**983**	**255**	985	255	982	255
526.blender_r	112	433	394	**434**	**393**	434	393	112	**434**	**393**	434	393	434	393
527.cam4_r	112	**505**	**388**	505	388	505	388	112	488	401	490	399	**489**	**401**
538.imagick_r	112	336	828	337	826	**337**	**827**	112	**337**	**827**	337	826	335	832
544.nab_r	112	**303**	**622**	302	623	304	621	112	302	624	305	618	**304**	**620**
549.fotonik3d_r	112	**2375**	**184**	2372	184	2378	184	112	**2378**	**184**	2384	183	2372	184
554.roms_r	112	1642	108	**1641**	**108**	1638	109	112	1583	112	1579	113	**1581**	**113**

SPECrate®2017_fp_base =	**299**
SPECrate®2017_fp_peak =	**305**

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"

General Notes

Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH = "/spec2017_2019u1/lib/ia32:/spec2017_2019u1/lib/intel64:
/spec2017_2019u1/je5.0.1-32:/spec2017_2019u1/je5.0.1-64"
 Binaries compiled on a system with 1x Intel Core i9-7900X CPU + 32GB RAM
 memory using Redhat Enterprise Linux 7.5
 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>
Yes: The test sponsor attests, as of date of publication, that CVE-2017-5754 (Meltdown)

(Continued on next page)

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$SPECrate^{®}2017\_fp\_peak = 305$

CPU2017 License:	9016	**Test Date:**	Apr-2019
Test Sponsor:	ASUSTeK Computer Inc.	**Hardware Availability:**	Apr-2019
Tested by:	ASUSTeK Computer Inc.	**Software Availability:**	Nov-2018

General Notes (Continued)

```
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.
```

Platform Notes

```
BIOS Configuration:
VT-d = Disabled
Patrol Scrub = Disabled
ENERGY_PERF_BIAS_CFG mode = performance
SNC = Enabled
IMC interleaving = 1-way
Engine Boost = Level3(Max)
Enforce POR = Disable
Memory Frequency = 2933
LLC dead line allc = Disabled
SR-IOV Support = Disabled
CSM Support = Disabled
 Sysinfo program /spec2017/bin/sysinfo
 Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
 running on linux-bsin Mon Apr 15 08:47:34 2019

 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) Platinum 8280L CPU @ 2.70GHz
       2  "physical id"s (chips)
       112 "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 : 28
       siblings  : 56
       physical 0: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27
       28 29 30
       physical 1: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27
       28 29 30

 From lscpu:
      Architecture:          x86_64
      CPU op-mode(s):        32-bit, 64-bit
      Byte Order:            Little Endian
      CPU(s):                112
```

(Continued on next page)

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SPECrate®2017_fp_base = 299

SPECrate®2017_fp_peak = 305

CPU2017 License: 9016
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Tested by: ASUSTeK Computer Inc.

Test Date: Apr-2019
Hardware Availability: Apr-2019
Software Availability: Nov-2018

Platform Notes (Continued)

```
        On-line CPU(s) list:     0-111
        Thread(s) per core:      2
        Core(s) per socket:      28
        Socket(s):               2
        NUMA node(s):            4
        Vendor ID:               GenuineIntel
        CPU family:              6
        Model:                   85
        Model name:              Intel(R) Xeon(R) Platinum 8280L CPU @ 2.70GHz
        Stepping:                6
        CPU MHz:                 3591.861
        CPU max MHz:             4000.0000
        CPU min MHz:             1000.0000
        BogoMIPS:                5561.96
        Virtualization:          VT-x
        L1d cache:               32K
        L1i cache:               32K
        L2 cache:                1024K
        L3 cache:                39424K
        NUMA node0 CPU(s):       0-3,7-9,14-17,21-23,56-59,63-65,70-73,77-79
        NUMA node1 CPU(s):       4-6,10-13,18-20,24-27,60-62,66-69,74-76,80-83
        NUMA node2 CPU(s):       28-31,35-37,42-45,49-51,84-87,91-93,98-101,105-107
        NUMA node3 CPU(s):       32-34,38-41,46-48,52-55,88-90,94-97,102-104,108-111
        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
    aperfmperf eagerfpu 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 ida arat epb invpcid_single pln pts
    dtherm hwp hwp_act_window hwp_epp hwp_pkg_req intel_pt rsb_ctxsw spec_ctrl stibp
    arch_capabilities retpoline kaiser tpr_shadow vnmi flexpriority ept vpid fsgsbase
    tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm cqm mpx avx512f avx512dq rdseed
    adx smap clflushopt clwb avx512cd avx512bw avx512vl xsaveopt xsavec xgetbv1 cqm_llc
    cqm_occup_llc pku ospke

 /proc/cpuinfo cache data
    cache size : 39424 KB

 From numactl --hardware  WARNING: a numactl 'node' might or might not correspond to a
 physical chip.
    available: 4 nodes (0-3)
    node 0 cpus: 0 1 2 3 7 8 9 14 15 16 17 21 22 23 56 57 58 59 63 64 65 70 71 72 73 77 78
    79
    node 0 size: 192043 MB
    node 0 free: 191708 MB
    node 1 cpus: 4 5 6 10 11 12 13 18 19 20 24 25 26 27 60 61 62 66 67 68 69 74 75 76 80 81
    82 83
```

(Continued on next page)

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Platform Notes (Continued)

```
   node 1 size: 193517 MB
   node 1 free: 193207 MB
   node 2 cpus: 28 29 30 31 35 36 37 42 43 44 45 49 50 51 84 85 86 87 91 92 93 98 99 100
   101 105 106 107
   node 2 size: 193517 MB
   node 2 free: 193209 MB
   node 3 cpus: 32 33 34 38 39 40 41 46 47 48 52 53 54 55 88 89 90 94 95 96 97 102 103 104
   108 109 110 111
   node 3 size: 193513 MB
   node 3 free: 193194 MB
   node distances:
   node   0   1   2   3
     0:  10  11  21  21
     1:  11  10  21  21
     2:  21  21  10  11
     3:  21  21  11  10

 From /proc/meminfo
    MemTotal:       791134428 kB
    HugePages_Total:        0
    Hugepagesize:        2048 kB

 From /etc/*release* /etc/*version*
    SuSE-release:
       SUSE Linux Enterprise Server 12 (x86_64)
       VERSION = 12
       PATCHLEVEL = 3
       # This file is deprecated and will be removed in a future service pack or release.
       # Please check /etc/os-release for details about this release.
    os-release:
       NAME="SLES"
       VERSION="12-SP3"
       VERSION_ID="12.3"
       PRETTY_NAME="SUSE Linux Enterprise Server 12 SP3"
       ID="sles"
       ANSI_COLOR="0;32"
       CPE_NAME="cpe:/o:suse:sles:12:sp3"

 uname -a:
    Linux linux-bsin 4.4.120-94.17-default #1 SMP Wed Mar 14 17:23:00 UTC 2018 (cf3a7bb)
    x86_64 x86_64 x86_64 GNU/Linux

 Kernel self-reported vulnerability status:

 CVE-2017-5754 (Meltdown):          Not affected
 CVE-2017-5753 (Spectre variant 1): Mitigation: __user pointer sanitization
 CVE-2017-5715 (Spectre variant 2): Mitigation: IBRS+IBPB
```

(Continued on next page)

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Tested by:	ASUSTeK Computer Inc.	**Software Availability:**	Nov-2018

Platform Notes (Continued)

```
  run-level 3 Apr 15 08:46

  SPEC is set to: /spec2017
    Filesystem      Type  Size  Used Avail Use% Mounted on
    /dev/sda4       xfs   199G  9.4G  190G   5% /

 Additional information from dmidecode 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.
   BIOS American Megatrends Inc. 5102 02/11/2019
   Memory:
    24x Micron 36ASF4G72PZ-2G9E2 32 GB 2 rank 2933, configured at 2934

 (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) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------


==============================================================================
C++                | 508.namd_r(base, peak) 510.parest_r(base, peak)
------------------------------------------------------------------------------
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------


==============================================================================
C++, C             | 511.povray_r(base, peak) 526.blender_r(base, peak)
------------------------------------------------------------------------------
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation.  All rights reserved.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------
```

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Compiler Version Notes (Continued)

```
==============================================================================
C++, C, Fortran | 507.cactuBSSN_r(base, peak)
------------------------------------------------------------------------------
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation.  All rights reserved.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation.  All rights reserved.
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
  64, Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 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 for applications running on Intel(R)
  64, Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------


==============================================================================
Fortran, C       | 521.wrf_r(base, peak) 527.cam4_r(base, peak)
------------------------------------------------------------------------------
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
  64, Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation.  All rights reserved.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:
icc -m64 -std=c11

C++ benchmarks:
icpc -m64

Fortran benchmarks:
ifort -m64

(Continued on next page)

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Base Compiler Invocation (Continued)

Benchmarks using both Fortran and C:
`ifort -m64 icc -m64 -std=c11`

Benchmarks using both C and C++:
`icpc -m64 icc -m64 -std=c11`

Benchmarks using Fortran, C, and C++:
`icpc -m64 icc -m64 -std=c11 ifort -m64`

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:
`-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only`
`-qopt-mem-layout-trans=4`

C++ benchmarks:
`-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only`
`-qopt-mem-layout-trans=4`

Fortran benchmarks:
`-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only`
`-qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs`
`-align array32byte`

Benchmarks using both Fortran and C:
`-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only`

(Continued on next page)

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Base Optimization Flags (Continued)

Benchmarks using both Fortran and C (continued):
```
-qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs
-align array32byte
```

Benchmarks using both C and C++:
```
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4
```

Benchmarks using Fortran, C, and C++:
```
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs
-align array32byte
```

Peak Compiler Invocation

C benchmarks:
```
icc -m64 -std=c11
```

C++ benchmarks:
```
icpc -m64
```

Fortran benchmarks:
```
ifort -m64
```

Benchmarks using both Fortran and C:
```
ifort -m64 icc -m64 -std=c11
```

Benchmarks using both C and C++:
```
icpc -m64 icc -m64 -std=c11
```

Benchmarks using Fortran, C, and C++:
```
icpc -m64 icc -m64 -std=c11 ifort -m64
```

Peak Portability Flags

```
Same as Base Portability Flags
```

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Hardware Availability: Apr-2019
Software Availability: Nov-2018

Peak Optimization Flags

C benchmarks:

 519.lbm_r: `-prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3`
`-no-prec-div -qopt-prefetch -ffinite-math-only`
`-qopt-mem-layout-trans=4`

 538.imagick_r: `-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch`
`-ffinite-math-only -qopt-mem-layout-trans=4`

 544.nab_r: `Same as 538.imagick_r`

C++ benchmarks:

 508.namd_r: `-prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3`
`-no-prec-div -qopt-prefetch -ffinite-math-only`
`-qopt-mem-layout-trans=4`

 510.parest_r: `-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch`
`-ffinite-math-only -qopt-mem-layout-trans=4`

Fortran benchmarks:

 503.bwaves_r: `-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch`
`-ffinite-math-only -qopt-mem-layout-trans=4 -auto`
`-nostandard-realloc-lhs -align array32byte`

 549.fotonik3d_r: `Same as 503.bwaves_r`

 554.roms_r: `-prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3`
`-no-prec-div -qopt-prefetch -ffinite-math-only`
`-qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs`
`-align array32byte`

Benchmarks using both Fortran and C:
`-prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3`
`-no-prec-div -qopt-prefetch -ffinite-math-only`
`-qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs`
`-align array32byte`

Benchmarks using both C and C++:

 511.povray_r: `-prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3`
`-no-prec-div -qopt-prefetch -ffinite-math-only`
`-qopt-mem-layout-trans=4`

(Continued on next page)

ASUSTeK Computer Inc.

ASUS ESC8000 G4(Z11PG-D24) Server System
(2.70 GHz, Intel Xeon Platinum 8280L)

SPECrate®2017_fp_base = 299

SPECrate®2017_fp_peak = 305

CPU2017 License:	9016	**Test Date:**	Apr-2019
Test Sponsor:	ASUSTeK Computer Inc.	**Hardware Availability:**	Apr-2019
Tested by:	ASUSTeK Computer Inc.	**Software Availability:**	Nov-2018

Peak Optimization Flags (Continued)

526.blender_r: `-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch`
`-ffinite-math-only -qopt-mem-layout-trans=4`

Benchmarks using Fortran, C, and C++:
`-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only`
`-qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs`
`-align array32byte`

The flags files that were used to format this result can be browsed at
`http://www.spec.org/cpu2017/flags/ASUSTekPlatform-Settings-z11-V2.0-revD.html`
`http://www.spec.org/cpu2017/flags/Intel-ic18.0-official-linux64.2019-04-02.html`

You can also download the XML flags sources by saving the following links:
`http://www.spec.org/cpu2017/flags/ASUSTekPlatform-Settings-z11-V2.0-revD.xml`
`http://www.spec.org/cpu2017/flags/Intel-ic18.0-official-linux64.2019-04-02.xml`

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

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