



SPEC CPU®2017 Integer Rate Result

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Fusionstor
(Test Sponsor: Meganet)

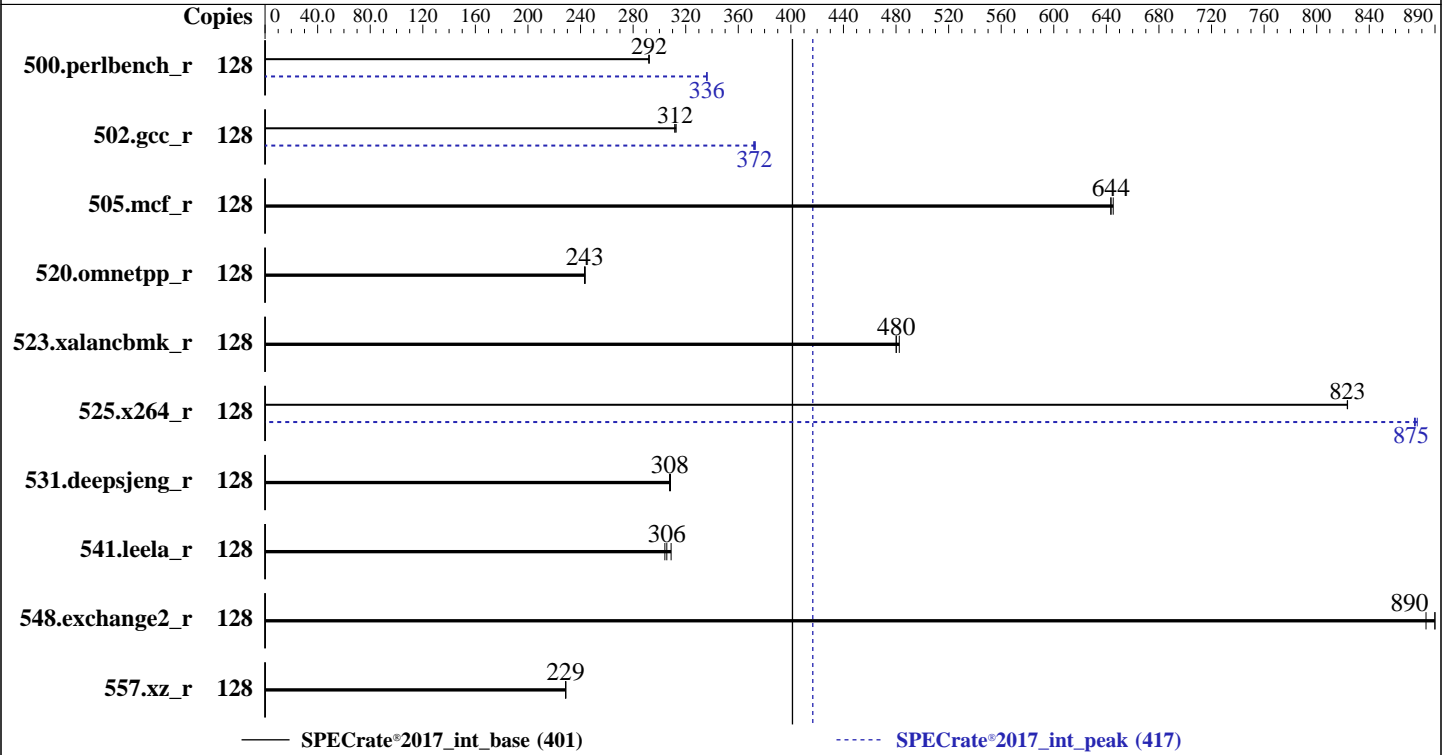
SPECrate®2017_int_base = 401

Invento i6327 (Intel Xeon Gold 6338)

SPECrate®2017_int_peak = 417

CPU2017 License: 6221
Test Sponsor: Meganet
Tested by: Fusionstor system

Test Date: Jul-2024
Hardware Availability: Dec-2021
Software Availability: Nov-2023



Hardware

CPU Name: Intel Xeon Gold 6338
 Max MHz: 3200
 Nominal: 2000
 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)
 Storage: 960 GB SATA SSD
 Other: CPU Cooling: Air

Software

OS: Ubuntu 22.04.4 LTS
 6.5.0-41-generic
 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: No
 Firmware: version w25.33.03 5.22 released Nov-2023
 File System: ext4
 System State: Run level 5 (multi-user mode)
 Base Pointers: 64-bit
 Peak Pointers: 32/64-bit
 Other: jemalloc memory allocator V5.0.1
 Power Management: Default



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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	698	292	697	292	698	292	128	606	336	606	336	606	336
502.gcc_r	128	581	312	580	313	581	312	128	487	372	488	372	486	373
505.mcf_r	128	321	645	322	643	321	644	128	321	645	322	643	321	644
520.omnetpp_r	128	691	243	690	243	690	243	128	691	243	690	243	690	243
523.xalancbmk_r	128	281	480	282	480	280	482	128	281	480	282	480	280	482
525.x264_r	128	272	823	272	823	272	823	128	256	876	256	874	256	875
531.deepsjeng_r	128	476	308	477	308	476	308	128	476	308	477	308	476	308
541.leela_r	128	694	306	686	309	697	304	128	694	306	686	309	697	304
548.exchange2_r	128	380	883	377	890	377	890	128	380	883	377	890	377	890
557.xz_r	128	605	229	605	229	604	229	128	605	229	605	229	604	229

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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"
Kernel version used in not LTS and patch xx is applied

Environment Variables Notes

Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH =
"/home/speccpu/cpu2017/lib/intel64:/home/speccpu/cpu2017/lib/ia32:/home/speccpu/cpu2017/je5.0.1-32"
MALLOC_CONF = "retain:true"

General Notes

Binaries compiled on a system with 2x Intel Xeon Platinum 8280M CPU + 384GB RAM
memory using Red Hat Enterprise Linux 8.4
Transparent Huge Pages enabled by default
Prior to runcpu invocation
Filesystem page cache synced and cleared with:
sync; echo 3> /proc/sys/vm/drop_caches
runcpu command invoked through numactl i.e.:
numactl --interleave=all runcpu <etc>
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>



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Platform Notes

Sysinfo program /home/speccpu/cpu2017/bin/sysinfo
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
running on intel Tue Jul 9 20:20:07 2024

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

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- 11. Systemd service manager version: systemd 249 (249.11-0ubuntu3.12)
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```
1. uname -a
Linux intel 6.5.0-41-generic #41~22.04.2-Ubuntu SMP PREEMPT_DYNAMIC Mon Jun  3 11:32:55 UTC 2 x86_64 x86_64
x86_64 GNU/Linux
```

```
2. w
20:20:07 up 8:39, 2 users, load average: 0.05, 0.11, 0.05
USER      TTY      FROM            LOGIN@   IDLE   JCPU   PCPU   WHAT
intel     :1       :1              11:41   ?xdm?  40:39  0.02s  /usr/libexec/gdm-x-session --run-script env
GNOME_SHELL_SESSION_MODE=ubuntu /usr/bin/gnome-session --session=ubuntu
intel    pts/1    -                20:20   3.00s  2.02s  0.14s  sudo
./reportable-ic2023.2.3-lin-core-avx512-rate-smt-on-20231121.sh
```

```
3. Username
From environment variable $USER:  root
From the command 'logname':      intel
```

```
4. ulimit -a
time(seconds)      unlimited
file(blocks)       unlimited
data(kbytes)       unlimited
stack(kbytes)      unlimited
coredump(blocks)   0
memory(kbytes)     unlimited
```

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Platform Notes (Continued)

```
locked memory(kbytes) 132056320
process                4126457
nofiles                1024
vmemory(kbytes)       unlimited
locks                  unlimited
rtprio                 0
```

```
-----
5. sysinfo process ancestry
/sbin/init splash
/lib/systemd/systemd --user
/usr/libexec/gnome-terminal-server
bash
sudo ./reportable-ic2023.2.3-lin-core-avx512-rate-smt-on-20231121.sh
sudo ./reportable-ic2023.2.3-lin-core-avx512-rate-smt-on-20231121.sh
sh ./reportable-ic2023.2.3-lin-core-avx512-rate-smt-on-20231121.sh
runcpu --nobuild --action validate --define default-platform-flags --define numcopies=128 -c
  ic2023.2.3-lin-core-avx512-rate-20231121.cfg --define smt-on --define cores=64 --define physicalfirst
  --define invoke_with_interleave --define drop_caches --tune base,peak -o all intrate
runcpu --nobuild --action validate --define default-platform-flags --define numcopies=128 --configfile
  ic2023.2.3-lin-core-avx512-rate-20231121.cfg --define smt-on --define cores=64 --define physicalfirst
  --define invoke_with_interleave --define drop_caches --tune base,peak --output_format all --nopower
  --runmode rate --tune base:peak --size refrate intrate --nopreenv --note-preenv --logfile
  $SPEC/tmp/CPU2017.011/temlogs/preenv.intrate.011.0.log --lognum 011.0 --from_runcpu 2
specperl $SPEC/bin/sysinfo
$SPEC = /home/speccpu/cpu2017
```

```
-----
6. /proc/cpuinfo
model name      : Intel(R) Xeon(R) Gold 6338 CPU @ 2.00GHz
vendor_id      : GenuineIntel
cpu family     : 6
model          : 106
stepping       : 6
microcode      : 0xd0003d1
bugs           : apic_cle spectre_v1 spectre_v2 spec_store_bypass swapgs mmio_stale_data eibrs_pbrsb gds
               bhi
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 6338 CPU @ 2.00GHz
```

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Platform Notes (Continued)

```

CPU family:          6
Model:              106
Thread(s) per core: 2
Core(s) per socket: 32
Socket(s):          2
Stepping:           6
CPU max MHz:        3200.0000
CPU min MHz:        800.0000
BogoMIPS:           4000.00
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 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
                   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 wbnoinvd dtherm ida arat pln pts hwp hwp_act_window
                   hwp_epp hwp_pkg_req vnmv avx512vbmi umip pku ospke avx512_vbmi2 gfni
                   vaes vpclmulqdq avx512_vnni avx512_bitalg tme avx512_vpoperntdq la57
                   rdpid fsrm md_clear pconfig flush_lld arch_capabilities

Virtualization:     VT-x
L1d cache:         3 MiB (64 instances)
L1i cache:         2 MiB (64 instances)
L2 cache:          80 MiB (64 instances)
L3 cache:          96 MiB (2 instances)
NUMA node(s):      2
NUMA node0 CPU(s): 0-31,64-95
NUMA node1 CPU(s): 32-63,96-127
Vulnerability Gather data sampling: Mitigation; Microcode
Vulnerability Itlb multihit:        Not affected
Vulnerability Lltf:                 Not affected
Vulnerability Mds:                  Not affected
Vulnerability Meltdown:             Not affected
Vulnerability Mmio stale data:      Mitigation; Clear CPU buffers; SMT vulnerable
Vulnerability Retbleed:             Not affected
Vulnerability Spec rstack overflow: Not affected
Vulnerability Spec store bypass:    Mitigation; Speculative Store Bypass disabled via prctl
Vulnerability Spectre v1:           Mitigation; usercopy/swaps barriers and __user pointer sanitization
Vulnerability Spectre v2:           Mitigation; Enhanced / Automatic IBRS; IBPB conditional; RSB filling;
                                     PBRSE-eIBRS SW sequence; BHI Syscall hardening, KVM SW loop

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	1.3M	80M	20	Unified	2	1024	1	64
L3	48M	96M	12	Unified	3	65536	1	64

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

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Platform Notes (Continued)

```
node 0 size: 515669 MB
node 0 free: 513302 MB
node 1 cpus: 32-63,96-127
node 1 size: 516020 MB
node 1 free: 514415 MB
node distances:
node  0  1
  0:  10  20
  1:  20  10
```

```
-----
9. /proc/meminfo
   MemTotal:      1056450580 kB
-----
```

```
10. who -r
    run-level 5 Jul 9 11:41
-----
```

```
11. Systemd service manager version: systemd 249 (249.11-0ubuntu3.12)
    Default Target Status
    graphical          running
-----
```

```
12. Services, from systemctl list-unit-files
STATE                               UNIT FILES
enabled                             ModemManager NetworkManager NetworkManager-dispatcher NetworkManager-wait-online
accounts-daemon anacron anydesk apparmor avahi-daemon bluetooth console-setup cron cups
cups-browsed dmesg e2scrub_reap getty@ gpu-manager grub-common grub-initrd-fallback
irqbalance kerneloops keyboard-setup networkd-dispatcher openvpn power-profiles-daemon
rsyslog secureboot-db setvtrgb snapd ssh switcheroo-control systemd-oom systemd-pstore
systemd-resolved systemd-timesyncd thermald ua-reboot-cmds ubuntu-advantage udisks2 ufw
unattended-upgrades wpa_supplicant
enabled-runtime netplan-ovs-cleanup systemd-fsck-root systemd-remount-fs
disabled acpid brltty console-getty debug-shell nftables openvpn-client@ openvpn-server@ openvpn@
rsync rtkit-daemon serial-getty@ speech-dispatcherd systemd-boot-check-no-failures
systemd-network-generator systemd-networkd systemd-networkd-wait-online systemd-sysext
systemd-time-wait-sync upower wpa_supplicant-nl80211@ wpa_supplicant-wired@
wpa_supplicant@
generated apport speech-dispatcher
indirect saned@ spice-vdagentd uidd
masked alsa-utils cryptdisks cryptdisks-early hwclock pulseaudio-enable-autospawn rc rcS saned
screen-cleanup sudo x11-common
-----
```

```
13. Linux kernel boot-time arguments, from /proc/cmdline
BOOT_IMAGE=/boot/vmlinuz-6.5.0-41-generic
root=UUID=eed05ad7-3678-4b37-aff7-318ba9064a38
ro
quiet
splash
vt.handoff=7
-----
```

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

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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

```

```

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

```

```

-----
16. /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

```

```

-----
17. OS release
From /etc/*-release /etc/*-version
os-release Ubuntu 22.04.4 LTS

```

```

-----
18. Disk information
SPEC is set to: /home/speccpu/cpu2017
Filesystem      Type  Size  Used Avail Use% Mounted on
/dev/sda2       ext4  879G  244G  591G  30% /

```

```

-----
19. /sys/devices/virtual/dmi/id
Vendor:         Fusionstor
Product:        Invento i6327
Product Family: Family
Serial:         i6327240317

```

```

-----
20. 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 NO DIMM NO DIMM
16x Samsung M393A8G40CB4-CWE 64 GB 2 rank 3200

```

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Platform Notes (Continued)

21. BIOS
(This section combines info from /sys/devices and dmidecode.)
BIOS Vendor: American Megatrends International, LLC.
BIOS Version: W25.33.03
BIOS Date: 11/16/2023
BIOS Revision: 5.22

Compiler Version Notes

=====
C | 502.gcc_r(peak)

Intel(R) oneAPI DPC++/C++ Compiler for applications running on IA-32, Version 2023.2.3 Build x
Copyright (C) 1985-2023 Intel Corporation. All rights reserved.

=====
C | 500.perlbench_r(base, peak) 502.gcc_r(base) 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 2023.2.3 Build x
Copyright (C) 1985-2023 Intel Corporation. All rights reserved.

=====
C | 502.gcc_r(peak)

Intel(R) oneAPI DPC++/C++ Compiler for applications running on IA-32, Version 2023.2.3 Build x
Copyright (C) 1985-2023 Intel Corporation. All rights reserved.

=====
C | 500.perlbench_r(base, peak) 502.gcc_r(base) 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 2023.2.3 Build x
Copyright (C) 1985-2023 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 2023.2.3 Build x
Copyright (C) 1985-2023 Intel Corporation. All rights reserved.

=====
Fortran | 548.exchange2_r(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.



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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/home/specdev/new_compilers/ic2023.2.3/compiler/lib/intel64_lin
-lqkmalloc
```

C++ benchmarks:

```
-w -std=c++14 -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-L/home/specdev/new_compilers/ic2023.2.3/compiler/lib/intel64_lin
-lqkmalloc
```

Fortran benchmarks:

```
-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ffast-math -flto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-nostandard-realloc-lhs -align array32byte -auto
-L/home/specdev/new_compilers/ic2023.2.3/compiler/lib/intel64_lin
-lqkmalloc
```



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Peak Compiler Invocation

C benchmarks:

icx

C++ benchmarks:

icpx

Fortran benchmarks:

ifx

Peak Portability Flags

```
500.perlbench_r: -DSPEC_LP64 -DSPEC_LINUX_X64
502.gcc_r: -D_FILE_OFFSET_BITS=64
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
```

Peak Optimization Flags

C benchmarks:

```
500.perlbench_r: -w -std=c11 -m64 -Wl,-z,muldefs
-fprofile-generate(pass 1)
-fprofile-use=default.profddata(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/home/specdev/new_compilers/ic2023.2.3/compiler/lib/intel64_lin
-lqkmalloc

502.gcc_r: -m32
-L/home/specdev/new_compilers/ic2023.2.3/compiler/lib/ia32_lin
-std=gnu89 -Wl,-z,muldefs -fprofile-generate(pass 1)
-fprofile-use=default.profddata(pass 2) -xCORE-AVX2(pass 1)
-flto -Ofast -xCORE-AVX512 -ffast-math -mfpmath=sse
-funroll-loops -qopt-mem-layout-trans=4
-L/usr/local/jemalloc32-5.0.1/lib -ljemalloc
```

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SPEC CPU®2017 Integer Rate Result

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Fusionstor
(Test Sponsor: Meganet)

SPECrate®2017_int_base = 401

Invento i6327 (Intel Xeon Gold 6338)

SPECrate®2017_int_peak = 417

CPU2017 License: 6221
Test Sponsor: Meganet
Tested by: Fusionstor system

Test Date: Jul-2024
Hardware Availability: Dec-2021
Software Availability: Nov-2023

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/home/specdev/new_compilers/ic2023.2.3/compiler/lib/intel64_lin
-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/Intel-ic2023p2-official-linux64.html>

<http://www.spec.org/cpu2017/flags/Fusionstor-Platform-Flags-Intel-ICX-rev3.html>

You can also download the XML flags sources by saving the following links:

<http://www.spec.org/cpu2017/flags/Intel-ic2023p2-official-linux64.xml>

<http://www.spec.org/cpu2017/flags/Fusionstor-Platform-Flags-Intel-ICX-rev3.xml>

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