SPEC CPU®2017 Integer Rate Result

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xFusion

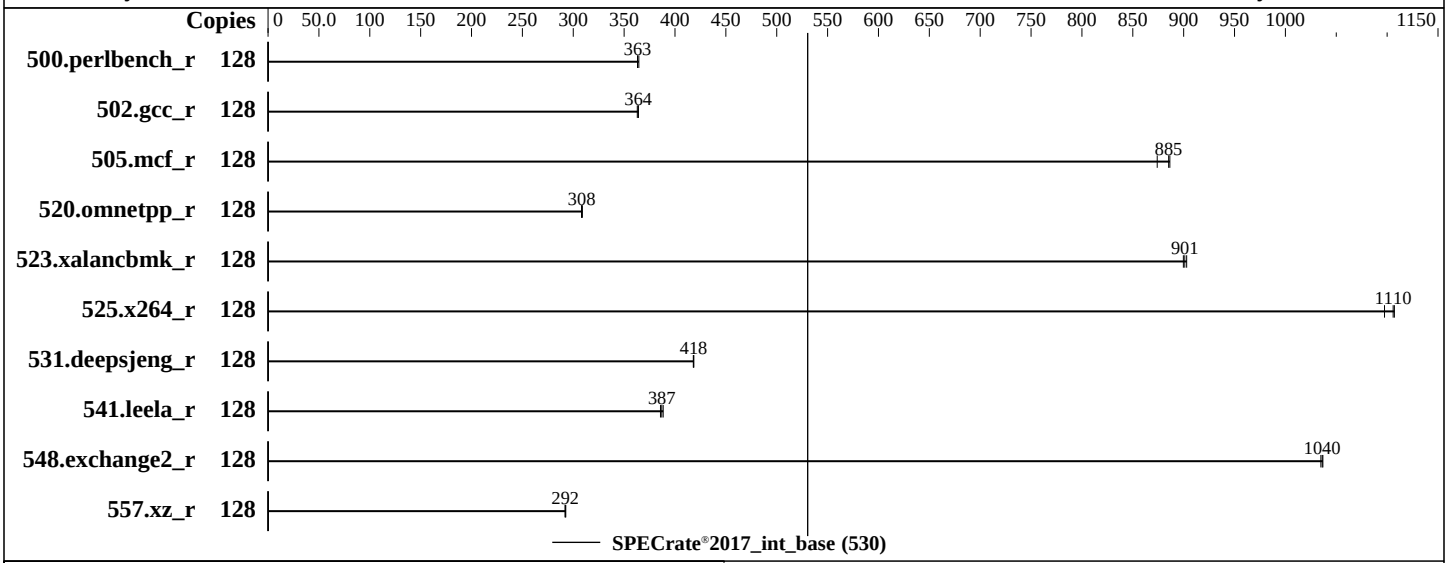
FusionServer 2488H V6 (Intel Xeon Gold 6328H)

SPECrate®2017_int_base = 530

SPECrate®2017_int_peak = Not Run

CPU2017 License: 6488
Test Sponsor: xFusion
Tested by: xFusion

Test Date: May-2023
Hardware Availability: Sep-2020
Software Availability: Dec-2022



Hardware

CPU Name:	Intel Xeon Gold 6328H
Max MHz:	4300
Nominal:	2800
Enabled:	64 cores, 4 chips, 2 threads/core
Orderable:	1,2,4 chips
Cache L1:	32 KB I + 32 KB D on chip per core
L2:	1 MB I+D on chip per core
L3:	22 MB I+D on chip per chip
Other:	None
Memory:	1536 GB (48 x 32 GB 2Rx8 PC4-3200AA-R, running at 2933)
Storage:	1 x 480 GB SATA SSD
Other:	None

Software

OS:	Red Hat Enterprise Linux 8.4 (Ootpa) 4.18.0-305.el8.x86_64
Compiler:	C/C++: Version 2023.0 of Intel oneAPI DPC++/C++ Compiler for Linux; Fortran: Version 2023.0 of Intel Fortran Compiler for Linux;
Parallel:	No
Firmware:	Version 1.03 Released Feb-2023
File System:	xfs
System State:	Run level 3 (multi-user)
Base Pointers:	64-bit
Peak Pointers:	Not Applicable
Other:	None
Power Management:	BIOS and OS set to prefer performance at the cost of additional power usage

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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	128	**561**	**363**	559	364	561	363							
502.gcc_r	128	499	363	**498**	**364**	498	364							
505.mcf_r	128	237	874	233	886	**234**	**885**							
520.omnetpp_r	128	545	308	**545**	**308**	544	309							
523.xalancbmk_r	128	**150**	**901**	150	903	150	900							
525.x264_r	128	204	1100	**203**	**1110**	202	1110							
531.deepsjeng_r	128	**351**	**418**	351	418	351	418							
541.leela_r	128	550	386	546	388	**548**	**387**							
548.exchange2_r	128	**324**	**1040**	324	1030	323	1040							
557.xz_r	128	472	293	474	292	**473**	**292**							

SPECrate®2017_int_base = 530

SPECrate®2017_int_peak = Not Run

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

Compiler Notes

```
SPEC has ruled that the compiler used for this result was performing a compilation
that specifically improves the performance of the 523.xalancbmk_r / 623.xalancbmk_s
benchmarks using a priori knowledge of the SPEC code and dataset to perform a
transformation that has narrow applicability.

In order to encourage optimizations that have wide applicability (see rule 1.4
https://www.spec.org/cpu2017/Docs/runrules.html#rule_1.4), SPEC will no longer
publish results using this optimization.

This result is left in the SPEC results database for historical reference.
```

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"
```

Environment Variables Notes

```
Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH = "/home/speccpu/lib/intel64:/home/speccpu/lib/ia32:/home/speccpu/je5.0.1-32"
MALLOC_CONF = "retain:true"
```

General Notes

```
Binaries compiled on a system with 2x Intel Xeon Platinum 8280M CPU + 384GB RAM
memory using Red Hat Enterprise Linux 8.4
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>
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.
```

Platform Notes

```
BIOS configuration:
Performance Profile Set to Performance
SNC Set to Enable SNC2 (2-clusters)

Sysinfo program /home/speccpu/bin/sysinfo
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
running on localhost.localdomain Mon May 22 17:55:43 2023

SUT (System Under Test) info as seen by some common utilities.

------------------------------------------------------------
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------------------------------------------------------------
 1. uname -a
 2. w
 3. Username
 4. ulimit -a
 5. sysinfo process ancestry
 6. /proc/cpuinfo
 7. lscpu
 8. numactl --hardware
 9. /proc/meminfo
10. who -r
11. Systemd service manager version: systemd 239 (239-45.el8)
12. Services, from systemctl list-unit-files
13. Linux kernel boot-time arguments, from /proc/cmdline
14. cpupower frequency-info
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16. sysctl
17. /sys/kernel/mm/transparent_hugepage
18. /sys/kernel/mm/transparent_hugepage/khugepaged
19. OS release
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21. Disk information
22. /sys/devices/virtual/dmi/id
23. dmidecode
24. BIOS
------------------------------------------------------------

------------------------------------------------------------
1. 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
```

(Continued on next page)

Platform Notes (Continued)

```
  GNU/Linux

------------------------------------------------------------
2. w
   17:55:43 up 3 min,  1 user,  load average: 0.01, 0.05, 0.02
  USER     TTY      FROM             LOGIN@   IDLE   JCPU   PCPU WHAT
  root     pts/0    172.166.0.211    17:53    1:03   1.25s  0.00s tail -f nohup.out

------------------------------------------------------------
3. Username
  From environment variable $USER:  root

------------------------------------------------------------
4. ulimit -a
  core file size          (blocks, -c) unlimited
  data seg size           (kbytes, -d) unlimited
  scheduling priority             (-e) 0
  file size               (blocks, -f) unlimited
  pending signals                 (-i) 6185112
  max locked memory       (kbytes, -l) 64
  max memory size         (kbytes, -m) unlimited
  open files                      (-n) 1024
  pipe size            (512 bytes, -p) 8
  POSIX message queues     (bytes, -q) 819200
  real-time priority              (-r) 0
  stack size              (kbytes, -s) unlimited
  cpu time               (seconds, -t) unlimited
  max user processes              (-u) 6185112
  virtual memory          (kbytes, -v) unlimited
  file locks                      (-x) unlimited

------------------------------------------------------------
5. sysinfo process ancestry
 /usr/lib/systemd/systemd --switched-root --system --deserialize 17
 /usr/sbin/sshd -D
   -oCiphers=aes256-gcm@openssh.com,chacha20-poly1305@openssh.com,aes256-ctr,aes256-cbc,aes128-gcm@openssh.co
   m,aes128-ctr,aes128-cbc
   -oMACs=hmac-sha2-256-etm@openssh.com,hmac-sha1-etm@openssh.com,umac-128-etm@openssh.com,hmac-sha2-512-etm@
   openssh.com,hmac-sha2-256,hmac-sha1,umac-128@openssh.com,hmac-sha2-512...
 sshd: root [priv]
 sshd: root@pts/0
 -bash
 bash test-rate-cpu2017.sh
 runcpu --define default-platform-flags --copies 128 -c ic2023.0-lin-core-avx512-rate-20221201.cfg --define
   smt-on --define cores=64 --define physicalfirst --define invoke_with_interleave --define drop_caches
   --tune base -o all intrate
 runcpu --define default-platform-flags --copies 128 --configfile ic2023.0-lin-core-avx512-rate-20221201.cfg
   --define smt-on --define cores=64 --define physicalfirst --define invoke_with_interleave --define
   drop_caches --tune base --output_format all --nopower --runmode rate --tune base --size refrate intrate
   --nopreenv --note-preenv --logfile $SPEC/tmp/CPU2017.002/templogs/preenv.intrate.002.0.log --lognum 002.0
   --from_runcpu 2
 specperl $SPEC/bin/sysinfo
$SPEC = /home/speccpu

------------------------------------------------------------
6. /proc/cpuinfo
    model name      : Intel(R) Xeon(R) Gold 6328H CPU @ 2.80GHz
    vendor_id       : GenuineIntel
    cpu family      : 6
    model           : 85
```

(Continued on next page)

Platform Notes (Continued)

```
     stepping        : 11
     microcode       : 0x7002302
     bugs            : spectre_v1 spectre_v2 spec_store_bypass swapgs
     cpu cores       : 16
     siblings        : 32
     4 physical ids (chips)
     128 processors (hardware threads)
     physical id 0: core ids 0-15
     physical id 1: core ids 0-15
     physical id 2: core ids 0-15
     physical id 3: core ids 0-15
     physical id 0: apicids 0-31
     physical id 1: apicids 32-63
     physical id 2: apicids 64-95
     physical id 3: apicids 96-127
   Caution: /proc/cpuinfo data regarding chips, cores, and threads is not necessarily reliable, especially for
   virtualized systems.  Use the above data carefully.

 ------------------------------------------------------------
 7. lscpu

 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):              128
   On-line CPU(s) list: 0-127
   Thread(s) per core:  2
   Core(s) per socket:  16
   Socket(s):           4
   NUMA node(s):        8
   Vendor ID:           GenuineIntel
   BIOS Vendor ID:      Intel(R) Corporation
   CPU family:          6
   Model:               85
   Model name:          Intel(R) Xeon(R) Gold 6328H CPU @ 2.80GHz
   BIOS Model name:     Intel(R) Xeon(R) Gold 6328H CPU @ 2.80GHz
   Stepping:            11
   CPU MHz:             3699.633
   BogoMIPS:            5600.00
   Virtualization:      VT-x
   L1d cache:           32K
   L1i cache:           32K
   L2 cache:            1024K
   L3 cache:            22528K
   NUMA node0 CPU(s):   0-3,8-11,64-67,72-75
   NUMA node1 CPU(s):   4-7,12-15,68-71,76-79
   NUMA node2 CPU(s):   16-19,24-27,80-83,88-91
   NUMA node3 CPU(s):   20-23,28-31,84-87,92-95
   NUMA node4 CPU(s):   32-35,40-43,96-99,104-107
   NUMA node5 CPU(s):   36-39,44-47,100-103,108-111
   NUMA node6 CPU(s):   48-51,56-59,112-115,120-123
   NUMA node7 CPU(s):   52-55,60-63,116-119,124-127
   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 pni
                        pclmulqdq dtes64 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 cpuid_fault epb cat_l3 cdp_l3 invpcid_single ssbd mba ibrs ibpb stibp
                        ibrs_enhanced tpr_shadow vnmi flexpriority ept vpid ept_ad fsgsbase tsc_adjust bmi1
```

(Continued on next page)

Platform Notes (Continued)

```
                    hle avx2 smep bmi2 erms invpcid cqm mpx rdt_a avx512f avx512dq rdseed adx smap
                    clflushopt clwb intel_pt avx512cd avx512bw avx512vl xsaveopt xsavec xgetbv1 xsaves
                    cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local avx512_bf16 dtherm ida arat pln pts
                    hwp_epp pku ospke avx512_vnni md_clear flush_l1d arch_capabilities

------------------------------------------------------------
8. numactl --hardware
NOTE: a numactl 'node' might or might not correspond to a physical chip.
  available: 8 nodes (0-7)
  node 0 cpus: 0-3,8-11,64-67,72-75
  node 0 size: 191590 MB
  node 0 free: 190726 MB
  node 1 cpus: 4-7,12-15,68-71,76-79
  node 1 size: 193532 MB
  node 1 free: 193115 MB
  node 2 cpus: 16-19,24-27,80-83,88-91
  node 2 size: 193532 MB
  node 2 free: 193232 MB
  node 3 cpus: 20-23,28-31,84-87,92-95
  node 3 size: 193532 MB
  node 3 free: 192604 MB
  node 4 cpus: 32-35,40-43,96-99,104-107
  node 4 size: 193532 MB
  node 4 free: 193172 MB
  node 5 cpus: 36-39,44-47,100-103,108-111
  node 5 size: 193532 MB
  node 5 free: 193177 MB
  node 6 cpus: 48-51,56-59,112-115,120-123
  node 6 size: 193532 MB
  node 6 free: 193241 MB
  node 7 cpus: 52-55,60-63,116-119,124-127
  node 7 size: 193531 MB
  node 7 free: 193073 MB
  node distances:
  node   0   1   2   3   4   5   6   7
    0:  10  11  20  20  20  20  20  20
    1:  11  10  20  20  20  20  20  20
    2:  20  20  10  11  20  20  20  20
    3:  20  20  11  10  20  20  20  20
    4:  20  20  20  20  10  11  20  20
    5:  20  20  20  20  11  10  20  20
    6:  20  20  20  20  20  20  10  11
    7:  20  20  20  20  20  20  11  10

------------------------------------------------------------
9. /proc/meminfo
   MemTotal:       1583428100 kB

------------------------------------------------------------
10. who -r
  run-level 3 May 22 17:52

------------------------------------------------------------
11. Systemd service manager version: systemd 239 (239-45.el8)
  Default Target  Status
  multi-user      running

------------------------------------------------------------
12. Services, from systemctl list-unit-files
  STATE      UNIT FILES
```

(Continued on next page)

Platform Notes (Continued)

```
  enabled    NetworkManager NetworkManager-dispatcher NetworkManager-wait-online auditd autovt@ crond
             firewalld getty@ import-state irqbalance kdump loadmodules lvm2-monitor mdmonitor microcode
             nis-domainname rhsmcertd rsyslog selinux-autorelabel-mark sshd sssd syslog tuned udisks2
  disabled   blk-availability console-getty cpupower debug-shell ebtables iprdump iprinit iprupdate kvm_stat
             nftables rdisc rhcd rhsm rhsm-facts serial-getty@ sshd-keygen@ systemd-resolved tcsd
  generated  SystemTap compile-server gcc-toolset-10-stap-server gcc-toolset-10-systemtap
             gcc-toolset-9-stap-server gcc-toolset-9-systemtap scripts startup
  indirect   sssd-autofs sssd-kcm sssd-nss sssd-pac sssd-pam sssd-ssh sssd-sudo

------------------------------------------------------------
13. Linux kernel boot-time arguments, from /proc/cmdline
  BOOT_IMAGE=(hd1,gpt2)/vmlinuz-4.18.0-305.el8.x86_64
  root=/dev/mapper/rhel-root
  ro
  crashkernel=auto
  resume=/dev/mapper/rhel-swap
  rd.lvm.lv=rhel/root
  rd.lvm.lv=rhel/swap
  rhgb
  quiet

------------------------------------------------------------
14. cpupower frequency-info
  analyzing CPU 0:
    Unable to determine current policy
    boost state support:
      Supported: yes
      Active: yes

------------------------------------------------------------
15. tuned-adm active
  Current active profile: throughput-performance

------------------------------------------------------------
16. sysctl
  kernel.numa_balancing               1
  kernel.randomize_va_space           2
  vm.compaction_proactiveness         0
  vm.dirty_background_bytes           0
  vm.dirty_background_ratio          10
  vm.dirty_bytes                      0
  vm.dirty_expire_centisecs        3000
  vm.dirty_ratio                     40
  vm.dirty_writeback_centisecs      500
  vm.dirtytime_expire_seconds     43200
  vm.extfrag_threshold              500
  vm.min_unmapped_ratio               1
  vm.nr_hugepages                     0
  vm.nr_hugepages_mempolicy           0
  vm.nr_overcommit_hugepages          0
  vm.swappiness                      10
  vm.watermark_boost_factor       15000
  vm.watermark_scale_factor          10
  vm.zone_reclaim_mode                0

------------------------------------------------------------
17. /sys/kernel/mm/transparent_hugepage
  defrag          always defer defer+madvise [madvise] never
  enabled         [always] madvise never
  hpage_pmd_size  2097152
```

(Continued on next page)

Platform Notes (Continued)

```
  shmem_enabled   always within_size advise [never] deny force

------------------------------------------------------------
18. /sys/kernel/mm/transparent_hugepage/khugepaged
  alloc_sleep_millisecs   60000
  defrag                      1
  max_ptes_none             511
  max_ptes_swap              64
  pages_to_scan            4096
  scan_sleep_millisecs    10000

------------------------------------------------------------
19. OS release
  From /etc/*-release /etc/*-version
  os-release     Red Hat Enterprise Linux 8.4 (Ootpa)
  redhat-release Red Hat Enterprise Linux release 8.4 (Ootpa)
  system-release Red Hat Enterprise Linux release 8.4 (Ootpa)

------------------------------------------------------------
20. Kernel self-reported vulnerability status, from /sys/devices/system/cpu/vulnerabilities
  itlb_multihit        Not affected
  l1tf                 Not affected
  mds                  Not affected
  meltdown             Not affected
  spec_store_bypass    Mitigation: Speculative Store Bypass disabled via prctl and seccomp
  spectre_v1           Mitigation: usercopy/swapgs barriers and __user pointer sanitization
  spectre_v2           Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling
  srbds                Not affected
  tsx_async_abort      Not affected
For more information, see the Linux documentation on hardware vulnerabilities, for example
     https://www.kernel.org/doc/html/latest/admin-guide/hw-vuln/index.html

------------------------------------------------------------
21. Disk information
SPEC is set to: /home/speccpu
  Filesystem            Type  Size  Used Avail Use% Mounted on
  /dev/mapper/rhel-home xfs   372G   12G  360G   4% /home

------------------------------------------------------------
22. /sys/devices/virtual/dmi/id
    Vendor:         xFusion
    Product:        2488H V6
    Product Family: Cedar Island
    Serial:         2102313CWY10MA000018

------------------------------------------------------------
23. dmidecode
  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:
    48x Samsung M393A4K40DB3-CWE 32 GB 2 rank 3200, configured at 2933


------------------------------------------------------------
24. BIOS
(This section combines info from /sys/devices and dmidecode.)
   BIOS Vendor:       Byosoft Corporation
   BIOS Version:      1.03
```

(Continued on next page)

Platform Notes (Continued)

```
    BIOS Date:         11/25/2022
```

Compiler Version Notes

```
==============================================================================================================
C       | 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base) 525.x264_r(base) 557.xz_r(base)
--------------------------------------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
--------------------------------------------------------------------------------------------------------------

==============================================================================================================
C++     | 520.omnetpp_r(base) 523.xalancbmk_r(base) 531.deepsjeng_r(base) 541.leela_r(base)
--------------------------------------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
--------------------------------------------------------------------------------------------------------------

==============================================================================================================
Fortran | 548.exchange2_r(base)
--------------------------------------------------------------------------------------------------------------
Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
--------------------------------------------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:
icx

C++ benchmarks:
icpx

Fortran benchmarks:
ifx

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

(Continued on next page)

Base Portability Flags (Continued)

557.xz_r: -DSPEC_LP64

Base Optimization Flags

C benchmarks:
-w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-L/usr/local/intel/compiler/2023.0.0/linux/compiler/lib/intel64_lin
-lqkmalloc

C++ benchmarks:
-w -std=c++14 -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-L/usr/local/intel/compiler/2023.0.0/linux/compiler/lib/intel64_lin
-lqkmalloc

Fortran benchmarks:
-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ffast-math -flto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-nostandard-realloc-lhs -align array32byte -auto
-L/usr/local/intel/compiler/2023.0.0/linux/compiler/lib/intel64_lin
-lqkmalloc

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/Intel-ic2023-official-linux64.html
http://www.spec.org/cpu2017/flags/xFusion-Platform-Settings-CPX-V1.4.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/Intel-ic2023-official-linux64.xml
http://www.spec.org/cpu2017/flags/xFusion-Platform-Settings-CPX-V1.4.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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