SPEC CPU®2017 Integer Rate Result

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xFusion
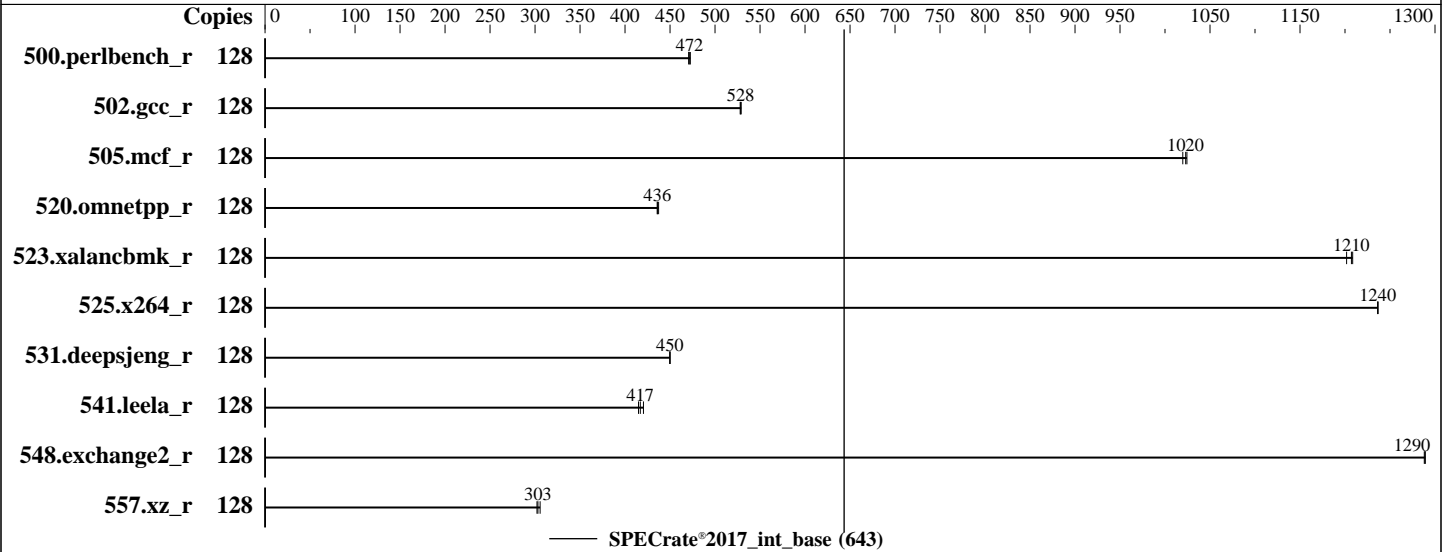
FusionServer 2288H V7 (Intel Xeon Gold 6448H)

$SPECrate^{®}2017\_int\_base = 643$

$SPECrate^{®}2017_int_peak = $ Not Run

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

Test Date: Jun-2023
Hardware Availability: Jan-2023
Software Availability: Dec-2022

Benchmark	Copies	Result
500.perlbench_r	128	472
502.gcc_r	128	528
505.mcf_r	128	1020
520.omnetpp_r	128	436
523.xalancbmk_r	128	1210
525.x264_r	128	1240
531.deepsjeng_r	128	450
541.leela_r	128	417
548.exchange2_r	128	1290
557.xz_r	128	303

SPECrate®2017_int_base (643)

Hardware

CPU Name: Intel Xeon Gold 6448H
 Max MHz: 4100
 Nominal: 2400
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: 2 MB I+D on chip per core
 L3: 60 MB I+D on chip per chip
 Other: None
Memory: 512 GB (16 x 32 GB 2Rx8 PC5-4800B-R)
Storage: 1 x 1920 GB SATA SSD
Other: None

Software

OS: Red Hat Enterprise Linux release 9.0 (Plow)
5.14.0-70.13.1.el9_0.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 2.00.55 Released Mar-2023
File System: xfs
System State: Run level 5 (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

Standard Performance Evaluation Corporation (info@spec.org)

https://www.spec.org/

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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	433	471	**432**	**472**	431	473							
502.gcc_r	128	**343**	**528**	343	528	343	529							
505.mcf_r	128	**202**	**1020**	202	1020	203	1020							
520.omnetpp_r	128	385	436	**385**	**436**	384	437							
523.xalancbmk_r	128	112	1210	112	1200	**112**	**1210**							
525.x264_r	128	**181**	**1240**	181	1240	181	1240							
531.deepsjeng_r	128	**326**	**450**	326	450	326	450							
541.leela_r	128	**508**	**417**	504	420	511	415							
548.exchange2_r	128	**260**	**1290**	260	1290	260	1290							
557.xz_r	128	452	306	458	302	**456**	**303**							
SPECrate®2017_int_base =		**643**												
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 =
     "/spec2017-icc2023.0/lib/intel64:/spec2017-icc2023.0/lib/ia32:/spec2017-icc2023.0/je5.0.1-32"
MALLOC_CONF = "retain:true"
```

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General Notes

```
Binaries compiled on a system with 2x Intel Xeon Platinum 8280M CPU + 384GB RAM
memory using Red Hat Enterprise Linux 8.4
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 /spec2017-icc2023.0/bin/sysinfo
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
running on localhost.localdomain Wed Jun 28 14:01:13 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 250 (250-6.el9_0)
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. sysctl
17. /sys/kernel/mm/transparent_hugepage
18. /sys/kernel/mm/transparent_hugepage/khugepaged
19. OS release
20. Disk information
21. /sys/devices/virtual/dmi/id
22. dmidecode
23. BIOS
-------------------------------------------------------------

-------------------------------------------------------------
1. uname -a
  Linux localhost.localdomain 5.14.0-70.13.1.el9_0.x86_64 #1 SMP PREEMPT Thu Apr 14 12:42:38 EDT 2022 x86_64
  x86_64 x86_64 GNU/Linux

-------------------------------------------------------------
2. w
   14:01:13 up 5 min,  1 user,  load average: 0.00, 0.05, 0.03
   USER     TTY        LOGIN@   IDLE   JCPU   PCPU WHAT
   root     tty2       14:00    9.00s  1.17s  0.04s -bash
```

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Platform Notes (Continued)

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


--------------------------------------------------------
4. ulimit -a
  real-time non-blocking time  (microseconds, -R) unlimited
  core file size              (blocks, -c) 0
  data seg size               (kbytes, -d) unlimited
  scheduling priority                (-e) 0
  file size                   (blocks, -f) unlimited
  pending signals                    (-i) 2060103
  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) 2060103
  virtual memory              (kbytes, -v) unlimited
  file locks                         (-x) unlimited


--------------------------------------------------------
5. sysinfo process ancestry
 /usr/lib/systemd/systemd rhgb --switched-root --system --deserialize 31
 login -- root
 -bash
 -bash
 runcpu --define default-platform-flags --copies 128 -c ic2023.0-lin-sapphirerapids-rate-20221201.cfg
   --define smt-on --define cores=64 --define physicalfirst --define invoke_with_interleave --define
   drop_caches --tune base --iterations 3 -o all intrate
 runcpu --define default-platform-flags --copies 128 --configfile
   ic2023.0-lin-sapphirerapids-rate-20221201.cfg --define smt-on --define cores=64 --define physicalfirst
   --define invoke_with_interleave --define drop_caches --tune base --iterations 3 --output_format all
   --nopower --runmode rate --tune base --size refrate intrate --nopreenv --note-preenv --logfile
   $SPEC/tmp/CPU2017.051/templogs/preenv.intrate.051.0.log --lognum 051.0 --from_runcpu 2
 specperl $SPEC/bin/sysinfo
 $SPEC = /spec2017-icc2023.0


--------------------------------------------------------
6. /proc/cpuinfo
    model name      : Intel(R) Xeon(R) Gold 6448H
    vendor_id       : GenuineIntel
    cpu family      : 6
    model           : 143
    stepping        : 7
    microcode       : 0x2b000111
    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
```

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Platform Notes (Continued)

```
   virtualized systems.  Use the above data carefully.


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

   From lscpu from util-linux 2.37.4:
     Architecture:                 x86_64
     CPU op-mode(s):               32-bit, 64-bit
     Address sizes:                46 bits physical, 57 bits virtual
     Byte Order:                   Little Endian
     CPU(s):                       128
     On-line CPU(s) list:          0-127
     Vendor ID:                    GenuineIntel
     BIOS Vendor ID:               Intel(R) Corporation
     Model name:                   Intel(R) Xeon(R) Gold 6448H
     BIOS Model name:              Intel(R) Xeon(R) Gold 6448H
     CPU family:                   6
     Model:                        143
     Thread(s) per core:           2
     Core(s) per socket:           32
     Socket(s):                    2
     Stepping:                     7
     BogoMIPS:                     4800.00
     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 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 cat_l2 cdp_l3 invpcid_single
                                   intel_ppin cdp_l2 ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vnmi
                                   flexpriority ept vpid ept_ad fsgsbase tsc_adjust bmi1 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
                                   avx_vnni avx512_bf16 wbnoinvd dtherm ida arat pln pts avx512vbmi umip pku
                                   ospke waitpkg avx512_vbmi2 gfni vaes vpclmulqdq avx512_vnni avx512_bitalg
                                   tme avx512_vpopcntdq la57 rdpid bus_lock_detect cldemote movdiri movdir64b
                                   enqcmd fsrm md_clear serialize tsxldtrk pconfig arch_lbr avx512_fp16
                                   amx_tile flush_l1d arch_capabilities
     Virtualization:               VT-x
     L1d cache:                    3 MiB (64 instances)
     L1i cache:                    2 MiB (64 instances)
     L2 cache:                     128 MiB (64 instances)
     L3 cache:                     120 MiB (2 instances)
     NUMA node(s):                 4
     NUMA node0 CPU(s):            0-15,64-79
     NUMA node1 CPU(s):            16-31,80-95
     NUMA node2 CPU(s):            32-47,96-111
     NUMA node3 CPU(s):            48-63,112-127
     Vulnerability Itlb multihit:  Not affected
     Vulnerability L1tf:           Not affected
     Vulnerability Mds:            Not affected
     Vulnerability Meltdown:       Not affected
     Vulnerability Spec store bypass: Mitigation; Speculative Store Bypass disabled via prctl
     Vulnerability Spectre v1:     Mitigation; usercopy/swapgs barriers and __user pointer sanitization
     Vulnerability Spectre v2:     Mitigation; Enhanced IBRS, IBPB conditional, RSB filling
     Vulnerability Srbds:          Not affected
     Vulnerability Tsx async abort: Not affected
```

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Platform Notes (Continued)

```
From lscpu --cache:
    NAME ONE-SIZE ALL-SIZE WAYS TYPE        LEVEL  SETS PHY-LINE COHERENCY-SIZE
    L1d      48K       3M   12 Data            1    64       1            64
    L1i      32K       2M    8 Instruction     1    64       1            64
    L2        2M     128M   16 Unified         2  2048       1            64
    L3       60M     120M   15 Unified         3 65536       1            64


------------------------------------------------------------
8. numactl --hardware
NOTE: a numactl 'node' might or might not correspond to a physical chip.
  available: 4 nodes (0-3)
  node 0 cpus: 0-15,64-79
  node 0 size: 128042 MB
  node 0 free: 127510 MB
  node 1 cpus: 16-31,80-95
  node 1 size: 129017 MB
  node 1 free: 128573 MB
  node 2 cpus: 32-47,96-111
  node 2 size: 129017 MB
  node 2 free: 127682 MB
  node 3 cpus: 48-63,112-127
  node 3 size: 129006 MB
  node 3 free: 128461 MB
  node distances:
  node   0   1   2   3
    0:  10  12  21  21
    1:  12  10  21  21
    2:  21  21  10  12
    3:  21  21  12  10


------------------------------------------------------------
9. /proc/meminfo
   MemTotal:       527445256 kB


------------------------------------------------------------
10. who -r
  run-level 5 Jun 28 13:55


------------------------------------------------------------
11. Systemd service manager version: systemd 250 (250-6.el9_0)
  Default Target  Status
  graphical       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


------------------------------------------------------------
13. Services, from systemctl list-unit-files
  STATE           UNIT FILES
  enabled         ModemManager NetworkManager NetworkManager-dispatcher NetworkManager-wait-online
                  accounts-daemon atd auditd avahi-daemon bluetooth chronyd crond cups dbus-broker gdm
                  getty@ insights-client-boot irqbalance iscsi iscsi-onboot kdump libstoragemgmt
                  low-memory-monitor lvm2-monitor mcelog mdmonitor microcode multipathd nis-domainname
                  nvmefc-boot-connections ostree-remount power-profiles-daemon qemu-guest-agent rhsmcertd
                  rsyslog rtkit-daemon selinux-autorelabel-mark sep5 smartd sshd sssd switcheroo-control
                  sysstat systemd-network-generator udisks2 upower vgauthd vmtoolsd
  enabled-runtime systemd-remount-fs
  disabled        arp-ethers blk-availability brltty canberra-system-bootup canberra-system-shutdown
```

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Platform Notes (Continued)

```
                    canberra-system-shutdown-reboot chrony-wait cni-dhcp console-getty cpupower cups-browsed
                    dbus-daemon debug-shell dnsmasq firewalld iprdump iprinit iprupdate iscsid iscsiuio kpatch
                    kvm_stat ledmon man-db-restart-cache-update nftables nvmf-autoconnect podman
                    podman-auto-update podman-restart psacct ras-mc-ctl rasdaemon rdisc rhcd rhsm rhsm-facts
                    rpmdb-rebuild serial-getty@ speech-dispatcherd sshd-keygen@ systemd-boot-check-no-failures
                    systemd-pstore systemd-sysext wpa_supplicant
  indirect          spice-vdagentd 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=(hd0,gpt3)/boot/vmlinuz-5.14.0-70.13.1.el9_0.x86_64
  root=UUID=cc4bab05-907e-44ef-b818-2b2874390234
  ro
  crashkernel=1G-4G:192M,4G-64G:256M,64G-:512M
  resume=UUID=5ba347ca-8beb-4f6e-9c11-de63dc4ddf5f
  rhgb
  quiet

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

----------------------------------------------------------------
16. sysctl
  kernel.numa_balancing           1
  kernel.randomize_va_space       2
  vm.compaction_proactiveness     20
  vm.dirty_background_bytes        0
  vm.dirty_background_ratio       10
  vm.dirty_bytes                   0
  vm.dirty_expire_centisecs     3000
  vm.dirty_ratio                  20
  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                   60
  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
  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
```

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Platform Notes (Continued)

```
   max_ptes_shared         256
   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 9.0 (Plow)
     redhat-release Red Hat Enterprise Linux release 9.0 (Plow)
     system-release Red Hat Enterprise Linux release 9.0 (Plow)

   --------------------------------------------------------------
   20. Disk information
   SPEC is set to: /spec2017-icc2023.0
     Filesystem      Type  Size  Used Avail Use% Mounted on
     /dev/sda3       xfs   420G   84G  337G  20% /

   --------------------------------------------------------------
   21. /sys/devices/virtual/dmi/id
       Vendor:         XFUSION
       Product:        2288H V7
       Product Family: Eagle Stream
       Serial:         serial


   --------------------------------------------------------------
   22. dmidecode
     Additional information from dmidecode 3.3 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:
       16x Samsung M321R4GA3BB6-CQKDG 32 GB 2 rank 4800



   --------------------------------------------------------------
   23. BIOS
   (This section combines info from /sys/devices and dmidecode.)
     BIOS Vendor:       XFUSION
     BIOS Version:      2.00.55
     BIOS Date:         03/07/2023
     BIOS Revision:     0.55
```

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.
------------------------------------------------------------------------------
```

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Compiler Version Notes (Continued)

```
==============================================================================
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
557.xz_r: -DSPEC_LP64

Base Optimization Flags

C benchmarks:
-w -std=c11 -m64 -Wl,-z,muldefs -xsapphirerapids -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 -xsapphirerapids -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

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SPECrate®2017_int_peak = Not Run

CPU2017 License: 6488	**Test Date:** Jun-2023
Test Sponsor: xFusion	**Hardware Availability:** Jan-2023
Tested by: xFusion	**Software Availability:** Dec-2022

Base Optimization Flags (Continued)

C++ benchmarks (continued):
```
-lqkmalloc
```

Fortran benchmarks:
```
-w -m64 -Wl,-z,muldefs -xsapphirerapids -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-SPR-V1.1-revC.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-SPR-V1.1-revC.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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