SPEC CPU®2017 Integer Rate Result

Daten Tecnologia Ltda.

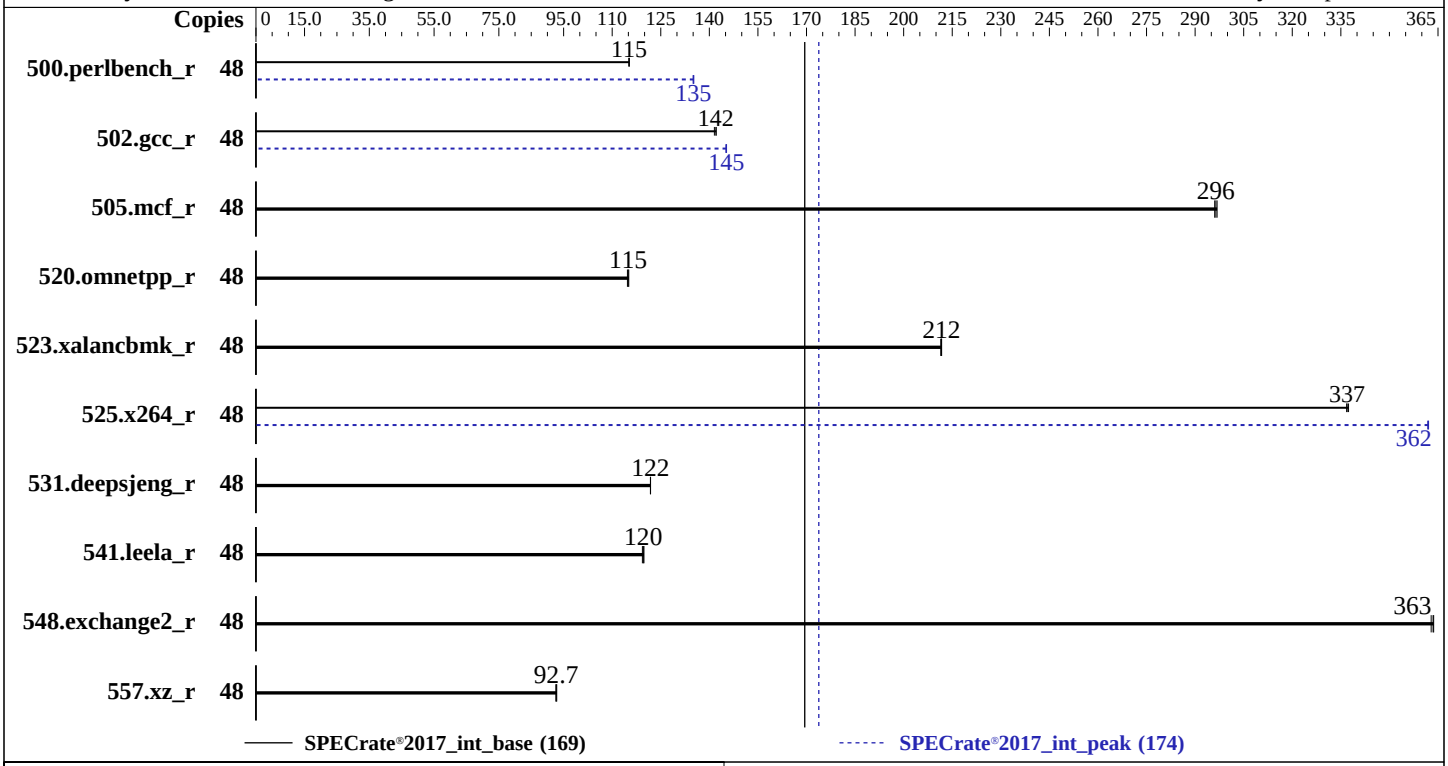
Daten Server DCS-R23I2
(2.10 GHz, Intel Xeon Silver 4310)

SPECrate®2017_int_base = 169

SPECrate®2017_int_peak = 174

CPU2017 License: 6837
Test Sponsor: Daten Tecnologia Ltda.
Tested by: Daten Tecnologia Ltda.

Test Date: Dec-2024
Hardware Availability: Jan-2024
Software Availability: Sep-2024



Hardware

CPU Name:	Intel Xeon Silver 4310
Max MHz:	3300
Nominal:	2100
Enabled:	24 cores, 2 chips, 2 threads/core
Orderable:	1, 2 chip(s)
Cache L1:	32 KB I + 48 KB D on chip per core
L2:	1.25 MB I+D on chip per core
L3:	18 MB I+D on chip per chip
Other:	None
Memory:	512 GB (32 x 16 GB 2Rx8 PC4-3200AA-R, running at 2667)
Storage:	1 x 402GB SAS SSD
Other:	CPU Cooling: Air

Software

OS:	Red Hat Enterprise Linux 8.10 (Ootpa) 4.18.0-553.22.1.el8_10.x86_64
Compiler:	C/C++: Version 2024.2 of Intel oneAPI DPC++/C++ Compiler for Linux; Fortran: Version 2024.2 of Intel Fortran Compiler for Linux;
Parallel:	No
Firmware:	Version T2DM09.00 released Dec-2023
File System:	xfs
System State:	Run level 3 (multi-user)
Base Pointers:	64-bit
Peak Pointers:	64-bit
Other:	jemalloc memory allocator V5.3.0
Power Management:	BIOS and OS set to prefer performance at the cost of additional power usage.

Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
500.perlbench_r	48	663	115	663	115	**663**	**115**	48	565	135	566	135	**566**	**135**
502.gcc_r	48	480	142	**479**	**142**	478	142	48	468	145	**468**	**145**	468	145
505.mcf_r	48	261	297	262	296	**262**	**296**	48	261	297	262	296	**262**	**296**
520.omnetpp_r	48	549	115	**548**	**115**	547	115	48	549	115	**548**	**115**	547	115
523.xalancbmk_r	48	239	212	240	211	**239**	**212**	48	239	212	240	211	**239**	**212**
525.x264_r	48	249	337	**249**	**337**	250	337	48	**232**	**362**	232	362	232	362
531.deepsjeng_r	48	452	122	451	122	**452**	**122**	48	452	122	451	122	**452**	**122**
541.leela_r	48	**664**	**120**	666	119	663	120	48	**664**	**120**	666	119	663	120
548.exchange2_r	48	347	363	346	364	**346**	**363**	48	347	363	346	364	**346**	**363**
557.xz_r	48	558	92.9	560	92.6	**559**	**92.7**	48	558	92.9	560	92.6	**559**	**92.7**

SPECrate®2017_int_base = 169

SPECrate®2017_int_peak = 174

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

Submit Notes

```
The numactl mechanism was used to bind copies to processors. The config file option 'submit'
was used to generate numactl commands to bind each copy to a specific processor.
For details, please see the config file.
```

Operating System Notes

```
Stack size set to unlimited using "ulimit -s unlimited"
OS set to performance mode via cpupower frequency-set -g performance
```

Environment Variables Notes

```
Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH =
     "/opt/intel/oneapi/compiler/2024.2/lib:/opt/intel/oneapi/compiler/2024.2/lib32:/opt/intel/oneapi/2024.
     2/lib:/opt/intel/oneapi/2024.2/lib32:/opt/jemalloc-5.3.0/lib:/home/spec/benchmarks/lib/intel64:/home/s
     pec/benchmarks/lib/ia32:/usr/lib:/usr/lib64:/usr/local/lib"
MALLOC_CONF = "retain:true"
```

General Notes

```
Binaries compiled on a system with 2x Intel Xeon Silver 4310 CPU + 512GB RAM
memory using Red Hat Enterprise Linux 8.10
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.
```

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General Notes (Continued)

```
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.
jemalloc, a general purpose malloc implementation
built with the RedHat Enterprise 8.4, and the system compiler gcc 4.8.5
sources available from jemalloc.net or https://github.com/jemalloc/jemalloc/releases
```

Platform Notes

```
BIOS Settings:
  Virtualization Technology : Disabled

       CPU Power Management : Maximum Performance
                        C1E : Disabled
                  C States : Autonomous
   Energy Efficiency Policy : Performance

Sysinfo program /home/spec/benchmarks/bin/sysinfo
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
running on spec-23i2.localdomain Fri Dec 20 13:14:26 2024

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

------------------------------------------------------------
Table of contents
------------------------------------------------------------
 1. uname -a
 2. w
 3. Username
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 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 (239-82.el8_10.2)
12. Services, from systemctl list-unit-files
13. Linux kernel boot-time arguments, from /proc/cmdline
14. cpupower frequency-info
15. tuned-adm active
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 warning
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------------------------------------------------------------

------------------------------------------------------------
1. uname -a
  Linux spec-23i2.localdomain 4.18.0-553.22.1.el8_10.x86_64 #1 SMP Wed Sep 11 18:02:00 EDT 2024 x86_64 x86_64
  x86_64 GNU/Linux

------------------------------------------------------------
```

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Platform Notes (Continued)

```
2. w
   13:14:26 up 22 min,  1 user,  load average: 0.00, 0.00, 0.00
  USER     TTY      FROM             LOGIN@   IDLE   JCPU   PCPU WHAT
  spec     tty1     -                13:08    2.00s  1.30s  0.00s w

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

------------------------------------------------------------
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) 4126970
  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) 8192
  cpu time               (seconds, -t) unlimited
  max user processes              (-u) 4126970
  virtual memory          (kbytes, -v) unlimited
  file locks                      (-x) unlimited

------------------------------------------------------------
5. sysinfo process ancestry
 /usr/lib/systemd/systemd --switched-root --system --deserialize 17
 login -- spec
 -bash
 runcpu --action validate --define default-platform-flags --define numcopies=48 --configfile
   intrate-Daten.cfg --define smt-on --define cores=24 --define physicalfirst --define invoke_with_interleave
   --define drop_caches --tune base,peak --output_format all --nopower --runmode rate --tune base:peak --size
   refrate intrate
 runcpu --action validate --define default-platform-flags --define numcopies=48 --configfile
   intrate-Daten.cfg --define smt-on --define cores=24 --define physicalfirst --define invoke_with_interleave
   --define drop_caches --tune base,peak --output_format all --nopower --runmode rate --tune base:peak --size
   refrate --nopower --runmode rate --tune base:peak --size refrate intrate --nopreenv --note-preenv
   --logfile $SPEC/tmp/CPU2017.535/templogs/preenv.intrate.535.0.log --lognum 535.0 --from_runcpu 2
 specperl $SPEC/bin/sysinfo
$SPEC = /home/spec/benchmarks

------------------------------------------------------------
6. /proc/cpuinfo
    model name      : Intel(R) Xeon(R) Silver 4310 CPU @ 2.10GHz
    vendor_id       : GenuineIntel
    cpu family      : 6
    model           : 106
    stepping        : 6
    microcode       : 0xd0003d1
    bugs            : spectre_v1 spectre_v2 spec_store_bypass swapgs mmio_stale_data eibrs_pbrsb gds bhi
    cpu cores       : 12
    siblings        : 24
    2 physical ids (chips)
    48 processors (hardware threads)
    physical id 0: core ids 0-11
    physical id 1: core ids 0-11
```

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Platform Notes (Continued)

```
    physical id 0: apicids 0-23
    physical id 1: apicids 64-87
  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):              48
  On-line CPU(s) list: 0-47
  Thread(s) per core:  2
  Core(s) per socket:  12
  Socket(s):           2
  NUMA node(s):        4
  Vendor ID:           GenuineIntel
  CPU family:          6
  Model:               106
  Model name:          Intel(R) Xeon(R) Silver 4310 CPU @ 2.10GHz
  Stepping:            6
  CPU MHz:             2100.000
  CPU max MHz:         3300.0000
  CPU min MHz:         800.0000
  BogoMIPS:            4200.00
  L1d cache:           48K
  L1i cache:           32K
  L2 cache:            1280K
  L3 cache:            18432K
  NUMA node0 CPU(s):   0-5,24-29
  NUMA node1 CPU(s):   6-11,30-35
  NUMA node2 CPU(s):   12-17,36-41
  NUMA node3 CPU(s):   18-23,42-47
  Flags:               fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36 clflush dts
                       acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtscp lm constant_tsc art
                       arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid aperfmperf pni
                       pclmulqdq dtes64 monitor ds_cpl 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 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 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 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: 4 nodes (0-3)
  node 0 cpus: 0-5,24-29
  node 0 size: 128381 MB
  node 0 free: 128041 MB
  node 1 cpus: 6-11,30-35
  node 1 size: 128406 MB
  node 1 free: 128206 MB
  node 2 cpus: 12-17,36-41
```

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Platform Notes (Continued)

```
  node 2 size: 129020 MB
  node 2 free: 128848 MB
  node 3 cpus: 18-23,42-47
  node 3 size: 129017 MB
  node 3 free: 128770 MB
  node distances:
  node   0   1   2   3
    0:  10  20  20  20
    1:  20  10  20  20
    2:  20  20  10  20
    3:  20  20  20  10

------------------------------------------------------------
9. /proc/meminfo
   MemTotal:       527182644 kB

------------------------------------------------------------
10. who -r
  run-level 3 2024-12-20 12:52

------------------------------------------------------------
11. Systemd service manager version: systemd 239 (239-82.el8_10.2)
  Default Target  Status
  multi-user      running

------------------------------------------------------------
12. Services, from systemctl list-unit-files
  STATE     UNIT FILES
  enabled   NetworkManager NetworkManager-dispatcher NetworkManager-wait-online autovt@ getty@ import-state
            iscsi iscsi-onboot loadmodules lvm2-monitor microcode nvmefc-boot-connections
            selinux-autorelabel-mark sshd sssd systemd-pstore timedatex tuned vdo
  disabled  arp-ethers atd auditd blk-availability chrony-wait chronyd cni-dhcp console-getty cpupower crond
            debug-shell dnf-system-upgrade dnsmasq ebtables firewalld hwloc-dump-hwdata insights-client-boot
            iprdump iprinit iprupdate irqbalance iscsid iscsiuio kdump kpatch kvm_stat ledmon libstoragemgmt
            man-db-restart-cache-update mcelog mdmonitor multipathd nftables nis-domainname nvmf-autoconnect
            oddjobd podman podman-auto-update podman-clean-transient podman-kube@ podman-restart psacct rdisc
            rhcd rhsm rhsm-facts rhsmcertd rsyslog sep5 serial-getty@ smartd sshd-keygen@ systemd-resolved
            tcsd udisks2
  indirect  sssd-autofs sssd-kcm sssd-nss sssd-pac sssd-pam sssd-ssh sssd-sudo
  masked    systemd-timedated

------------------------------------------------------------
13. Linux kernel boot-time arguments, from /proc/cmdline
  BOOT_IMAGE=(hd0,gpt2)/vmlinuz-4.18.0-553.22.1.el8_10.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
  nopti
  spectre_v2=off
  retpoline=off

------------------------------------------------------------
14. cpupower frequency-info
  analyzing CPU 0:
    current policy: frequency should be within 800 MHz and 3.30 GHz.
```

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Platform Notes (Continued)

```
                    The governor "performance" may decide which speed to use
                    within this range.
      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
  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 8.10 (Ootpa)
  redhat-release Red Hat Enterprise Linux release 8.10 (Ootpa)
  system-release Red Hat Enterprise Linux release 8.10 (Ootpa)

------------------------------------------------------------
20. Kernel self-reported vulnerability status, from /sys/devices/system/cpu/vulnerabilities
  gather_data_sampling      Mitigation: Microcode
  itlb_multihit             Not affected
  l1tf                      Not affected
```

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Platform Notes (Continued)

```
  mds                     Not affected
  meltdown                Not affected
  mmio_stale_data         Mitigation: Clear CPU buffers; SMT vulnerable
  reg_file_data_sampling  Not affected
  retbleed                Not affected
  spec_rstack_overflow    Not affected
  spec_store_bypass       Mitigation: Speculative Store Bypass disabled via prctl
  spectre_v1              Mitigation: usercopy/swapgs barriers and __user pointer sanitization
  spectre_v2              Vulnerable; IBPB: disabled; STIBP: disabled; PBRSB-eIBRS: Vulnerable; BHI:
                          Vulnerable
  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/spec/benchmarks
  Filesystem            Type  Size  Used Avail Use% Mounted on
  /dev/mapper/rhel-home xfs   402G  304G   98G  76% /home

------------------------------------------------------------
22. /sys/devices/virtual/dmi/id
    Vendor:         Daten Tecnologia Ltda
    Product:        DCS-R23I2
    Product Family: SYSTEM_FAMILY

------------------------------------------------------------
23. dmidecode warning
  Cannot run dmidecode; consider saying (as root)
   chmod +s /sbin/dmidecode


------------------------------------------------------------
24. BIOS
(This section combines info from /sys/devices and dmidecode.)
   BIOS Vendor:       American Megatrends International, LLC.
   BIOS Version:      T2DM09.00
   BIOS Date:         12/05/2023
```

Compiler Version Notes

```
==============================================================================================================
C       | 500.perlbench_r(base, peak) 502.gcc_r(base, peak) 505.mcf_r(base, peak) 525.x264_r(base, peak)
        | 557.xz_r(base, peak)
--------------------------------------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2024.2.1 Build 20240711
Copyright (C) 1985-2024 Intel Corporation. All rights reserved.
--------------------------------------------------------------------------------------------------------------

==============================================================================================================
C++     | 520.omnetpp_r(base, peak) 523.xalancbmk_r(base, peak) 531.deepsjeng_r(base, peak)
        | 541.leela_r(base, peak)
--------------------------------------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2024.2.1 Build 20240711
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==============================================================================================================
```

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Compiler Version Notes (Continued)

```
Fortran | 548.exchange2_r(base, peak)
------------------------------------------------------------------------------------------------------------------------
Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2024.2.1 Build 20240711
Copyright (C) 1985-2024 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 -xCORE-AVX512 -O3 -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-L/opt/intel/oneapi/compiler/2024.2/lib -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/opt/intel/oneapi/compiler/2024.2/lib -lqkmalloc

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Base Optimization Flags (Continued)

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/opt/intel/oneapi/compiler/2024.2/lib -lqkmalloc

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:

500.perlbench_r: -w -std=c11 -m64 -Wl,-z,muldefs
-fprofile-generate(pass 1)
-fprofile-use=default.profdata(pass 2) -xCORE-AVX2(pass 1)
-flto -Ofast -xCORE-AVX512 -ffast-math -mfpmath=sse
-funroll-loops -qopt-mem-layout-trans=4
-fno-strict-overflow
-L/opt/intel/oneapi/compiler/2024.2/lib -lqkmalloc

502.gcc_r: -m64 -std=c11 -Wl,-z,muldefs -fprofile-generate(pass 1)
-fprofile-use=default.profdata(pass 2) -xCORE-AVX2(pass 1)
-flto -Ofast -xCORE-AVX512 -ffast-math -mfpmath=sse
-funroll-loops -qopt-mem-layout-trans=4
-L/opt/jemalloc-5.3.0/lib -ljemalloc

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Peak Optimization Flags (Continued)

505.mcf_r: `basepeak = yes`

525.x264_r: `-w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math -flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -fno-alias -L/opt/intel/oneapi/compiler/2024.2/lib -lqkmalloc`

557.xz_r: `basepeak = yes`

C++ benchmarks:

520.omnetpp_r: `basepeak = yes`

523.xalancbmk_r: `basepeak = yes`

531.deepsjeng_r: `basepeak = yes`

541.leela_r: `basepeak = yes`

Fortran benchmarks:

548.exchange2_r: `basepeak = yes`

The flags files that were used to format this result can be browsed at
`http://www.spec.org/cpu2017/flags/DatenPlatform-Settings-v1.3.html`
`http://www.spec.org/cpu2017/flags/Intel-ic2024-official-linux64.html`

You can also download the XML flags sources by saving the following links:
`http://www.spec.org/cpu2017/flags/DatenPlatform-Settings-v1.3.xml`
`http://www.spec.org/cpu2017/flags/Intel-ic2024-official-linux64.xml`

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

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