SPEC CPU®2017 Integer Speed Result

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Esconet Technologies Ltd.

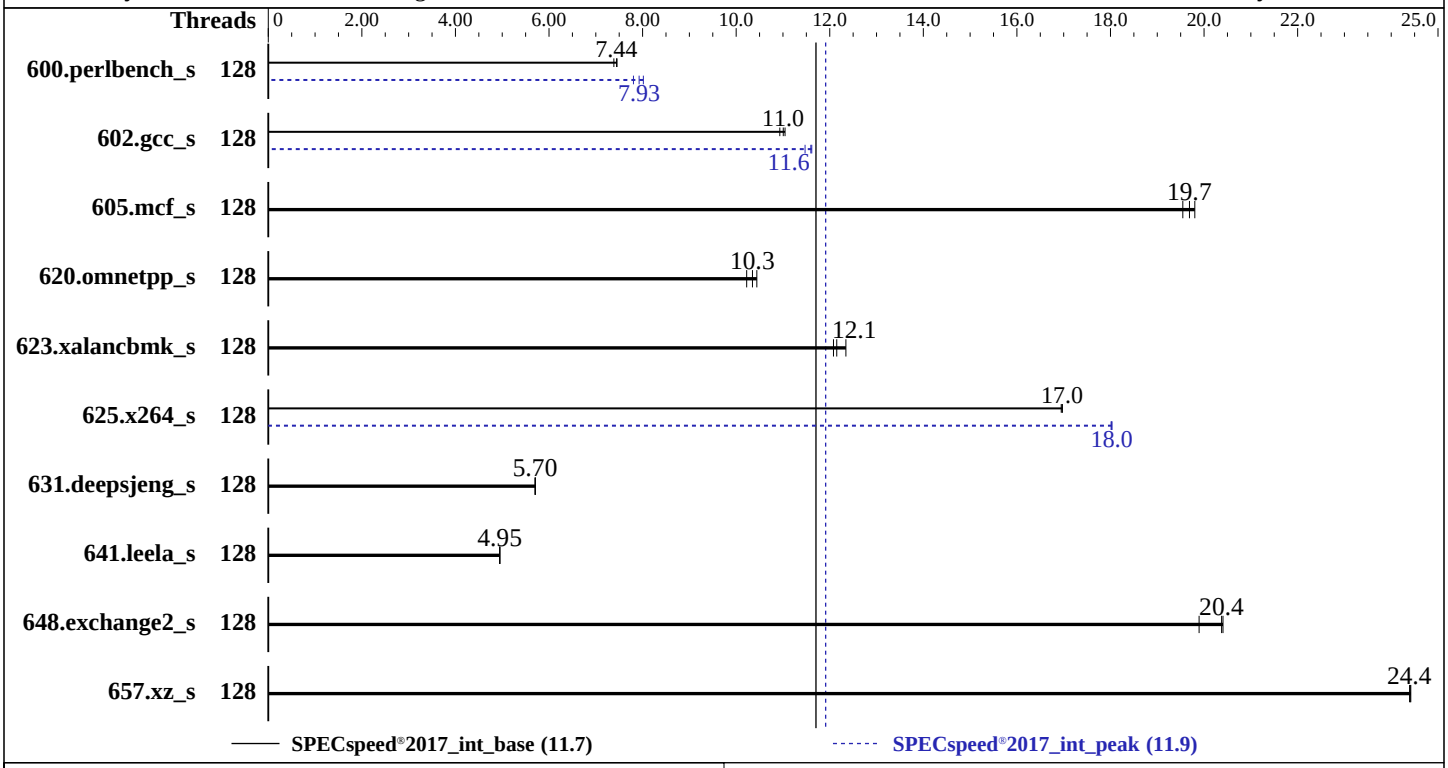
Hexadata HDR-RM2386212I Ver: ILX-002
(Intel Xeon Gold 6338N, 2.20 GHz)

SPECspeed®2017_int_base = 11.7

SPECspeed®2017_int_peak = 11.9

CPU2017 License: 6523
Test Sponsor: Esconet Technologies Ltd.
Tested by: Esconet Technologies Ltd.

Test Date: Dec-2023
Hardware Availability: May-2021
Software Availability: Dec-2023



Hardware

CPU Name:	Intel Xeon Gold 6338N
Max MHz:	3500
Nominal:	2200
Enabled:	64 cores, 2 chips, 2 threads/core
Orderable:	1,2 chips
Cache L1:	32 KB I + 48 KB D on chip per core
L2:	1.25 MB I+D on chip per core
L3:	48 MB I+D on chip per chip
Other:	None
Memory:	1 TB (16 x 64 GB 2Rx4 PC4-3200AA-R, running at 2666)
Storage:	960 GB SSD
Other:	None

Software

OS:	CentOS Linux 8 4.18.0-348.7.1.el8_5.x86_64
Compiler:	C/C++: Version 2023.2.3 of Intel oneAPI DPC++/C++ Compiler for Linux; Fortran: Version 2023.2.3 of Intel Fortran Compiler for Linux;
Parallel:	Yes
Firmware:	Version F26 released May-2023
File System:	xfs
System State:	Run level 3 (multi-user)
Base Pointers:	64-bit
Peak Pointers:	64-bit
Other:	jemalloc memory allocator V5.0.1
Power Management:	OS set to prefer performance at the cost of additional power usage.

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Results Table

Benchmark	Base							Peak						
	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
600.perlbench_s	128	240	7.39	238	7.45	**238**	**7.44**	128	**224**	**7.93**	227	7.80	221	8.02
602.gcc_s	128	361	11.0	364	10.9	**362**	**11.0**	128	343	11.6	**343**	**11.6**	347	11.5
605.mcf_s	128	238	19.8	**240**	**19.7**	242	19.5	128	238	19.8	**240**	**19.7**	242	19.5
620.omnetpp_s	128	**158**	**10.3**	160	10.2	156	10.4	128	**158**	**10.3**	160	10.2	156	10.4
623.xalancbmk_s	128	**117**	**12.1**	115	12.3	117	12.1	128	**117**	**12.1**	115	12.3	117	12.1
625.x264_s	128	104	16.9	**104**	**17.0**	104	17.0	128	97.8	18.0	**97.9**	**18.0**	97.9	18.0
631.deepsjeng_s	128	251	5.70	**251**	**5.70**	251	5.71	128	251	5.70	**251**	**5.70**	251	5.71
641.leela_s	128	345	4.95	**345**	**4.95**	345	4.95	128	345	4.95	**345**	**4.95**	345	4.95
648.exchange2_s	128	144	20.4	148	19.9	**144**	**20.4**	128	144	20.4	148	19.9	**144**	**20.4**
657.xz_s	128	**253**	**24.4**	253	24.4	253	24.4	128	**253**	**24.4**	253	24.4	253	24.4

SPECspeed®2017_int_base = **11.7**

SPECspeed®2017_int_peak = **11.9**

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"
```

Environment Variables Notes

```
Environment variables set by runcpu before the start of the run:
KMP_AFFINITY = "granularity=fine,scatter"
LD_LIBRARY_PATH = "/home/ub/cpu17/lib/intel64:/home/ub/cpu17/lib/ia32:/home/ub/cpu17/je5.0.1-64"
MALLOC_CONF = "retain:true"
OMP_STACKSIZE = "192M"
```

General Notes

```
Binaries compiled on a system with 2x Intel Xeon Platinum 8280M CPU + 384GB RAM
memory using Redhat Enterprise Linux 8.0
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
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

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 settings: Default

Sysinfo program /home/ub/cpu17/bin/sysinfo
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
running on localhost.localdomain Fri Dec 22 19:07:55 2023

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

------------------------------------------------------------
Table of contents
------------------------------------------------------------
 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 (239-51.el8_5.2)
12. Failed units, from systemctl list-units --state=failed
13. Services, from systemctl list-unit-files
14. Linux kernel boot-time arguments, from /proc/cmdline
15. cpupower frequency-info
16. tuned-adm active
17. sysctl
18. /sys/kernel/mm/transparent_hugepage
19. /sys/kernel/mm/transparent_hugepage/khugepaged
20. OS release
21. Kernel self-reported vulnerability status, from /sys/devices/system/cpu/vulnerabilities
22. Disk information
23. /sys/devices/virtual/dmi/id
24. dmidecode
25. BIOS
------------------------------------------------------------

------------------------------------------------------------
1. uname -a
  Linux localhost.localdomain 4.18.0-348.7.1.el8_5.x86_64 #1 SMP Wed Dec 22 13:25:12 UTC 2021 x86_64 x86_64
  x86_64 GNU/Linux

------------------------------------------------------------
2. w
   19:07:55 up 1 min,  1 user,  load average: 0.35, 0.11, 0.04
  USER     TTY      FROM             LOGIN@   IDLE   JCPU   PCPU WHAT
  ub       tty1     -                19:07    3.00s  1.04s  0.00s sh
  reportable-ic2023.2.3-lin-core-avx512-speed-smt-on-20231121.sh

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

------------------------------------------------------------
4. ulimit -a
  core file size          (blocks, -c) 0
  data seg size           (kbytes, -d) unlimited
  scheduling priority             (-e) 0
```

(Continued on next page)

Platform Notes (Continued)

```
   file size               (blocks, -f) unlimited
   pending signals                 (-i) 4125541
   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) 4125541
   virtual memory          (kbytes, -v) unlimited
   file locks                      (-x) unlimited

------------------------------------------------------------
5. sysinfo process ancestry
 /usr/lib/systemd/systemd --switched-root --system --deserialize 18
 login -- ub
 -bash
 sh reportable-ic2023.2.3-lin-core-avx512-speed-smt-on-20231121.sh
 runcpu --nobuild --action validate --define default-platform-flags -c
   ic2023.2.3-lin-core-avx512-speed-20231121.cfg --define cores=64 --tune base,peak -o all --define
   intspeedaffinity --define smt-on --define drop_caches intspeed
 runcpu --nobuild --action validate --define default-platform-flags --configfile
   ic2023.2.3-lin-core-avx512-speed-20231121.cfg --define cores=64 --tune base,peak --output_format all
   --define intspeedaffinity --define smt-on --define drop_caches --nopower --runmode speed --tune base:peak
   --size refspeed intspeed --nopreenv --note-preenv --logfile
   $SPEC/tmp/CPU2017.001/templogs/preenv.intspeed.001.0.log --lognum 001.0 --from_runcpu 2
 specperl $SPEC/bin/sysinfo
$SPEC = /home/ub/cpu17

------------------------------------------------------------
6. /proc/cpuinfo
    model name      : Intel(R) Xeon(R) Gold 6338N CPU @ 2.20GHz
    vendor_id       : GenuineIntel
    cpu family      : 6
    model           : 106
    stepping        : 6
    microcode       : 0xd0003a5
    bugs            : spectre_v1 spectre_v2 spec_store_bypass swapgs
    cpu cores       : 32
    siblings        : 64
    2 physical ids (chips)
    128 processors (hardware threads)
    physical id 0: core ids 0-31
    physical id 1: core ids 0-31
    physical id 0: apicids 0-63
    physical id 1: apicids 128-191
  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
```

(Continued on next page)

Platform Notes (Continued)

```
  Thread(s) per core:  2
  Core(s) per socket:  32
  Socket(s):           2
  NUMA node(s):        2
  Vendor ID:           GenuineIntel
  CPU family:          6
  Model:               106
  Model name:          Intel(R) Xeon(R) Gold 6338N CPU @ 2.20GHz
  Stepping:            6
  CPU MHz:             2200.000
  CPU max MHz:         3500.0000
  CPU min MHz:         800.0000
  BogoMIPS:            4400.00
  Virtualization:      VT-x
  L1d cache:           48K
  L1i cache:           32K
  L2 cache:            1280K
  L3 cache:            49152K
  NUMA node0 CPU(s):   0-31,64-95
  NUMA node1 CPU(s):   32-63,96-127
  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 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 cpuid_fault epb cat_l3 invpcid_single intel_ppin ssbd mba ibrs ibpb
                       stibp ibrs_enhanced tpr_shadow vnmi flexpriority ept vpid ept_ad fsgsbase tsc_adjust
                       sgx bmi1 hle avx2 smep bmi2 erms invpcid cqm rdt_a avx512f avx512dq rdseed adx smap
                       avx512ifma clflushopt clwb intel_pt avx512cd sha_ni avx512bw avx512vl xsaveopt xsavec
                       xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local split_lock_detect
                       wbnoinvd dtherm ida arat pln pts hwp hwp_act_window hwp_epp hwp_pkg_req avx512vbmi
                       umip pku ospke avx512_vbmi2 gfni vaes vpclmulqdq avx512_vnni avx512_bitalg tme
                       avx512_vpopcntdq la57 rdpid sgx_lc fsrm md_clear pconfig flush_l1d arch_capabilities

------------------------------------------------------------
8. numactl --hardware
NOTE: a numactl 'node' might or might not correspond to a physical chip.
  available: 2 nodes (0-1)
  node 0 cpus: 0-31,64-95
  node 0 size: 515379 MB
  node 0 free: 513970 MB
  node 1 cpus: 32-63,96-127
  node 1 size: 516042 MB
  node 1 free: 515395 MB
  node distances:
  node   0   1
    0:  10  20
    1:  20  10

------------------------------------------------------------
9. /proc/meminfo
   MemTotal:       1056175752 kB

------------------------------------------------------------
10. who -r
  run-level 3 Dec 22 19:07

------------------------------------------------------------
11. Systemd service manager version: systemd 239 (239-51.el8_5.2)
  Default Target  Status
```

(Continued on next page)

Platform Notes (Continued)

```
  multi-user      degraded

------------------------------------------------------------
12. Failed units, from systemctl list-units --state=failed
    UNIT                   LOAD   ACTIVE SUB    DESCRIPTION
  * sep5.service           loaded failed failed systemd script to load sep5 driver at boot time
  * systemd-sysctl.service loaded failed failed Apply Kernel Variables

------------------------------------------------------------
13. Services, from systemctl list-unit-files
  STATE     UNIT FILES
  enabled   NetworkManager NetworkManager-dispatcher NetworkManager-wait-online auditd autovt@ crond
            firewalld getty@ import-state irqbalance kdump loadmodules lvm2-monitor mdmonitor microcode
            nis-domainname rsyslog selinux-autorelabel-mark sep5 sshd sssd syslog tuned udisks2
  disabled  blk-availability console-getty cpupower debug-shell ebtables iprdump iprinit iprupdate kvm_stat
            man-db-restart-cache-update nftables rdisc serial-getty@ sshd-keygen@ systemd-resolved tcsd
  indirect  sssd-autofs sssd-kcm sssd-nss sssd-pac sssd-pam sssd-ssh sssd-sudo

------------------------------------------------------------
14. Linux kernel boot-time arguments, from /proc/cmdline
  BOOT_IMAGE=(hd1,gpt2)/vmlinuz-4.18.0-348.7.1.el8_5.x86_64
  root=/dev/mapper/cl-root
  ro
  crashkernel=auto
  resume=/dev/mapper/cl-swap
  rd.lvm.lv=cl/root
  rd.lvm.lv=cl/swap
  rhgb
  quiet

------------------------------------------------------------
15. cpupower frequency-info
  analyzing CPU 0:
    current policy: frequency should be within 800 MHz and 3.50 GHz.
                    The governor "performance" may decide which speed to use
                    within this range.
    boost state support:
      Supported: yes
      Active: yes

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

------------------------------------------------------------
17. 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
```

(Continued on next page)

Platform Notes (Continued)

```
  vm.nr_overcommit_hugepages          0
  vm.swappiness                      10
  vm.watermark_boost_factor       15000
  vm.watermark_scale_factor          10
  vm.zone_reclaim_mode                0

------------------------------------------------------------
18. /sys/kernel/mm/transparent_hugepage
  defrag          always defer defer+madvise [madvise] never
  enabled         [always] madvise never
  hpage_pmd_size  2097152
  shmem_enabled   always within_size advise [never] deny force

------------------------------------------------------------
19. /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

------------------------------------------------------------
20. OS release
  From /etc/*-release /etc/*-version
  os-release     CentOS Linux 8
  redhat-release CentOS Linux release 8.5.2111
  system-release CentOS Linux release 8.5.2111

------------------------------------------------------------
21. 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

------------------------------------------------------------
22. Disk information
SPEC is set to: /home/ub/cpu17
  Filesystem          Type  Size  Used Avail Use% Mounted on
  /dev/mapper/cl-home xfs   819G  160G  659G  20% /home

------------------------------------------------------------
23. /sys/devices/virtual/dmi/id
    Vendor:         ESCONET TECHNOLOGIES LTD.
    Product:        HEXADATA
    Product Family: Server

------------------------------------------------------------
24. 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
```

(Continued on next page)

Platform Notes (Continued)

```
  "DMTF SMBIOS" standard.
  Memory:
    16x Samsung M393A8G40AB2-CWE 64 GB 2 rank 3200, configured at 2666


 ------------------------------------------------------------
 25. BIOS
 (This section combines info from /sys/devices and dmidecode.)
    BIOS Vendor:       GIGABYTE
    BIOS Version:      F26
    BIOS Date:         05/29/2023
    BIOS Revision:     5.22
```

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) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.2.3 Build x
Copyright (C) 1985-2023 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) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.2.3 Build x
Copyright (C) 1985-2023 Intel Corporation. All rights reserved.
--------------------------------------------------------------------------------------------------------------

==============================================================================================================
Fortran | 648.exchange2_s(base, peak)
--------------------------------------------------------------------------------------------------------------
Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2023.2.3 Build x
Copyright (C) 1985-2023 Intel Corporation. All rights reserved.
--------------------------------------------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:
icx

C++ benchmarks:
icpx

Fortran benchmarks:
ifx

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:
`-w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ffast-math -flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -fiopenmp -DSPEC_OPENMP -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc`

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/jemalloc64-5.0.1/lib -ljemalloc`

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 -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc`

Peak Compiler Invocation

C benchmarks:
`icx`

C++ benchmarks:
`icpx`

Fortran benchmarks:
`ifx`

Peak Portability Flags

Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:

600.perlbench_s: -w -m64 -std=c11 -Wl,-z,muldefs
-fprofile-generate(pass 1)
-fprofile-use=default.profdata(pass 2) -xCORE-AVX2(pass 1)
-flto -Ofast(pass 1) -xCORE-AVX512 -O3 -ffast-math
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-fiopenmp -DSPEC_OPENMP -fno-strict-overflow
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

602.gcc_s: -w -m64 -std=c11 -Wl,-z,muldefs
-fprofile-generate(pass 1)
-fprofile-use=default.profdata(pass 2) -xCORE-AVX2(pass 1)
-flto -Ofast(pass 1) -xCORE-AVX512 -O3 -ffast-math
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-fiopenmp -DSPEC_OPENMP -L/usr/local/jemalloc64-5.0.1/lib
-ljemalloc

605.mcf_s: basepeak = yes

625.x264_s: -w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3
-ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -fiopenmp -DSPEC_OPENMP
-fno-alias -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

657.xz_s: basepeak = yes

C++ benchmarks:

620.omnetpp_s: basepeak = yes

623.xalancbmk_s: basepeak = yes

631.deepsjeng_s: basepeak = yes

641.leela_s: basepeak = yes

Fortran benchmarks:

(Continued on next page)

Peak Optimization Flags (Continued)

648.exchange2_s: `basepeak = yes`

The flags files that were used to format this result can be browsed at
`http://www.spec.org/cpu2017/flags/Hexadata-Default-Platform-Flags.html`
`http://www.spec.org/cpu2017/flags/Hexadata-Intel-ic2023p2-official-linux64.html`

You can also download the XML flags sources by saving the following links:
`http://www.spec.org/cpu2017/flags/Hexadata-Default-Platform-Flags.xml`
`http://www.spec.org/cpu2017/flags/Hexadata-Intel-ic2023p2-official-linux64.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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