SPEC CPU®2017 Integer Rate Result

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Supermicro
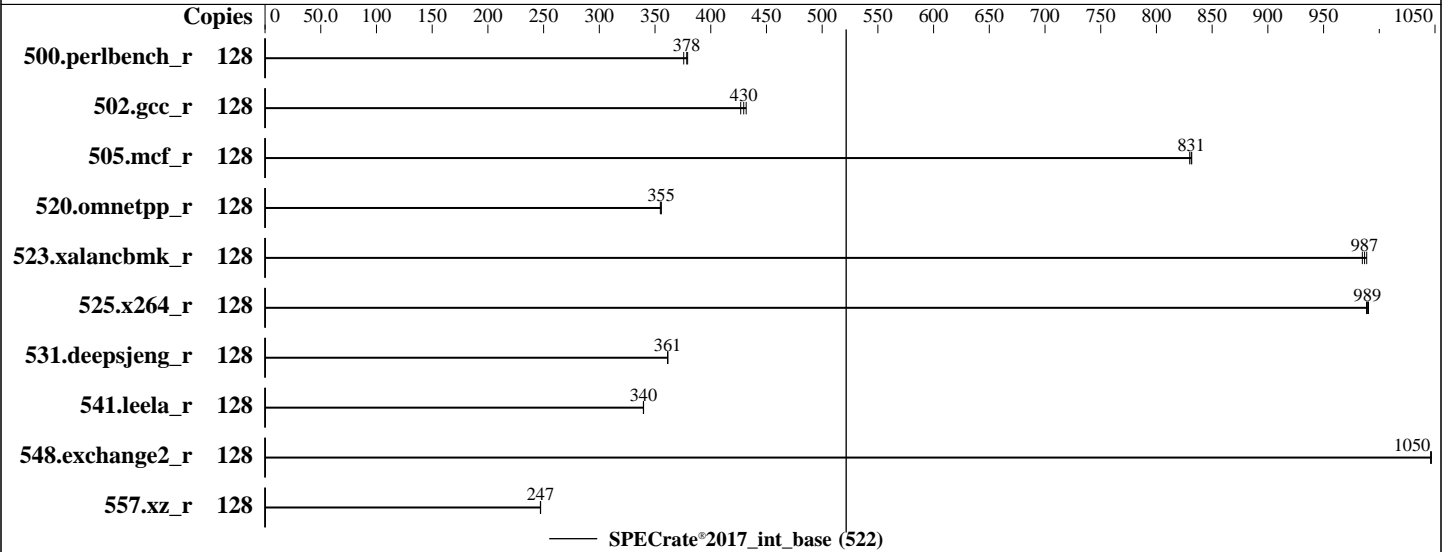
SuperServer SYS-621C-TN12R
(X13DDW , Intel Xeon Gold 6430)

$SPECrate®2017\_int\_base =$ 522

$SPECrate®2017\_int\_peak =$ Not Run

CPU2017 License: 9019	**Test Date:** Sep-2023
Test Sponsor: Supermicro	**Hardware Availability:** Aug-2023
Tested by: Supermicro	**Software Availability:** Dec-2022

Copies

Benchmark	Copies	Value
500.perlbench_r	128	378
502.gcc_r	128	430
505.mcf_r	128	831
520.omnetpp_r	128	355
523.xalancbmk_r	128	987
525.x264_r	128	989
531.deepsjeng_r	128	361
541.leela_r	128	340
548.exchange2_r	128	1050
557.xz_r	128	247

SPECrate®2017_int_base (522)

Hardware

CPU Name: Intel Xeon Gold 6430
 Max MHz: 3400
 Nominal: 2100
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: 1 TB (16 x 64 GB 2Rx4 PC5-4800B-R)
Storage: 1 x 2 TB SATA HDD, 7200RPM
Other: None

Software

OS: SUSE Linux Enterprise Server 15 SP4
 5.14.21-150400.22-default
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 1.4 released Aug-2023
File System: xfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: Not Applicable
Other: None
Power Management: BIOS 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	537	379	542	376	**538**	**378**							
502.gcc_r	128	**422**	**430**	425	427	420	432							
505.mcf_r	128	249	830	249	832	**249**	**831**							
520.omnetpp_r	128	**472**	**355**	472	356	473	355							
523.xalancbmk_r	128	137	985	137	989	**137**	**987**							
525.x264_r	128	227	989	226	990	**227**	**989**							
531.deepsjeng_r	128	406	361	406	361	**406**	**361**							
541.leela_r	128	624	340	624	340	**624**	**340**							
548.exchange2_r	128	321	1050	**321**	**1050**	320	1050							
557.xz_r	128	559	247	559	247	**559**	**247**							

SPECrate®2017_int_base = 522

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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/cpu2017/lib/intel64:/home/cpu2017/lib/ia32:/home/cpu2017/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
 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 Settings:
 Power Performance Tuning = BIOS Controls EPB
 ENERGY_PERF_BIAS_CFG mode = Performance
 DCU Streamer Prefetcher = Disable
 KTI Prefetch = Enable
 SNC = Enable SNC4 (4-clusters)
 LLC Dead Line Alloc = Disable

 Sysinfo program /home/cpu2017/bin/sysinfo
 Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
 running on 105-55 Wed Sep 13 18:27:36 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 249 (249.11+suse.124.g2bc0b2c447)
 12. Services, from systemctl list-unit-files
 13. Linux kernel boot-time arguments, from /proc/cmdline
 14. cpupower frequency-info
 15. sysctl
 16. /sys/kernel/mm/transparent_hugepage
 17. /sys/kernel/mm/transparent_hugepage/khugepaged
 18. OS release
 19. Disk information
 20. /sys/devices/virtual/dmi/id
 21. dmidecode
 22. BIOS
 -----------------------------------------------------------
```

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Platform Notes (Continued)

```
   -----------------------------------------------------------
   1. uname -a
     Linux 105-55 5.14.21-150400.22-default #1 SMP PREEMPT_DYNAMIC Wed May 11 06:57:18 UTC 2022 (49db222) x86_64
     x86_64 x86_64 GNU/Linux

   -----------------------------------------------------------
   2. w
      18:27:36 up 23:38,  3 users,  load average: 0.00, 0.04, 0.00
     USER     TTY      FROM             LOGIN@   IDLE   JCPU   PCPU WHAT
     root     tty1     -                Tue18    7.00s  1.23s  0.04s -bash

   -----------------------------------------------------------
   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) 4125205
     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) 4125205
     virtual memory          (kbytes, -v) unlimited
     file locks                      (-x) unlimited

   -----------------------------------------------------------
   5. sysinfo process ancestry
    /usr/lib/systemd/systemd --switched-root --system --deserialize 30
    login -- root
    -bash
    -bash
    runcpu --nobuild --action validate --define default-platform-flags --define numcopies=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 -o all intrate
    runcpu --nobuild --action validate --define default-platform-flags --define numcopies=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 --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/cpu2017

   -----------------------------------------------------------
   6. /proc/cpuinfo
       model name      : Intel(R) Xeon(R) Gold 6430
       vendor_id       : GenuineIntel
       cpu family      : 6
       model           : 143
       stepping        : 8
       microcode       : 0x2b0004b1
       bugs            : spectre_v1 spectre_v2 spec_store_bypass swapgs
```

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Platform Notes (Continued)

```
      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 2.37.2:
      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
      Model name:             Intel(R) Xeon(R) Gold 6430
      CPU family:             6
      Model:                  143
      Thread(s) per core:     2
      Core(s) per socket:     32
      Socket(s):              2
      Stepping:               8
      Frequency boost:        enabled
      CPU max MHz:            2101.0000
      CPU min MHz:            800.0000
      BogoMIPS:              4200.00
      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 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 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 hle
                              avx2 smep bmi2 erms invpcid rtm 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):           8
      NUMA node0 CPU(s):      0-7,64-71
      NUMA node1 CPU(s):      8-15,72-79
      NUMA node2 CPU(s):      16-23,80-87
      NUMA node3 CPU(s):      24-31,88-95
```

(Continued on next page)

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Platform Notes (Continued)

```
  NUMA node4 CPU(s):              32-39,96-103
  NUMA node5 CPU(s):              40-47,104-111
  NUMA node6 CPU(s):              48-55,112-119
  NUMA node7 CPU(s):              56-63,120-127
  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 and seccomp
  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

  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: 8 nodes (0-7)
  node 0 cpus: 0-7,64-71
  node 0 size: 128589 MB
  node 0 free: 122528 MB
  node 1 cpus: 8-15,72-79
  node 1 size: 128985 MB
  node 1 free: 125614 MB
  node 2 cpus: 16-23,80-87
  node 2 size: 129019 MB
  node 2 free: 124751 MB
  node 3 cpus: 24-31,88-95
  node 3 size: 129019 MB
  node 3 free: 125651 MB
  node 4 cpus: 32-39,96-103
  node 4 size: 129019 MB
  node 4 free: 125360 MB
  node 5 cpus: 40-47,104-111
  node 5 size: 129019 MB
  node 5 free: 125015 MB
  node 6 cpus: 48-55,112-119
  node 6 size: 129019 MB
  node 6 free: 125478 MB
  node 7 cpus: 56-63,120-127
  node 7 size: 128651 MB
  node 7 free: 125136 MB
  node distances:
  node    0    1    2    3    4    5    6    7
    0:   10   12   12   12   21   21   21   21
    1:   12   10   12   12   21   21   21   21
    2:   12   12   10   12   21   21   21   21
    3:   12   12   12   10   21   21   21   21
    4:   21   21   21   21   10   12   12   12
    5:   21   21   21   21   12   10   12   12
    6:   21   21   21   21   12   12   10   12
    7:   21   21   21   21   12   12   12   10
```

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Platform Notes (Continued)

```
----------------------------------------------------------
9. /proc/meminfo
   MemTotal:       1056077444 kB


----------------------------------------------------------
10. who -r
  run-level 3 Sep 12 18:50 last=5


----------------------------------------------------------
11. Systemd service manager version: systemd 249 (249.11+suse.124.g2bc0b2c447)
  Default Target  Status
  graphical       running


----------------------------------------------------------
12. Services, from systemctl list-unit-files
  STATE           UNIT FILES
  enabled         YaST2-Firstboot YaST2-Second-Stage apparmor auditd bluetooth cron display-manager
                  firewalld getty@ haveged irqbalance iscsi issue-generator kbdsettings kdump kdump-early
                  klog lvm2-monitor nscd postfix purge-kernels rollback rsyslog smartd sshd wicked
                  wickedd-auto4 wickedd-dhcp4 wickedd-dhcp6 wickedd-nanny
  enabled-runtime systemd-remount-fs
  disabled        accounts-daemon appstream-sync-cache autofs autoyast-initscripts blk-availability
                  bluetooth-mesh boot-sysctl ca-certificates chrony-wait chronyd console-getty cups
                  cups-browsed debug-shell ebtables exchange-bmc-os-info gpm grub2-once haveged-switch-root
                  ipmi ipmievd iscsi-init iscsid iscsiuio issue-add-ssh-keys kexec-load lunmask
                  man-db-create multipathd nfs nfs-blkmap nmb ostree-remount rdisc rpcbind rpmconfigcheck
                  rsyncd rtkit-daemon serial-getty@ smartd_generate_opts smb snmpd snmptrapd
                  speech-dispatcherd systemd-boot-check-no-failures systemd-network-generator systemd-sysext
                  systemd-time-wait-sync systemd-timesyncd udisks2 upower
  indirect        wickedd


----------------------------------------------------------
13. Linux kernel boot-time arguments, from /proc/cmdline
  BOOT_IMAGE=/boot/vmlinuz-5.14.21-150400.22-default
  root=UUID=ebf0634e-4c48-4c5b-86b6-a36f33a307a7
  splash=silent
  resume=/dev/disk/by-uuid/cf02ba25-9f51-46af-b067-8adca89c27bb
  mitigations=auto
  quiet
  security=apparmor
  crashkernel=321M,high
  crashkernel=72M,low


----------------------------------------------------------
14. cpupower frequency-info
  analyzing CPU 0:
    current policy: frequency should be within 800 MHz and 2.10 GHz.
                    The governor "ondemand" may decide which speed to use
                    within this range.
    boost state support:
      Supported: yes
      Active: yes


----------------------------------------------------------
15. sysctl
  kernel.numa_balancing             1
  kernel.randomize_va_space         2
  vm.compaction_proactiveness       20
  vm.dirty_background_bytes          0
  vm.dirty_background_ratio         10
```

(Continued on next page)

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Platform Notes (Continued)

```
   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


   -----------------------------------------------------------
16. /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


   -----------------------------------------------------------
17. /sys/kernel/mm/transparent_hugepage/khugepaged
   alloc_sleep_millisecs   60000
   defrag                      1
   max_ptes_none             511
   max_ptes_shared           256
   max_ptes_swap              64
   pages_to_scan            4096
   scan_sleep_millisecs    10000


   -----------------------------------------------------------
18. OS release
   From /etc/*-release /etc/*-version
   os-release SUSE Linux Enterprise Server 15 SP4


   -----------------------------------------------------------
19. Disk information
SPEC is set to: /home/cpu2017
   Filesystem      Type  Size  Used Avail Use% Mounted on
   /dev/sda3       xfs   815G   99G  717G  13% /home


   -----------------------------------------------------------
20. /sys/devices/virtual/dmi/id
   Vendor:         Supermicro
   Product:        Super Server
   Product Family: Family
   Serial:         0123456789


   -----------------------------------------------------------
21. 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:
     16x SK Hynix HMCG94MEBRA123N 64 GB 2 rank 4800, configured at 4400
```

(Continued on next page)

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Platform Notes (Continued)

```
        ------------------------------------------------------------
  22. BIOS
  (This section combines info from /sys/devices and dmidecode.)
    BIOS Vendor:       American Megatrends International, LLC.
    BIOS Version:      1.4
    BIOS Date:         08/10/2023
    BIOS Revision:     5.31
```

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`

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Base Portability Flags (Continued)

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
-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/Supermicro-Platform-Settings-V1.2-SPR-revF.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/Supermicro-Platform-Settings-V1.2-SPR-revF.xml

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

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