SPEC® CPU2017 Integer Rate Result

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Lenovo Global Technology

ThinkSystem SR950
(2.70 GHz, Intel Xeon Platinum 8168)

SPECrate2017_int_base = 533
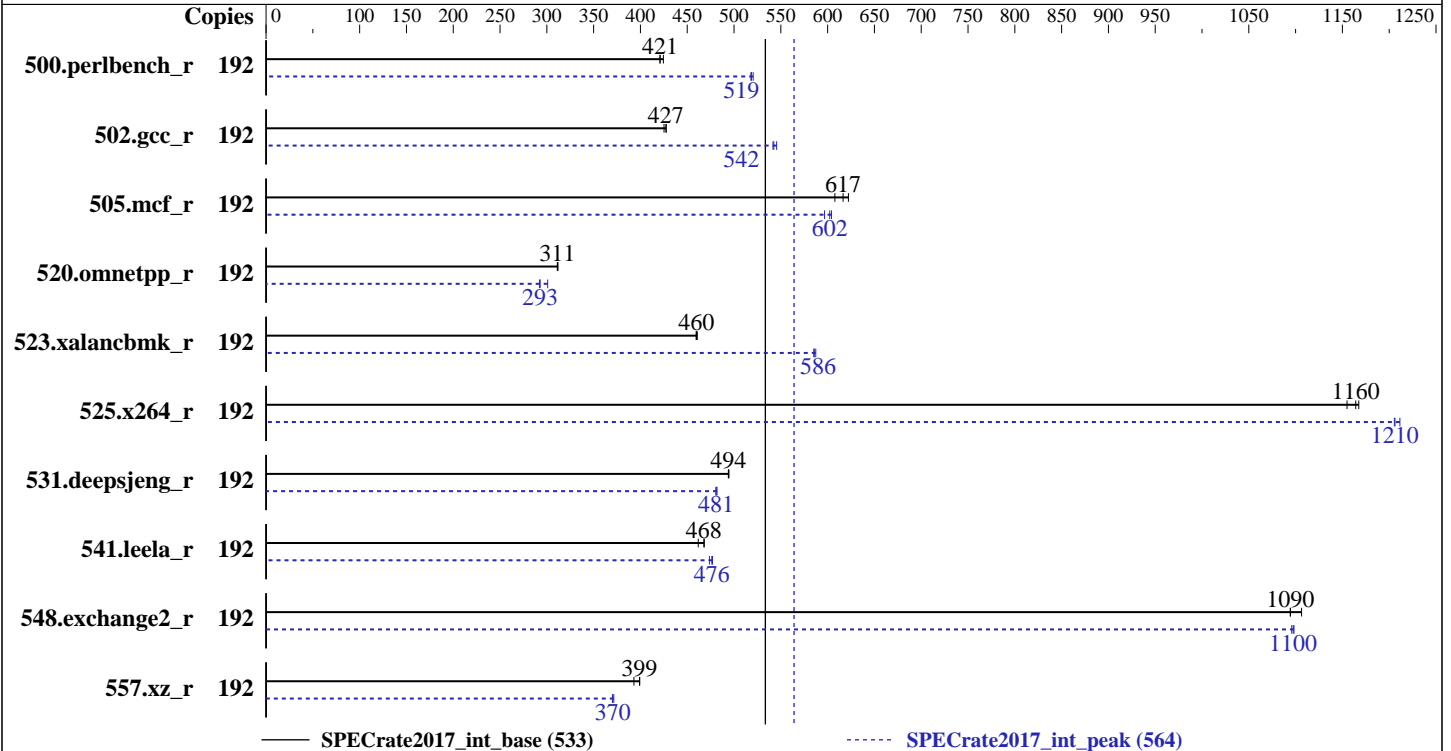
SPECrate2017_int_peak = 564

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

Test Date: Oct-2017
Hardware Availability: Sep-2017
Software Availability: Sep-2017

Copies

Benchmark	Copies	base	peak
500.perlbench_r	192	421	519
502.gcc_r	192	427	542
505.mcf_r	192	617	602
520.omnetpp_r	192	311	293
523.xalancbmk_r	192	460	586
525.x264_r	192	1160	1210
531.deepsjeng_r	192	494	481
541.leela_r	192	468	476
548.exchange2_r	192	1090	1100
557.xz_r	192	399	370

—— **SPECrate2017_int_base (533)**   ------ **SPECrate2017_int_peak (564)**

Hardware

CPU Name: Intel Xeon Platinum 8168
 Max MHz.:   3700
 Nominal: 2700
Enabled: 96 cores, 4 chips, 2 threads/core
Orderable: 2,4 chips
Cache L1:   32 KB I + 32 KB D on chip per core
 L2:   1 MB I+D on chip per core
 L3:   33 MB I+D on chip per chip
 Other: None
Memory: 1536 GB (48 x 32 GB 2Rx4 PC4-2666V-R)
Storage: 800 GB tmpfs
Other: None

Software

OS: SUSE Linux Enterprise Server 12 SP2 (x86_64)
               Kernel 4.4.21-69-default
Compiler: C/C++: Version 18.0.0.128 of Intel C/C++
               Compiler for Linux;
               Fortran: Version 18.0.0.128 of Intel Fortran
               Compiler for Linux
Parallel: No
Firmware: Lenovo BIOS Version PSE105X 1.00 released Aug-2017
File System: tmpfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: 32/64-bit
Other: jemalloc: jemalloc memory allocator library
               V5.0.1;
               jemalloc: configured and built at default for
               32bit (i686) and 64bit (x86_64) targets;
               jemalloc: built with the RedHat Enterprise 7.4,
               and the system compiler gcc 4.8.5;
               jemalloc: sources avilable from jemalloc.net or
               releases

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Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
500.perlbench_r	192	720	425	**726**	**421**	726	421	192	587	520	**589**	**519**	590	518
502.gcc_r	192	639	425	636	428	**636**	**427**	192	502	542	498	546	**501**	**542**
505.mcf_r	192	499	622	**503**	**617**	511	608	192	514	604	**515**	**602**	520	597
520.omnetpp_r	192	810	311	808	312	**809**	**311**	192	837	301	862	292	**860**	**293**
523.xalancbmk_r	192	**441**	**460**	441	460	440	461	192	**346**	**586**	346	585	345	587
525.x264_r	192	291	1150	288	1170	**289**	**1160**	192	278	1210	279	1210	**279**	**1210**
531.deepsjeng_r	192	445	495	445	494	**445**	**494**	192	**458**	**481**	458	481	457	482
541.leela_r	192	**680**	**468**	689	462	679	468	192	667	477	**668**	**476**	671	474
548.exchange2_r	192	**460**	**1090**	455	1110	460	1090	192	459	1100	**458**	**1100**	458	1100
557.xz_r	192	519	399	**520**	**399**	528	393	192	558	372	560	370	**560**	**370**
SPECrate2017_int_base =		533												
SPECrate2017_int_peak =		564												

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"
 Tmpfs filesystem can be set with:
  mount -t tmpfs -o size=800g tmpfs /home
 Process tuning setting:
  echo 50000     > /proc/sys/kernel/sched_cfs_bandwidth_slice_us
  echo 240000000 > /proc/sys/kernel/sched_latency_ns
  echo 5000000   > /proc/sys/kernel/sched_migration_cost_ns
  echo 100000000 > /proc/sys/kernel/sched_min_granularity_ns
  echo 150000000 > /proc/sys/kernel/sched_wakeup_granularity_ns
  echo 0 > /proc/sys/kernel/numa_balancing
```

General Notes

```
Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH = "/home/cpu2017.1.0.2.ic18.0/lib/ia32:/home/cpu2017.1.0.2.ic18.0/lib/intel64"
LD_LIBRARY_PATH = "$LD_LIBRARY_PATH:/home/cpu2017.1.0.2.ic18.0/je5.0.1-32:/home/cpu2017.1.0.2.ic18.0/je5.0.1-64"
OMP_STACKSIZE = "192M"

 Binaries compiled on a system with 1x Intel Core i7-4790 CPU + 32GB RAM
 memory using Redhat Enterprise Linux 7.4
```

(Continued on next page)

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General Notes (Continued)

```
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
```

Platform Notes

```
BIOS configuration:
Choose Operating Mode set to Maximum Performance
SNC set to Enable
DCU Streamer Prefetcher set to Disable
MONITORMWAIT set to Enable
Execute Disable Bit set to Disable
XPT Prefetcher set to Enable
DCA set to Enable
 Sysinfo program /home/cpu2017.1.0.2.ic18.0/bin/sysinfo
 Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618bcc091c0f
 running on linux-ciok Tue Oct 24 22:01:24 2017

 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 8168 CPU @ 2.70GHz
       4  "physical id"s (chips)
       192 "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 : 24
       siblings  : 48
       physical 0: cores 0 1 2 3 4 5 8 9 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29
       physical 1: cores 0 1 2 3 4 5 8 9 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29
       physical 2: cores 0 1 2 3 4 5 8 9 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29
       physical 3: cores 0 1 2 3 4 5 8 9 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29

 From lscpu:
    Architecture:          x86_64
    CPU op-mode(s):        32-bit, 64-bit
    Byte Order:            Little Endian
    CPU(s):                192
    On-line CPU(s) list:   0-191
    Thread(s) per core:    2
    Core(s) per socket:    24
    Socket(s):             4
    NUMA node(s):          8
```

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Lenovo Global Technology

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CPU2017 License:	9017	**Test Date:**	Oct-2017
Test Sponsor:	Lenovo Global Technology	**Hardware Availability:**	Sep-2017
Tested by:	Lenovo Global Technology	**Software Availability:**	Sep-2017

Platform Notes (Continued)

```
        Vendor ID:              GenuineIntel
        CPU family:             6
        Model:                  85
        Model name:             Intel(R) Xeon(R) Platinum 8168 CPU @ 2.70GHz
        Stepping:               4
        CPU MHz:                2693.684
        BogoMIPS:               5387.36
        Virtualization:         VT-x
        L1d cache:              32K
        L1i cache:              32K
        L2 cache:               1024K
        L3 cache:               33792K
        NUMA node0 CPU(s):      0-2,6-8,12-14,18-20,96-98,102-104,108-110,114-116
        NUMA node1 CPU(s):      3-5,9-11,15-17,21-23,99-101,105-107,111-113,117-119
        NUMA node2 CPU(s):      24-26,30-32,36-38,42-44,120-122,126-128,132-134,138-140
        NUMA node3 CPU(s):      27-29,33-35,39-41,45-47,123-125,129-131,135-137,141-143
        NUMA node4 CPU(s):      48-50,54-56,60-62,66-68,144-146,150-152,156-158,162-164
        NUMA node5 CPU(s):      51-53,57-59,63-65,69-71,147-149,153-155,159-161,165-167
        NUMA node6 CPU(s):      72-74,78-80,84-86,90-92,168-170,174-176,180-182,186-188
        NUMA node7 CPU(s):      75-77,81-83,87-89,93-95,171-173,177-179,183-185,189-191
        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 pln pts dtherm intel_pt
    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

 /proc/cpuinfo cache data
    cache size : 33792 KB

 From numactl --hardware  WARNING: a numactl 'node' might or might not correspond to a
 physical chip.
    available: 8 nodes (0-7)
    node 0 cpus: 0 1 2 6 7 8 12 13 14 18 19 20 96 97 98 102 103 104 108 109 110 114 115 116
    node 0 size: 192979 MB
    node 0 free: 192400 MB
    node 1 cpus: 3 4 5 9 10 11 15 16 17 21 22 23 99 100 101 105 106 107 111 112 113 117 118
    119
    node 1 size: 193521 MB
    node 1 free: 192553 MB
    node 2 cpus: 24 25 26 30 31 32 36 37 38 42 43 44 120 121 122 126 127 128 132 133 134
    138 139 140
    node 2 size: 193521 MB
    node 2 free: 192963 MB
```

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Platform Notes (Continued)

```
   node 3 cpus: 27 28 29 33 34 35 39 40 41 45 46 47 123 124 125 129 130 131 135 136 137
   141 142 143
   node 3 size: 193521 MB
   node 3 free: 184467 MB
   node 4 cpus: 48 49 50 54 55 56 60 61 62 66 67 68 144 145 146 150 151 152 156 157 158
   162 163 164
   node 4 size: 193521 MB
   node 4 free: 187946 MB
   node 5 cpus: 51 52 53 57 58 59 63 64 65 69 70 71 147 148 149 153 154 155 159 160 161
   165 166 167
   node 5 size: 193521 MB
   node 5 free: 192935 MB
   node 6 cpus: 72 73 74 78 79 80 84 85 86 90 91 92 168 169 170 174 175 176 180 181 182
   186 187 188
   node 6 size: 193521 MB
   node 6 free: 192980 MB
   node 7 cpus: 75 76 77 81 82 83 87 88 89 93 94 95 171 172 173 177 178 179 183 184 185
   189 190 191
   node 7 size: 193516 MB
   node 7 free: 192980 MB
   node distances:
   node   0   1   2   3   4   5   6   7
     0:  10  11  21  21  21  21  21  21
     1:  11  10  21  21  21  21  21  21
     2:  21  21  10  11  21  21  21  21
     3:  21  21  11  10  21  21  21  21
     4:  21  21  21  21  10  11  21  21
     5:  21  21  21  21  11  10  21  21
     6:  21  21  21  21  21  21  10  11
     7:  21  21  21  21  21  21  11  10

 From /proc/meminfo
    MemTotal:       1584766272 kB
    HugePages_Total:        0
    Hugepagesize:        2048 kB

 From /etc/*release* /etc/*version*
    SuSE-release:
       SUSE Linux Enterprise Server 12 (x86_64)
       VERSION = 12
       PATCHLEVEL = 2
       # 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-SP2"
       VERSION_ID="12.2"
```

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Platform Notes (Continued)

```
          PRETTY_NAME="SUSE Linux Enterprise Server 12 SP2"
          ID="sles"
          ANSI_COLOR="0;32"
          CPE_NAME="cpe:/o:suse:sles:12:sp2"

   uname -a:
      Linux linux-ciok 4.4.21-69-default #1 SMP Tue Oct 25 10:58:20 UTC 2016 (9464f67)
      x86_64 x86_64 x86_64 GNU/Linux

   run-level 3 Oct 24 21:59

   SPEC is set to: /home/cpu2017.1.0.2.ic18.0
      Filesystem      Type   Size  Used Avail Use% Mounted on
      tmpfs           tmpfs  800G   11G  790G   2% /home

   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 Lenovo -[PSE105X-1.00]- 08/17/2017
      Memory:
       48x NO DIMM NO DIMM
       48x Samsung M393A4K40BB2-CTD 32 GB 2 rank 2666

   (End of data from sysinfo program)
```

Compiler Version Notes

```
==============================================================================
  CC  500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base, peak)
      525.x264_r(base, peak) 557.xz_r(base, peak)
------------------------------------------------------------------------------
icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------


==============================================================================
  CC   500.perlbench_r(peak) 502.gcc_r(peak)
------------------------------------------------------------------------------
icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------


==============================================================================
  CXXC 520.omnetpp_r(base) 523.xalancbmk_r(base) 531.deepsjeng_r(base)
       541.leela_r(base)
```

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

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Compiler Version Notes (Continued)

```
-------------------------------------------------------------------------
icpc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation.  All rights reserved.
-------------------------------------------------------------------------


==========================================================================
CXXC 520.omnetpp_r(peak) 523.xalancbmk_r(peak) 531.deepsjeng_r(peak)
     541.leela_r(peak)
-------------------------------------------------------------------------
icpc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation.  All rights reserved.
-------------------------------------------------------------------------


==========================================================================
 FC  548.exchange2_r(base, peak)
-------------------------------------------------------------------------
ifort (IFORT) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation.  All rights reserved.
-------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:
`icc`

C++ benchmarks:
`icpc`

Fortran benchmarks:
`ifort`

Base Portability Flags

500.perlbench_r: `-DSPEC_LP64 -DSPEC_LINUX_X64`
502.gcc_r: `-DSPEC_LP64`
505.mcf_r: `-DSPEC_LP64`
520.omnetpp_r: `-DSPEC_LP64`
523.xalancbmk_r: `-DSPEC_LP64 -DSPEC_LINUX`
525.x264_r: `-DSPEC_LP64`
531.deepsjeng_r: `-DSPEC_LP64`
541.leela_r: `-DSPEC_LP64`
548.exchange2_r: `-DSPEC_LP64`
557.xz_r: `-DSPEC_LP64`

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Base Optimization Flags

C benchmarks:
```
-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=3 -L/usr/local/je5.0.1-64/lib -ljemalloc
```

C++ benchmarks:
```
-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=3 -L/usr/local/je5.0.1-64/lib -ljemalloc
```

Fortran benchmarks:
```
-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=3 -nostandard-realloc-lhs -align array32byte
-L/usr/local/je5.0.1-64/lib -ljemalloc
```

Base Other Flags

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

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

Fortran benchmarks:
```
-m64
```

Peak Compiler Invocation

C benchmarks:
```
icc
```

C++ benchmarks:
```
icpc
```

Fortran benchmarks:
```
ifort
```

Peak Portability Flags

500.perlbench_r: `-DSPEC_LP64 -DSPEC_LINUX_X64`
502.gcc_r: `-D_FILE_OFFSET_BITS=64`

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Peak Portability Flags (Continued)

505.mcf_r: `-DSPEC_LP64`
520.omnetpp_r: `-DSPEC_LP64`
523.xalancbmk_r: `-D_FILE_OFFSET_BITS=64 -DSPEC_LINUX`
525.x264_r: `-DSPEC_LP64`
531.deepsjeng_r: `-DSPEC_LP64`
541.leela_r: `-DSPEC_LP64`
548.exchange2_r: `-DSPEC_LP64`
557.xz_r: `-DSPEC_LP64`

Peak Optimization Flags

C benchmarks:

500.perlbench_r: `-Wl,-z,muldefs` -prof-gen(pass 1) -prof-use(pass 2) `-ipo`
`-xCORE-AVX512 -O3 -no-prec-div -qopt-mem-layout-trans=3`
`-fno-strict-overflow -L/usr/local/je5.0.1-64/lib`
`-ljemalloc`

502.gcc_r: `-L/opt/intel/compilers_and_libraries_2018/linux/lib/ia32`
`-Wl,-z,muldefs` -prof-gen(pass 1) -prof-use(pass 2) `-ipo`
`-xCORE-AVX512 -O3 -no-prec-div -qopt-mem-layout-trans=3`
`-L/usr/local/je5.0.1-32/lib -ljemalloc`

505.mcf_r: `-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div`
`-qopt-mem-layout-trans=3 -L/usr/local/je5.0.1-64/lib`
`-ljemalloc`

525.x264_r: `-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div`
`-qopt-mem-layout-trans=3 -fno-alias`
`-L/usr/local/je5.0.1-64/lib -ljemalloc`

557.xz_r: `Same as 505.mcf_r`

C++ benchmarks:

520.omnetpp_r: `-Wl,-z,muldefs` -prof-gen(pass 1) -prof-use(pass 2) `-ipo`
`-xCORE-AVX512 -O3 -no-prec-div -qopt-mem-layout-trans=3`
`-L/usr/local/je5.0.1-64/lib -ljemalloc`

523.xalancbmk_r: `-L/opt/intel/compilers_and_libraries_2018/linux/lib/ia32`
`-Wl,-z,muldefs` -prof-gen(pass 1) -prof-use(pass 2) `-ipo`
`-xCORE-AVX512 -O3 -no-prec-div -qopt-mem-layout-trans=3`
`-L/usr/local/je5.0.1-32/lib -ljemalloc`

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Peak Optimization Flags (Continued)

531.deepsjeng_r: `Same as 520.omnetpp_r`

541.leela_r: `Same as 520.omnetpp_r`

Fortran benchmarks:
```
-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=3 -nostandard-realloc-lhs -align array32byte
-L/usr/local/je5.0.1-64/lib -ljemalloc
```

Peak Other Flags

C benchmarks (except as noted below):
```
-m64 -std=c11
```

502.gcc_r: `-m32 -std=c11`

C++ benchmarks (except as noted below):
```
-m64
```

523.xalancbmk_r: `-m32`

Fortran benchmarks:
```
-m64
```

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/Intel-ic18.0-official-linux64.html
http://www.spec.org/cpu2017/flags/Lenovo-Platform-Flags-V1.2-SKL-E.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/Intel-ic18.0-official-linux64.xml
http://www.spec.org/cpu2017/flags/Lenovo-Platform-Flags-V1.2-SKL-E.xml

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

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