SPEC CPU®2017 Integer Speed Result

Copyright 2017-2020 Standard Performance Evaluation Corporation

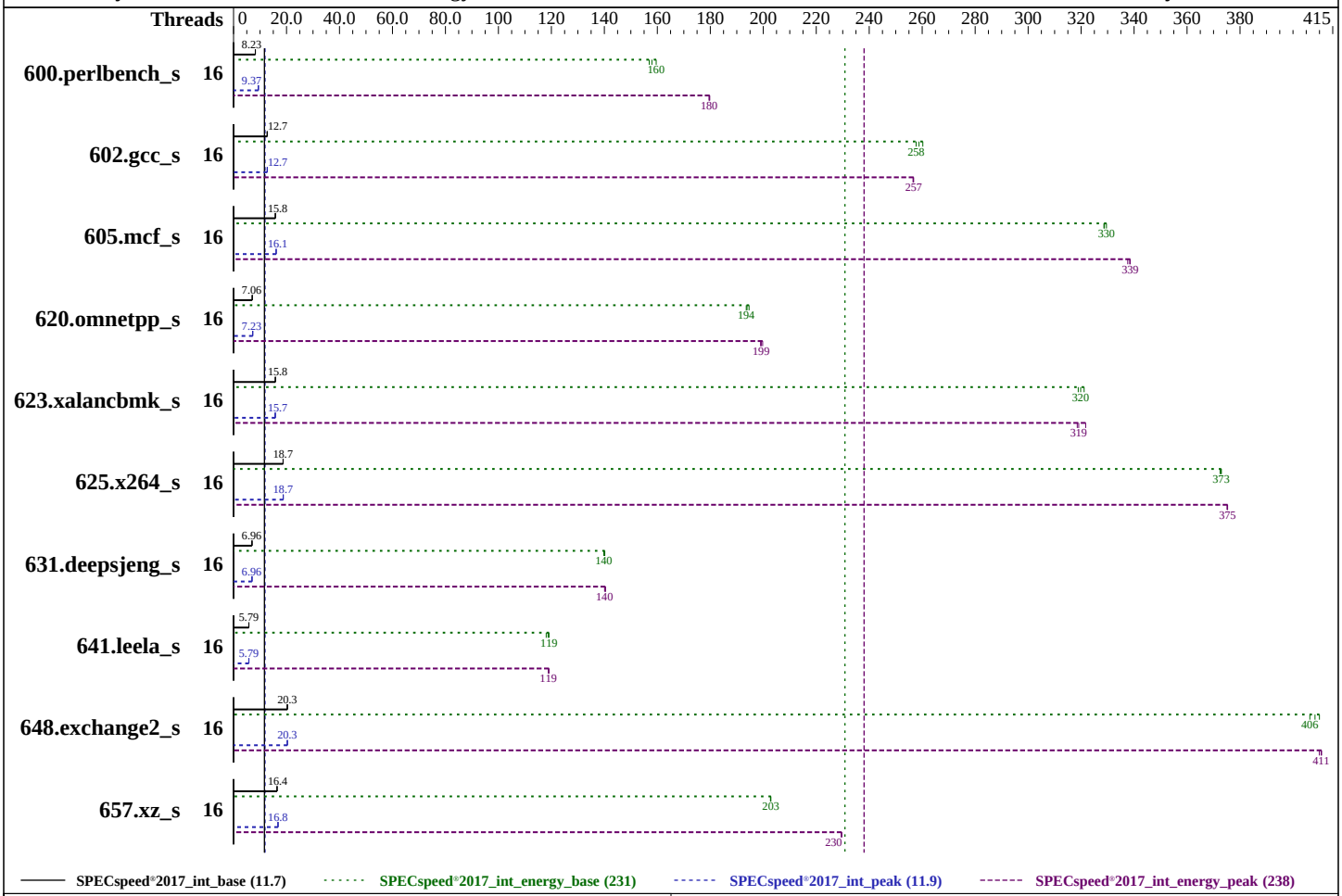
Lenovo Global Technology

ThinkSystem SR250
(3.70 GHz, Intel Xeon E-2288G)

SPECspeed®2017_int_base =	11.7
SPECspeed®2017_int_energy_base =	231
SPECspeed®2017_int_peak =	11.9
SPECspeed®2017_int_energy_peak =	238

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

Test Date: Feb-2020
Hardware Availability: Mar-2020
Software Availability: Jun-2019



Hardware

CPU Name:	Intel Xeon E-2288G
Max MHz:	5000
Nominal:	3700
Enabled:	8 cores, 1 chip, 2 threads/core
Orderable:	1 chip
Cache L1:	32 KB I + 32 KB D on chip per core
L2:	256 KB I+D on chip per core
L3:	16 MB I+D on chip per chip
Other:	None
Memory:	64 GB (2 x 32 GB 2Rx8 PC4-2666V-E, populated on DIMM 1 and DIMM 3)
Storage:	1 x 480 GB ThinkSystem 2.5" Intel S4510 Entry SATA 6Gb Hot Swap SSD
Other:	None

Software

OS:	SUSE Linux Enterprise Server 15 SP1 (x86_64) Kernel 4.12.14-195-default
Compiler:	C/C++: Version 19.0.4.227 of Intel C/C++ Compiler for Linux; Fortran: Version 19.0.4.227 of Intel Fortran Compiler for Linux
Parallel:	Yes
Firmware:	Lenovo BIOS Version ISE113H 2.00 released Dec-2019
File System:	xfs
System State:	Run level 3 (multi-user)
Base Pointers:	64-bit
Peak Pointers:	64-bit

(Continued on next page)

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Software (Continued)

Other: jemalloc memory allocator V5.0.1
Power Management: BIOS and OS set to prefer performance at the cost of additional power usage

Power

Max. Power (W): 187.47
Idle Power (W): 24.96
Min. Temperature (C): 20.94
Elevation (m): 43
Line Standard: 220 V / 50 Hz / 1 phase / 3 wires
Provisioning: Line-powered

Power Settings

Management FW: Version 3.40 of TEI395L
Memory Mode: Normal

Power-Relevant Hardware

Power Supply: 1 x 450 W (non-redundant)
Details: ThinkSystem 450W (230V/115V) Platinum Hot-Swap Power Supply 4P57A12649
Backplane: ThinkSystem SR250 2.5" SATA/SAS 8-Bay BP[B413]
Other Storage: Embedded SATA Controller
Storage Model #s: 4XB7A10248
NICs Installed: 1 x Broadcom 2-port BCM5720 embedded @ 1 Gb
NICs Enabled (FW/OS): 2 / 1
NICs Connected/Speed: 1 @ 1 Gb
Other HW Model #s: 2.5" Chassis

Power Analyzer

Power Analyzer: WIN:8888
Hardware Vendor: YOKOGAWA, Inc.
Model: YokogawaWT310E
Serial Number: C3UG05013E
Input Connection: Default
Metrology Institute: CNAS
Calibration By: China CEPREI Laboratory
Calibration Label: 1GA19013841-0005
Calibration Date: 27-Sep-2019
PTDaemon™ Version: 1.9.1 (a2d19f26; 2019-07-17)
Setup Description: Connected to PSU1
Current Ranges Used: 1A
Voltage Range Used: 300V

Temperature Meter

Temperature Meter: WIN:8889
Hardware Vendor: Digi International, Inc.
Model: DigiWATCHPORT_H
Serial Number: COM1
Input Connection: USB
PTDaemon Version: 1.9.1 (a2d19f26; 2019-07-17)
Setup Description: 50 mm in front of SUT main intake

Base Results Table

Benchmark	Threads	Seconds	Ratio	Energy (kJ)	Energy Ratio	Average Power	Maximum Power	Seconds	Ratio	Energy (kJ)	Energy Ratio	Average Power	Maximum Power	Seconds	Ratio	Energy (kJ)	Energy Ratio	Average Power	Maximum Power
600.perlbench_s	16	**216**	**8.23**	**12.1**	**160**	**55.9**	**57.4**	216	8.21	12.3	157	56.7	57.8	215	8.26	12.2	158	56.7	57.9
602.gcc_s	16	314	12.7	16.7	259	53.3	56.3	**313**	**12.7**	**16.8**	**258**	**53.6**	**56.2**	313	12.7	16.6	260	53.2	56.6
605.mcf_s	16	299	15.8	15.7	329	52.4	58.1	299	15.8	15.7	329	52.4	57.7	**299**	**15.8**	**15.6**	**330**	**52.2**	**57.9**
620.omnetpp_s	16	231	7.06	9.12	195	39.5	43.0	**231**	**7.06**	**9.17**	**194**	**39.7**	**43.4**	231	7.05	9.15	194	39.5	44.4
623.xalancbmk_s	16	**89.8**	**15.8**	**4.81**	**320**	**53.6**	**56.9**	89.9	15.8	4.83	319	53.7	57.1	89.5	15.8	4.79	321	53.5	56.8
625.x264_s	16	94.4	18.7	5.15	373	54.5	55.5	94.2	18.7	5.15	372	54.7	55.8	**94.3**	**18.7**	**5.15**	**373**	**54.6**	**55.3**

Table continues on next page. Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

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SPECspeed®2017_int_energy_base = 231

SPECspeed®2017_int_peak = 11.9

SPECspeed®2017_int_energy_peak = 238

CPU2017 License: 9017
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Test Date: Feb-2020
Hardware Availability: Mar-2020
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Base Results Table (Continued)

Benchmark	Threads	Seconds	Ratio	Energy (kJ)	Energy Ratio	Average Power	Maximum Power	Seconds	Ratio	Energy (kJ)	Energy Ratio	Average Power	Maximum Power	Seconds	Ratio	Energy (kJ)	Energy Ratio	Average Power	Maximum Power
631.deepsjeng_s	16	**206**	**6.96**	**11.1**	**140**	**54.1**	**55.4**	206	6.96	11.1	140	53.9	55.1	206	6.97	11.1	140	54.1	56.0
641.leela_s	16	295	5.79	15.7	118	53.1	53.8	295	5.78	15.6	119	52.7	53.7	**295**	**5.79**	**15.5**	**119**	**52.6**	**53.2**
648.exchange2_s	16	**145**	**20.3**	**7.87**	**406**	**54.3**	**54.9**	144	20.4	7.80	410	54.0	54.7	145	20.3	7.83	408	54.0	54.6
657.xz_s	16	376	16.4	33.2	203	88.3	187	377	16.4	33.2	203	88.2	179	**376**	**16.4**	**33.2**	**203**	**88.1**	**178**

SPECspeed®2017_int_base = 11.7

SPECspeed®2017_int_energy_base = 231

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

Peak Results Table

Benchmark	Threads	Seconds	Ratio	Energy (kJ)	Energy Ratio	Average Power	Maximum Power	Seconds	Ratio	Energy (kJ)	Energy Ratio	Average Power	Maximum Power	Seconds	Ratio	Energy (kJ)	Energy Ratio	Average Power	Maximum Power
600.perlbench_s	16	**190**	**9.37**	**10.7**	**180**	**56.6**	**57.9**	190	9.35	10.7	180	56.5	58.1	189	9.37	10.7	180	56.5	57.7
602.gcc_s	16	313	12.7	16.9	257	53.9	57.1	313	12.7	16.9	257	53.9	56.0	**313**	**12.7**	**16.9**	**257**	**53.9**	**57.7**
605.mcf_s	16	293	16.1	15.3	338	52.0	57.5	294	16.1	15.2	338	51.8	57.5	**294**	**16.1**	**15.2**	**339**	**51.8**	**57.7**
620.omnetpp_s	16	225	7.24	8.92	199	39.6	41.4	226	7.22	8.88	200	39.3	44.3	**226**	**7.23**	**8.91**	**199**	**39.5**	**41.5**
623.xalancbmk_s	16	90.3	15.7	4.83	319	53.5	56.8	**90.2**	**15.7**	**4.82**	**319**	**53.4**	**56.5**	89.6	15.8	4.78	322	53.4	57.0
625.x264_s	16	94.1	18.7	5.11	375	54.3	55.4	94.0	18.8	5.12	375	54.5	55.2	**94.1**	**18.7**	**5.11**	**375**	**54.3**	**55.3**
631.deepsjeng_s	16	206	6.96	11.1	140	53.9	55.4	**206**	**6.96**	**11.1**	**140**	**54.0**	**55.7**	206	6.96	11.1	140	53.9	55.4
641.leela_s	16	**295**	**5.79**	**15.5**	**119**	**52.7**	**53.3**	295	5.78	15.5	119	52.6	53.3	295	5.79	15.5	119	52.7	53.3
648.exchange2_s	16	145	20.3	7.80	410	53.8	54.5	145	20.3	7.79	411	53.9	54.8	**145**	**20.3**	**7.79**	**411**	**53.8**	**54.5**
657.xz_s	16	**368**	**16.8**	**29.3**	**230**	**79.6**	**149**	368	16.8	29.3	230	79.6	158	369	16.8	29.3	229	79.6	149

SPECspeed®2017_int_peak = 11.9

SPECspeed®2017_int_energy_peak = 238

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"
Set CPU frequency governor to maximum performance with:
cpupower -c all frequency-set -g performance
```

Environment Variables Notes

```
Environment variables set by runcpu before the start of the run:
KMP_AFFINITY = "granularity=fine,scatter"
LD_LIBRARY_PATH =
     "/home/cpu2017-1.1.0-ic19.0u4/lib/intel64:/home/cpu2017-1.1.0-ic19.0u4/j
     e5.0.1-64"
OMP_STACKSIZE = "192M"
```

General Notes

```
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
```

(Continued on next page)

General Notes (Continued)

```
 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.
Yes: The test sponsor attests, as of date of publication, that CVE-2018-3640 (Spectre variant 3a)
is mitigated in the system as tested and documented.
Yes: The test sponsor attests, as of date of publication, that CVE-2018-3639 (Spectre variant 4)
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 Custom Mode
Zero Output set to Advanced Mode
Per Core P-state set to Disable

 Sysinfo program /home/cpu2017-1.1.0-ic19.0u4/bin/sysinfo
 Rev: r6365 of 2019-08-21 295195f888a3d7edb1e6e46a485a0011
 running on linux-jecn Thu Feb 14 23:44:56 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) E-2288G CPU @ 3.70GHz
       1  "physical id"s (chips)
       16 "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 : 8
       siblings  : 16
       physical 0: cores 0 1 2 3 4 5 6 7

 From lscpu:
      Architecture:        x86_64
```

(Continued on next page)

Platform Notes (Continued)

```
      CPU op-mode(s):      32-bit, 64-bit
      Byte Order:          Little Endian
      Address sizes:       39 bits physical, 48 bits virtual
      CPU(s):              16
      On-line CPU(s) list: 0-15
      Thread(s) per core:  2
      Core(s) per socket:  8
      Socket(s):           1
      NUMA node(s):        1
      Vendor ID:           GenuineIntel
      CPU family:          6
      Model:               158
      Model name:          Intel(R) Xeon(R) E-2288G CPU @ 3.70GHz
      Stepping:            13
      CPU MHz:             3701.000
      CPU max MHz:         3701.0000
      CPU min MHz:         800.0000
      BogoMIPS:            7392.00
      Virtualization:      VT-x
      L1d cache:           32K
      L1i cache:           32K
      L2 cache:            256K
      L3 cache:            16384K
      NUMA node0 CPU(s):   0-15
      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 fsgsbase
      tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm mpx rdseed adx smap clflushopt
      intel_pt xsaveopt xsavec xgetbv1 xsaves dtherm ida arat pln pts hwp hwp_notify
      hwp_act_window hwp_epp md_clear flush_l1d arch_capabilities

  /proc/cpuinfo cache data
     cache size : 16384 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 4 5 6 7 8 9 10 11 12 13 14 15
    node 0 size: 64352 MB
    node 0 free: 63354 MB
    node distances:
```

(Continued on next page)

Platform Notes (Continued)

```
  node   0
    0:  10

From /proc/meminfo
   MemTotal:       65896704 kB
   HugePages_Total:       0
   Hugepagesize:       2048 kB

From /etc/*release* /etc/*version*
   os-release:
      NAME="SLES"
      VERSION="15-SP1"
      VERSION_ID="15.1"
      PRETTY_NAME="SUSE Linux Enterprise Server 15 SP1"
      ID="sles"
      ID_LIKE="suse"
      ANSI_COLOR="0;32"
      CPE_NAME="cpe:/o:suse:sles:15:sp1"

uname -a:
   Linux linux-jecn 4.12.14-195-default #1 SMP Tue May 7 10:55:11 UTC 2019 (8fba516)
   x86_64 x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:

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: __user pointer sanitization
CVE-2017-5715 (Spectre variant 2):        Mitigation: Enhanced IBRS, IBPB: conditional,
                                          RSB filling

run-level 3 Feb 14 22:21

SPEC is set to: /home/cpu2017-1.1.0-ic19.0u4
   Filesystem     Type  Size  Used Avail Use% Mounted on
   /dev/sda2      xfs   446G   28G  418G   7% /

From /sys/devices/virtual/dmi/id
    BIOS:    Lenovo -[ISE113H-2.00]- 12/27/2019
    Vendor:  Lenovo
    Product: ThinkSystem SR250 -[7Y51CTO0WW]-
    Product Family: ThinkSystem
```

(Continued on next page)

Platform Notes (Continued)

```
     Serial:  1234567890

 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.
   Memory:
     2x Not Specified Not Specified
     2x SK Hynix HMAA4GU7AJR8N-VK 32767 MB 2 rank 2666

 (End of data from sysinfo program)
```

Compiler Version Notes

```
==============================================================================
C       | 600.perlbench_s(base, peak) 602.gcc_s(base, peak) 605.mcf_s(base,
        | peak) 625.x264_s(base, peak) 657.xz_s(base, peak)
------------------------------------------------------------------------------
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------

==============================================================================
C++     | 620.omnetpp_s(base, peak) 623.xalancbmk_s(base, peak)
        | 631.deepsjeng_s(base, peak) 641.leela_s(base, peak)
------------------------------------------------------------------------------
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------

==============================================================================
Fortran | 648.exchange2_s(base, peak)
------------------------------------------------------------------------------
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
  64, Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:
icc -m64 -std=c11

C++ benchmarks:
icpc -m64

Fortran benchmarks:
ifort -m64

Base Portability Flags

600.perlbench_s: -DSPEC_LP64 -DSPEC_LINUX_X64
602.gcc_s: -DSPEC_LP64
605.mcf_s: -DSPEC_LP64
620.omnetpp_s: -DSPEC_LP64
623.xalancbmk_s: -DSPEC_LP64 -DSPEC_LINUX
625.x264_s: -DSPEC_LP64
631.deepsjeng_s: -DSPEC_LP64
641.leela_s: -DSPEC_LP64
648.exchange2_s: -DSPEC_LP64
657.xz_s: -DSPEC_LP64

Base Optimization Flags

C benchmarks:
-Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
-L/usr/local/je5.0.1-64/lib -ljemalloc

C++ benchmarks:
-Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64
-lqkmalloc

Fortran benchmarks:
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-mem-layout-trans=4
-nostandard-realloc-lhs

Peak Compiler Invocation

C benchmarks:
icc -m64 -std=c11

C++ benchmarks:
icpc -m64

Fortran benchmarks:
ifort -m64

Peak Portability Flags

Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:

600.perlbench_s: -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -O2
-xCORE-AVX2 -qopt-mem-layout-trans=4 -ipo -O3
-no-prec-div -DSPEC_SUPPRESS_OPENMP -qopenmp
-DSPEC_OPENMP -fno-strict-overflow
-L/usr/local/je5.0.1-64/lib -ljemalloc

602.gcc_s: -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -O2
-xCORE-AVX2 -qopt-mem-layout-trans=4 -ipo -O3
-no-prec-div -DSPEC_SUPPRESS_OPENMP
-L/usr/local/je5.0.1-64/lib -ljemalloc

605.mcf_s: -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo
-xCORE-AVX2 -O3 -no-prec-div -qopt-mem-layout-trans=4
-DSPEC_SUPPRESS_OPENMP -qopenmp -DSPEC_OPENMP
-L/usr/local/je5.0.1-64/lib -ljemalloc

625.x264_s: -Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
-L/usr/local/je5.0.1-64/lib -ljemalloc

657.xz_s: -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -O2
-xCORE-AVX2 -qopt-mem-layout-trans=4 -ipo -O3

(Continued on next page)

Peak Optimization Flags (Continued)

657.xz_s (continued):
-no-prec-div -DSPEC_SUPPRESS_OPENMP -qopenmp
-DSPEC_OPENMP -L/usr/local/je5.0.1-64/lib -ljemalloc

C++ benchmarks:

620.omnetpp_s: -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo
-xCORE-AVX2 -O3 -no-prec-div -qopt-mem-layout-trans=4
-DSPEC_SUPPRESS_OPENMP
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64
-lqkmalloc

623.xalancbmk_s: -Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64
-lqkmalloc

631.deepsjeng_s: Same as 623.xalancbmk_s

641.leela_s: Same as 623.xalancbmk_s

Fortran benchmarks:
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-mem-layout-trans=4
-nostandard-realloc-lhs

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/Intel-ic19.0u1-official-linux64.2019-07-09.html
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-SKL-J.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/Intel-ic19.0u1-official-linux64.2019-07-09.xml
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-SKL-J.xml

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