



SPEC CPU®2017 Integer Rate Result

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant DL20 Gen11

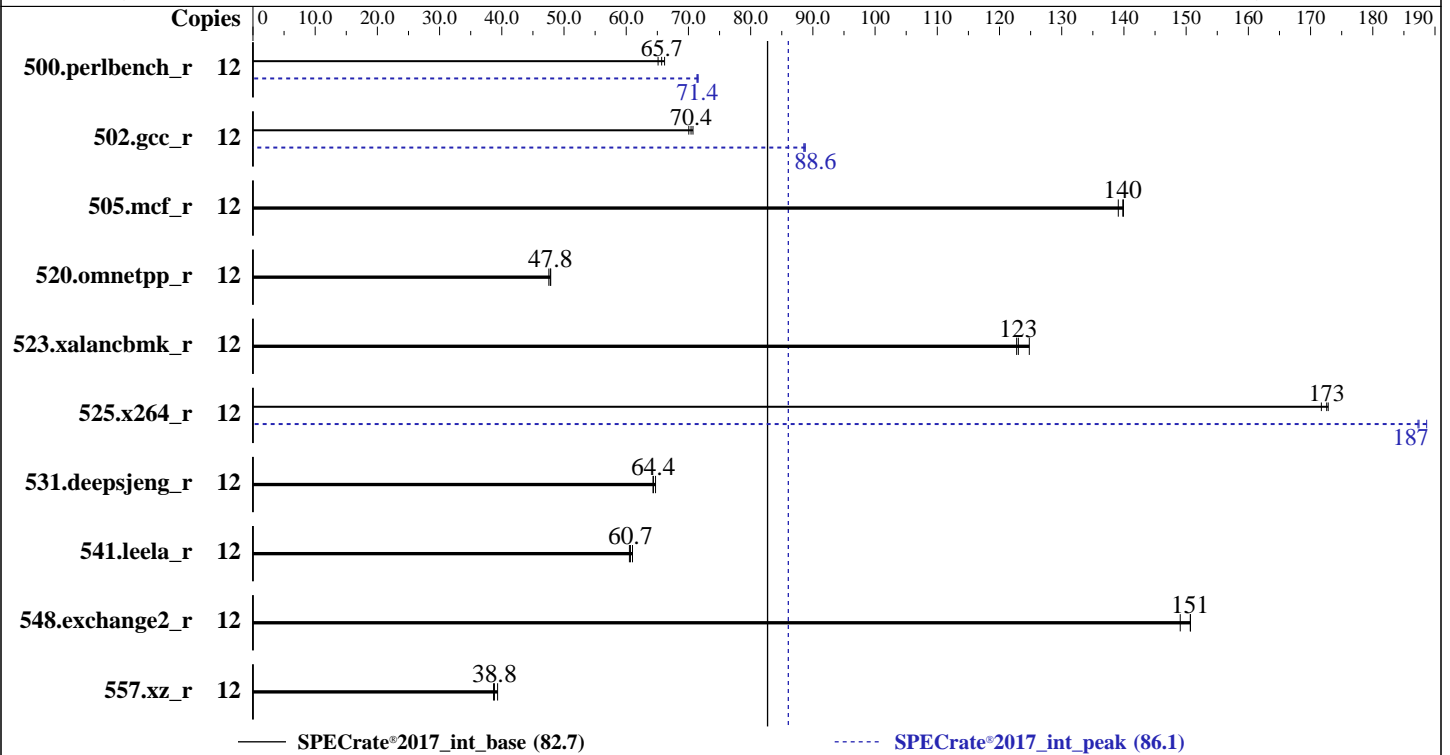
(3.50 GHz, Intel Xeon E-2486)

SPECrate®2017_int_base = 82.7

SPECrate®2017_int_peak = 86.1

CPU2017 License: 3
Test Sponsor: HPE
Tested by: HPE

Test Date: Jan-2024
Hardware Availability: Dec-2023
Software Availability: Dec-2023



Hardware

CPU Name: Intel Xeon E-2486
 Max MHz: 5600
 Nominal: 3500
 Enabled: 6 cores, 1 chip, 2 threads/core
 Orderable: 1 Chip
 Cache L1: 32 KB I + 48 KB D on chip per core
 L2: 2 MB I+D on chip per core
 L3: 18 MB I+D on chip per chip
 Other: None
 Memory: 64 GB (2 x 32 GB 2Rx8 PC5-5600B-E, running at 4400), orderable using HPE part# P64339-B21
 Storage: 1 x 480 GB SATA SSD
 Other: None

Software

OS: SUSE Linux Enterprise Server 15 SP4
 Kernel 5.14.21-150400.22-default
 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: HPE BIOS Version v1.44 01/04/2024 released Jan-2024
 File System: xfs
 System State: Run level 3 (multi-user)
 Base Pointers: 64-bit
 Peak Pointers: 32/64-bit
 Other: jemalloc memory allocator V5.0.1
 Power Management: BIOS and OS set to prefer performance at the cost of additional power usage



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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	12	289	66.2	<u>291</u>	<u>65.7</u>	293	65.1	12	267	71.6	<u>267</u>	<u>71.4</u>	268	71.4
502.gcc_r	12	243	70.1	<u>241</u>	<u>70.4</u>	240	70.7	12	191	88.8	192	88.6	<u>192</u>	<u>88.6</u>
505.mcf_r	12	139	140	139	139	<u>139</u>	<u>140</u>	12	139	140	139	139	<u>139</u>	<u>140</u>
520.omnetpp_r	12	331	47.6	<u>329</u>	<u>47.8</u>	329	47.9	12	331	47.6	<u>329</u>	<u>47.8</u>	329	47.9
523.xalancbmk_r	12	<u>103</u>	<u>123</u>	102	125	103	123	12	<u>103</u>	<u>123</u>	102	125	103	123
525.x264_r	12	122	172	<u>122</u>	<u>173</u>	122	173	12	<u>112</u>	<u>187</u>	111	189	112	187
531.deepsjeng_r	12	<u>214</u>	<u>64.4</u>	214	64.3	213	64.7	12	<u>214</u>	<u>64.4</u>	214	64.3	213	64.7
541.leela_r	12	326	61.0	328	60.5	<u>327</u>	<u>60.7</u>	12	326	61.0	328	60.5	<u>327</u>	<u>60.7</u>
548.exchange2_r	12	<u>209</u>	<u>151</u>	209	151	211	149	12	<u>209</u>	<u>151</u>	209	151	211	149
557.xz_r	12	335	38.7	330	39.3	<u>334</u>	<u>38.8</u>	12	335	38.7	330	39.3	<u>334</u>	<u>38.8</u>

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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"
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
tuned service was stopped using "systemctl stop tuned"

Environment Variables Notes

Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH = "/home/cpu2017_new/lib/intel64:/home/cpu2017_new/lib/ia32:/home/cpu2017_new/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
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.
jemalloc, a general purpose malloc implementation
built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5

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General Notes (Continued)

sources available from jemalloc.net or <https://github.com/jemalloc/jemalloc/releases>

Platform Notes

The system ROM used for this result contains Intel microcode version 0x121 for the Intel Xeon E-2486 processor.

BIOS Configuration:

Workload Profile set to General Throughput Compute
Thermal Configuration set to Maximum Cooling
Enhanced Processor Performance Profile set to Enabled

Sysinfo program /home/cpu2017_new/bin/sysinfo
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
running on localhost Sat Jan 20 23:07:26 2024

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. tuned-adm active
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 5.14.21-150400.22-default #1 SMP PREEMPT_DYNAMIC Wed May 11 06:57:18 UTC 2022 (49db222/lp)
x86_64 x86_64 x86_64 GNU/Linux

```

```

2. w
23:07:26 up 1 day, 25 min,  1 user,  load average: 0.00, 0.00, 0.00
USER      TTY      FROM          LOGIN@      IDLE        JCPU   PCPU   WHAT
root     pts/0    172.17.1.96   Fri22      6.00s    0.57s  0.00s  -bash

```

```

3. Username
From environment variable $USER:  root

```

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Platform Notes (Continued)

```

-----
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) 256724
   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) 256724
   virtual memory        (kbytes, -v) unlimited
   file locks            (-x) unlimited

```

```

-----
5. sysinfo process ancestry
   /usr/lib/systemd/systemd --switched-root --system --deserialize 29
   sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups
   sshd: root@pts/0
   -bash
   -bash
   runcpu --nobuild --action validate --define default-platform-flags --define numcopies=12 -c
     ic2023.2.3-lin-core-avx2-rate-20231121.cfg --define smt-on --define cores=6 --define physicalfirst
     --define no-numa --tune base,peak -o all --define drop_caches intrate
   runcpu --nobuild --action validate --define default-platform-flags --define numcopies=12 --configfile
     ic2023.2.3-lin-core-avx2-rate-20231121.cfg --define smt-on --define cores=6 --define physicalfirst
     --define no-numa --tune base,peak --output_format all --define drop_caches --nopower --runmode rate --tune
     base:peak --size refrate intrate --nopreenv --note-preenv --logfile
     $$SPEC/tmp/CPU2017.008/templogs/preenv.intrate.008.0.log --lognum 008.0 --from_runcpu 2
   specperl $$SPEC/bin/sysinfo
   $$SPEC = /home/cpu2017_new

```

```

-----
6. /proc/cpuinfo
   model name      : Intel(R) Xeon(R) E E-2486
   vendor_id      : GenuineIntel
   cpu family     : 6
   model          : 183
   stepping       : 1
   microcode      : 0x121
   bugs           : spectre_v1 spectre_v2 spec_store_bypass swapgs
   cpu cores      : 6
   siblings       : 12
   1 physical ids (chips)
   12 processors (hardware threads)
   physical id 0: core ids 0-5
   physical id 0: apicids 0-11
   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:

```

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Platform Notes (Continued)

```

Architecture:                x86_64
CPU op-mode(s):              32-bit, 64-bit
Address sizes:                46 bits physical, 48 bits virtual
Byte Order:                   Little Endian
CPU(s):                       12
On-line CPU(s) list:         0-11
Vendor ID:                    GenuineIntel
Model name:                   Intel(R) Xeon(R) E E-2486
CPU family:                   6
Model:                        183
Thread(s) per core:          2
Core(s) per socket:          6
Socket(s):                    1
Stepping:                     1
BogoMIPS:                     6988.80
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 sse4_1 sse4_2
                                x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c rdrand lahf_lm
                                abm 3dnowprefetch cpuid_fault epb invpcid_single ssbd ibrs ibpb stibp
                                ibrs_enhanced tpr_shadow vnmi flexpriority ept vpid ept_ad fsgsbase
                                tsc_adjust bmi1 avx2 smep bmi2 erms invpcid rdseed adx smap clflushopt
                                clwb intel_pt sha_ni xsaveopt xsavec xgetbv1 xsaves avx_vnni dtherm ida
                                arat pln pts umip pku ospke waitpkg gfni vaes vpclmulqdq tme rdpid movdiri
                                movdir64b fsrm md_clear serialize pconfig arch_lbr flush_l1d
                                arch_capabilities

Virtualization:              VT-x
L1d cache:                   288 KiB (6 instances)
L1i cache:                   192 KiB (6 instances)
L2 cache:                    12 MiB (6 instances)
L3 cache:                    18 MiB (1 instance)
NUMA node(s):                1
NUMA node0 CPU(s):          0-11
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	288K	12	Data	1	64	1	64
L1i	32K	192K	8	Instruction	1	64	1	64
L2	2M	12M	16	Unified	2	2048	1	64
L3	18M	18M	9	Unified	3	32768	1	64

8. numactl --hardware

NOTE: a numactl 'node' might or might not correspond to a physical chip.

```

available: 1 nodes (0)
node 0 cpus: 0-11
node 0 size: 64203 MB
node 0 free: 58193 MB
node distances:

```

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Platform Notes (Continued)

node 0
0: 10

9. /proc/meminfo
MemTotal: 65744624 kB

10. who -r
run-level 3 Jan 19 22:42

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

12. Services, from systemctl list-unit-files

STATE	UNIT FILES
enabled	apparmor auditd cron getty@ haveged irqbalance issue-generator kbdsettings lvm2-monitor postfix purge-kernels rollback sshd wicked wickedd-auto4 wicked-dhcp4 wicked-dhcp6 wickedd-nanny
enabled-runtime	systemd-remount-fs
disabled	blk-availability boot-sysctl ca-certificates chrony-wait chronyd console-getty debug-shell grub2-once haveged-switch-root hwloc-dump-hwdata issue-add-ssh-keys kexec-load lunmask rpmconfigcheck serial-getty@ systemd-boot-check-no-failures systemd-network-generator systemd-sysexit systemd-time-wait-sync systemd-timesyncd tuned
indirect	pcscd wickedd

13. Linux kernel boot-time arguments, from /proc/cmdline
BOOT_IMAGE=/boot/vmlinuz-5.14.21-150400.22-default
root=UUID=0568eef9-b0ff-4cd5-adb9-1f8e14da628c
splash=silent
resume=/dev/disk/by-uuid/ffb9593d-577b-484e-83b9-b995375d44ca
mitigations=auto
quiet
security=apparmor

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

15. tuned-adm active
It seems that tuned daemon is not running, preset profile is not activated.
Preset profile: throughput-performance

16. sysctl

kernel.numa_balancing	0
kernel.randomize_va_space	2
vm.compaction_proactiveness	20
vm.dirty_background_bytes	0
vm.dirty_background_ratio	10
vm.dirty_bytes	0

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Platform Notes (Continued)

```

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
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 SUSE Linux Enterprise Server 15 SP4

```

```

-----
20. Disk information
SPEC is set to: /home/cpu2017_new
Filesystem      Type  Size  Used Avail Use% Mounted on
/dev/sda3       xfs   344G   87G  258G  26% /home

```

```

-----
21. /sys/devices/virtual/dmi/id
Vendor:          HPE
Product:         ProLiant DL20 Gen11
Product Family: ProLiant
Serial:          DA2G93DK88

```

```

-----
22. 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:
  2x Hynix HMC88AGBEA084N 32 GB 2 rank 5600, configured at 4400

```

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Platform Notes (Continued)

23. BIOS
(This section combines info from /sys/devices and dmidecode.)
BIOS Vendor: HPE
BIOS Version: 1.44
BIOS Date: 01/04/2024
BIOS Revision: 1.44
Firmware Revision: 1.45

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
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=====
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-AVX2 -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
-lqkmallo
```

C++ benchmarks:

```
-w -std=c++14 -m64 -Wl,-z,muldefs -xCORE-AVX2 -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
-lqkmallo
```

Fortran benchmarks:

```
-w -m64 -Wl,-z,muldefs -xCORE-AVX2 -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
-lqkmallo
```



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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 -flto
-Ofast -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 -flto
-Ofast -ffast-math -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -L/usr/local/jemalloc32-5.0.1/lib
-ljemalloc

```

(Continued on next page)



SPEC CPU®2017 Integer Rate Result

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant DL20 Gen11

(3.50 GHz, Intel Xeon E-2486)

SPECrate®2017_int_base = 82.7

SPECrate®2017_int_peak = 86.1

CPU2017 License: 3

Test Sponsor: HPE

Tested by: HPE

Test Date: Jan-2024

Hardware Availability: Dec-2023

Software Availability: Dec-2023

Peak Optimization Flags (Continued)

505.mcf_r: basepeak = yes

```
525.x264_r: -w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX2 -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/HPE-Platform-Flags-Intel-RPL-rev2.0.html>

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

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

<http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-RPL-rev2.0.xml>

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

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