## Lenovo Global Technology

ThinkSystem SN550  
(2.10 GHz, Intel Xeon Silver 4116)

<table>
<thead>
<tr>
<th>CPU2017 License:</th>
<th>9017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Sponsor:</td>
<td>Lenovo Global Technology</td>
</tr>
<tr>
<td>Tested by:</td>
<td>Lenovo Global Technology</td>
</tr>
</tbody>
</table>

**SPECrater2017_int_base = 109**  
**SPECrater2017_int_peak = 116**

### Hardware

<table>
<thead>
<tr>
<th>Name</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU Name</td>
<td>Intel Xeon Silver 4116</td>
</tr>
<tr>
<td>Max MHz.</td>
<td>3000</td>
</tr>
<tr>
<td>Nominal</td>
<td>2100</td>
</tr>
<tr>
<td>Enabled</td>
<td>24 cores, 2 chips, 2 threads/core</td>
</tr>
<tr>
<td>Orderable</td>
<td>1.2 chips</td>
</tr>
<tr>
<td>Cache L1</td>
<td>32 KB I + 32 KB D on chip per core</td>
</tr>
<tr>
<td>L2</td>
<td>1 MB I+D on chip per core</td>
</tr>
<tr>
<td>L3</td>
<td>16.5 MB I+D on chip per chip</td>
</tr>
<tr>
<td>Other</td>
<td>None</td>
</tr>
<tr>
<td>Memory</td>
<td>768 GB (24 x 32 GB 2Rx4 PC4-2666V-R, running at 2400)</td>
</tr>
<tr>
<td>Storage</td>
<td>1 x 800 GB SAS SSD</td>
</tr>
<tr>
<td>Other</td>
<td>None</td>
</tr>
</tbody>
</table>

### Software

<table>
<thead>
<tr>
<th>Name</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>OS</td>
<td>SUSE Linux Enterprise Server 12 SP2 (x86_64)</td>
</tr>
<tr>
<td>Compiler</td>
<td>C/C++: Version 18.0.0.128 of Intel C/C++</td>
</tr>
<tr>
<td>Parallel</td>
<td>No</td>
</tr>
<tr>
<td>Firmware</td>
<td>Lenovo BIOS Version IVE1111 1.01 released Aug-2017</td>
</tr>
<tr>
<td>File System</td>
<td>xfs</td>
</tr>
<tr>
<td>System State</td>
<td>Run level 3 (multi-user)</td>
</tr>
<tr>
<td>Base Pointers</td>
<td>64-bit</td>
</tr>
<tr>
<td>Peak Pointers</td>
<td>32/64-bit</td>
</tr>
<tr>
<td>Other</td>
<td>jemalloc: jemalloc memory allocator library V5.0.1</td>
</tr>
</tbody>
</table>
## Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Copies</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>500.perlbench_r</td>
<td>48</td>
<td>913</td>
<td>83.7</td>
<td>919</td>
<td>83.2</td>
<td>920</td>
<td>83.0</td>
<td>48</td>
<td>750</td>
<td>102</td>
<td>748</td>
<td>102</td>
<td>750</td>
<td>102</td>
</tr>
<tr>
<td>502.gcc_r</td>
<td>48</td>
<td>698</td>
<td>97.3</td>
<td>699</td>
<td>97.2</td>
<td>698</td>
<td>97.3</td>
<td>48</td>
<td>592</td>
<td>115</td>
<td>594</td>
<td>114</td>
<td>593</td>
<td>115</td>
</tr>
<tr>
<td>505.mcf_r</td>
<td>48</td>
<td>563</td>
<td>138</td>
<td>555</td>
<td>140</td>
<td>571</td>
<td>136</td>
<td>48</td>
<td>572</td>
<td>136</td>
<td>559</td>
<td>139</td>
<td>570</td>
<td>136</td>
</tr>
<tr>
<td>520.omnetpp_r</td>
<td>48</td>
<td>885</td>
<td>71.1</td>
<td>879</td>
<td>71.6</td>
<td>877</td>
<td>71.8</td>
<td>48</td>
<td>876</td>
<td>71.9</td>
<td>874</td>
<td>72.1</td>
<td>875</td>
<td>72.0</td>
</tr>
<tr>
<td>523.xalancbmk_r</td>
<td>48</td>
<td>459</td>
<td>110</td>
<td>461</td>
<td>110</td>
<td>460</td>
<td>110</td>
<td>48</td>
<td>381</td>
<td>133</td>
<td>381</td>
<td>133</td>
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<td>133</td>
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<tr>
<td>525.x264_r</td>
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<td>408</td>
<td>206</td>
<td>402</td>
<td>209</td>
<td>407</td>
<td>206</td>
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<td>388</td>
<td>217</td>
<td>387</td>
<td>216</td>
<td>388</td>
<td>217</td>
</tr>
<tr>
<td>531.deepsjeng_r</td>
<td>48</td>
<td>575</td>
<td>95.7</td>
<td>575</td>
<td>95.7</td>
<td>574</td>
<td>95.8</td>
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<td>577</td>
<td>95.4</td>
<td>577</td>
<td>95.4</td>
<td>577</td>
<td>95.3</td>
</tr>
<tr>
<td>541.leela_r</td>
<td>48</td>
<td>923</td>
<td>86.1</td>
<td>939</td>
<td>84.7</td>
<td>922</td>
<td>86.2</td>
<td>48</td>
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<td>87.7</td>
<td>914</td>
<td>86.9</td>
<td>922</td>
<td>86.2</td>
</tr>
<tr>
<td>557.xz_r</td>
<td>48</td>
<td>638</td>
<td>81.3</td>
<td>639</td>
<td>81.2</td>
<td>639</td>
<td>81.1</td>
<td>48</td>
<td>638</td>
<td>81.3</td>
<td>638</td>
<td>81.3</td>
<td>638</td>
<td>81.3</td>
</tr>
</tbody>
</table>

**SPECrate2017_int_base = 109**  
**SPECrate2017_int_peak = 116**

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 = "/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"`

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

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>`

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;
Lenovo Global Technology
ThinkSystem SN550 (2.10 GHz, Intel Xeon Silver 4116)

SPECrater2017_int_base = 109
SPECrater2017_int_peak = 116

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

Test Date: Jan-2018
Hardware Availability: Aug-2017
Software Availability: Sep-2017

General Notes (Continued)

No: The test sponsor attests, as of date of publication, that CVE-2017-5754 (Meltdown) is mitigated in the system as tested and documented.
No: 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.
No: 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.
This benchmark result is intended to provide perspective on past performance using the historical hardware and/or software described on this result page.
The system as described on this result page was formerly generally available. At the time of this publication, it may not be shipping, and/or may not be supported, and/or may fail to meet other tests of General Availability described in the SPEC OSG Policy document, http://www.spec.org/osg/policy.html
This measured result may not be representative of the result that would be measured were this benchmark run with hardware and software available as of the publication date.

Platform Notes

BIOS configuration:
Choose Operating Mode set to Maximum Performance
SNC set to Enable
Hardware Prefetcher set to Disable
.MONITORMWAIT set to Enable
Execute Disable Bit set to Disable
Intel Virtualization Technology set to Disable
DCA set to Enable
Sysinfo program /home/cpu2017.1.0.2.ic18.0/bin/sysinfo
Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618b091c0f
running on SN550 Sat Jan 27 13:07:56 2018

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) Silver 4116 CPU @ 2.10GHz
2 "physical id"s (chips)
48 "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 : 12
siblings : 24
physical 0: cores 0 1 2 3 4 5 8 9 10 11 12 13
physical 1: cores 0 1 2 3 4 5 8 9 10 11 12 13

(Continued on next page)
Lenovo Global Technology

ThinkSystem SN550
(2.10 GHz, Intel Xeon Silver 4116)

**SPECrate2017_int_base** = 109
**SPECrate2017_int_peak** = 116

---

**CPU2017 License:** 9017  
**Test Sponsor:** Lenovo Global Technology  
**Tested by:** Lenovo Global Technology  
**Test Date:** Jan-2018  
**Hardware Availability:** Aug-2017  
**Software Availability:** Sep-2017

---

**Platform Notes (Continued)**

From `lscpu`:
- **Architecture:** x86_64
- **CPU op-mode(s):** 32-bit, 64-bit
- **Byte Order:** Little Endian
- **CPU(s):** 48
- **On-line CPU(s) list:** 0-47
- **Thread(s) per core:** 2
- **Core(s) per socket:** 12
- **Socket(s):** 2
- **NUMA node(s):** 2
- **Vendor ID:** GenuineIntel
- **CPU family:** 6
- **Model:** 85
- **Model name:** Intel(R) Xeon(R) Silver 4116 CPU @ 2.10GHz
- **Stepping:** 4
- **CPU MHz:** 2095.085
- **BogoMIPS:** 4190.17
- **Virtualization:** VT-x
- **L1d cache:** 32K
- **L1i cache:** 32K
- **L2 cache:** 1024K
- **L3 cache:** 16896K
- **NUMA node0 CPU(s):** 0-11, 24-35
- **NUMA node1 CPU(s):** 12-23, 36-47
- **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 arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc aperffmperf eagerfpu pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtpmr pdcm pcid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c rdrand lahf_lm abm 3nowprefetch ida arat epb pln pts dtherm tsc_ipl tpr_shadow vnmi flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 3dnowprefetch ida arat epb pln pts dtherm intel_pt tpr_shadow vnmi flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 3dnowprefetch ida arat epb pln pts dtherm intel_pt tpr_shadow vnmi flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 3dnowprefetch ida arat epb pln pts dtherm intel_pt tpr_shadow vnmi flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2

```
From numactl --hardware  
WARNING: a numactl 'node' might or might not correspond to a physical chip.
```

```
available: 2 nodes (0-1)  
node 0 cpus: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35
node 0 size: 386637 MB  
node 0 free: 385149 MB  
node 1 cpus: 12 13 14 15 16 17 18 19 20 21 22 23 26 27 28 29 30 31 32 33 34 35  
node 1 size: 387040 MB  
node 1 free: 385692 MB
```

(Continued on next page)
## Platform Notes (Continued)

node distances:

<table>
<thead>
<tr>
<th>node</th>
<th>0</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>0:</td>
<td>10</td>
<td>21</td>
</tr>
<tr>
<td>1:</td>
<td>21</td>
<td>10</td>
</tr>
</tbody>
</table>

From /proc/meminfo

- MemTotal: 792245524 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"
  - 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 SN550 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 Jan 27 09:40

SPEC is set to: /home/cpu2017.1.0.2.ic18.0

<table>
<thead>
<tr>
<th>Filesystem</th>
<th>Type</th>
<th>Size</th>
<th>Used</th>
<th>Avail</th>
<th>Use%</th>
<th>Mounted on</th>
</tr>
</thead>
<tbody>
<tr>
<td>/dev/sda4</td>
<td>xfs</td>
<td>687G</td>
<td>136G</td>
<td>552G</td>
<td>20%</td>
<td>/home</td>
</tr>
</tbody>
</table>

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 -[IVE111I-1.01]- 08/11/2017
- Memory:
  - 24x Samsung M393A4K40BB2-CTD 32 GB 2 rank 2666, configured at 2400

(End of data from sysinfo program)
Lenovo Global Technology
ThinkSystem SN550
(2.10 GHz, Intel Xeon Silver 4116)

SPEC CPU2017 Integer Rate Result

SPECrate2017_int_base = 109
SPECrate2017_int_peak = 116

Copyright 2017-2018 Standard Performance Evaluation Corporation

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

Test Date: Jan-2018
Hardware Availability: Aug-2017
Software Availability: Sep-2017

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)
------------------------------------------------------------------------------
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)
cfgf (IFORT) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------

Base Compiler Invocation

C benchmarks:
  icc

C++ benchmarks:
  icpc
## Lenovo Global Technology

**ThinkSystem SN550**  
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<table>
<thead>
<tr>
<th>SPECrate2017_int_base</th>
<th>109</th>
</tr>
</thead>
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<tr>
<td>SPECrate2017_int_peak</td>
<td>116</td>
</tr>
</tbody>
</table>

**CPU2017 License:** 9017  
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### Base Compiler Invocation (Continued)

- **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

### Base Optimization Flags

**C benchmarks:**
- -W1,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div
- -qopt-mem-layout-trans=3 -L/usr/local/je5.0.1-64/lib -ljemalloc

**C++ benchmarks:**
- -W1,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div
- -qopt-mem-layout-trans=3 -L/usr/local/je5.0.1-64/lib -ljemalloc

**Fortran benchmarks:**
- -W1,-z,muldefs -xCORE-AVX2 -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
SPEC CPU2017 Integer Rate Result

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Test Date: Jan-2018
Hardware Availability: Aug-2017
Software Availability: Sep-2017

Base Other Flags (Continued)

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
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
532.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-AVX2 -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-AVX2 -O3 -no-prec-div -qopt-mem-layout-trans=3
-L/usr/local/je5.0.1-32/lib -ljemalloc

(Continued on next page)
Lenovo Global Technology
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SPECrate2017_int_base = 109
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Peak Optimization Flags (Continued)

505.mcf_r: -Wl,-z,muldefs -xCORE-AVX2 -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-AVX2 -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-AVX2 -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-AVX2 -O3 -no-prec-div -qopt-mem-layout-trans=3
-L/usr/local/je5.0.1-32/lib -ljemalloc

531.deepsjeng_r: Same as 520.omnetpp_r

541.leela_r: Same as 520.omnetpp_r

Fortran benchmarks:

-Wl,-z,muldefs -xCORE-AVX2 -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

(Continued on next page)
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<table>
<thead>
<tr>
<th>SPECrate2017_int_base = 109</th>
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<td><strong>Software Availability:</strong> Sep-2017</td>
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### Peak Other Flags (Continued)

- Fortran benchmarks:  
  - `-m64`

The flags files that were used to format this result can be browsed at:

- [Intel-ic18.0-official-linux64.html](http://www.spec.org/cpu2017/flags/Intel-ic18.0-official-linux64.html)

You can also download the XML flags sources by saving the following links:

- [Intel-ic18.0-official-linux64.xml](http://www.spec.org/cpu2017/flags/Intel-ic18.0-official-linux64.xml)
- [Lenovo-Platform-SPECcpu2017-Flags-V1.2-SKL-A.xml](http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-SKL-A.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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