



SPEC CPU®2017 Integer Rate Result

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant DL20 Gen11

(3.60 GHz, Intel Xeon 6349P)

SPECrate®2017_int_base = 86.6

SPECrate®2017_int_peak = 90.2

CPU2017 License: 3

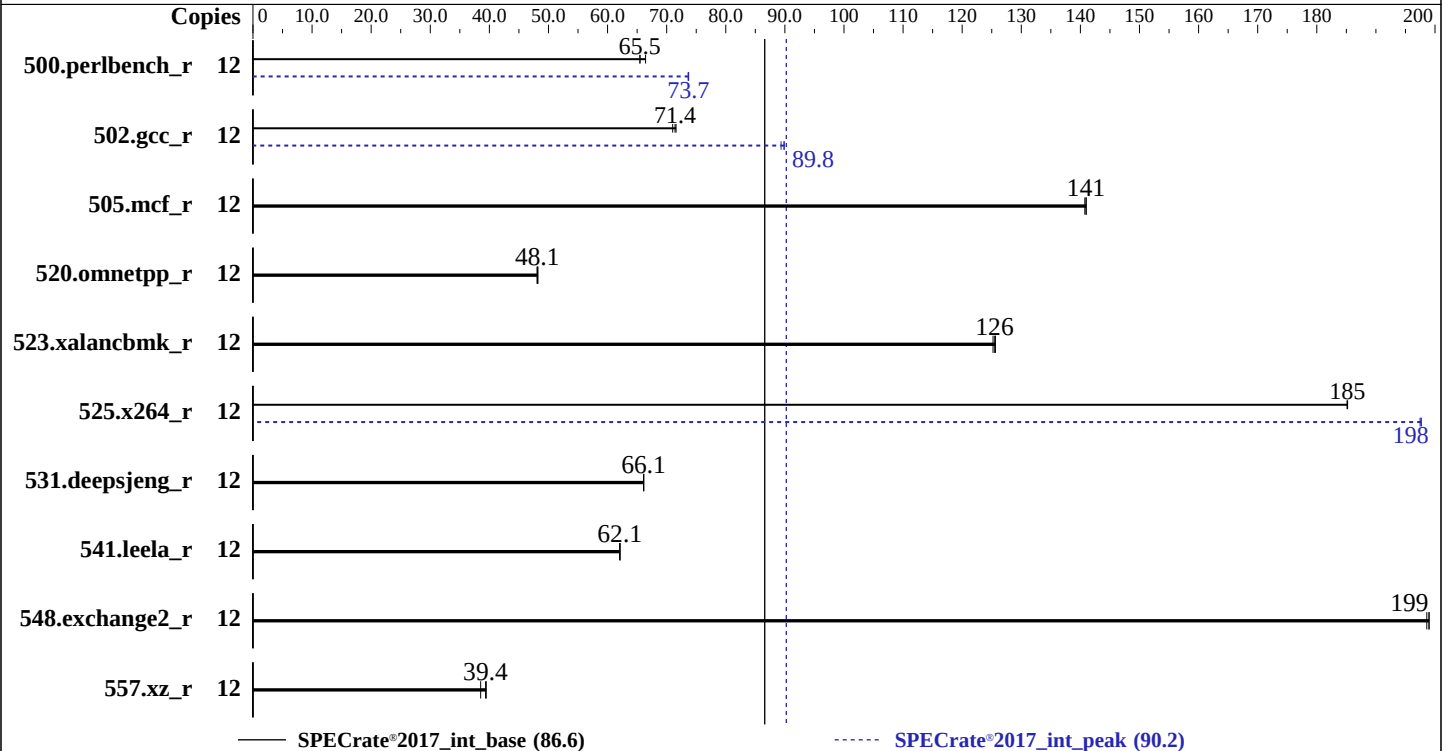
Test Sponsor: HPE

Tested by: HPE

Test Date: Feb-2025

Hardware Availability: Mar-2025

Software Availability: Jun-2024



Hardware

CPU Name: Intel Xeon 6349P
Max MHz: 5700
Nominal: 3600
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: CPU Cooling: Air

Software

OS: SUSE Linux Enterprise Server 15 SP6
Kernel 6.4.0-150600.21-default
Compiler: C/C++: Version 2024.1 of Intel oneAPI DPC++/C++ Compiler for Linux;
Fortran: Version 2024.1 of Intel Fortran Compiler for Linux;
Parallel: No
Firmware: HPE BIOS Version v2.10 12/06/2024 released Dec-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 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	288	66.4	<u>292</u>	<u>65.5</u>	292	65.5	12	259	73.6	<u>259</u>	<u>73.7</u>	259	73.7
502.gcc_r	12	<u>238</u>	<u>71.4</u>	237	71.6	239	71.0	12	<u>189</u>	<u>89.8</u>	190	89.4	189	89.9
505.mcf_r	12	138	141	138	141	<u>138</u>	<u>141</u>	12	138	141	138	141	<u>138</u>	<u>141</u>
520.omnetpp_r	12	328	48.1	<u>327</u>	<u>48.1</u>	326	48.2	12	328	48.1	<u>327</u>	<u>48.1</u>	326	48.2
523.xalancbmk_r	12	101	126	<u>101</u>	<u>126</u>	101	125	12	101	126	<u>101</u>	<u>126</u>	101	125
525.x264_r	12	<u>113</u>	<u>185</u>	114	185	113	185	12	<u>106</u>	<u>198</u>	106	198	106	197
531.deepsjeng_r	12	208	66.1	<u>208</u>	<u>66.1</u>	208	66.1	12	208	66.1	<u>208</u>	<u>66.1</u>	208	66.1
541.leela_r	12	320	62.1	320	62.1	<u>320</u>	<u>62.1</u>	12	320	62.1	320	62.1	<u>320</u>	<u>62.1</u>
548.exchange2_r	12	158	199	<u>158</u>	<u>199</u>	158	199	12	158	199	<u>158</u>	<u>199</u>	158	199
557.xz_r	12	328	39.5	<u>329</u>	<u>39.4</u>	336	38.5	12	328	39.5	<u>329</u>	<u>39.4</u>	336	38.5

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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

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"

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



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Platform Notes

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/bin/sysinfo
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
running on localhost Fri Feb 21 20:46:07 2025

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

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10. who -r
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12. Services, from systemctl list-unit-files
13. Linux kernel boot-time arguments, from /proc/cmdline
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17. /sys/kernel/mm/transparent_hugepage/khugepaged
18. OS release
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20. /sys/devices/virtual/dmi/id
21. dmidecode
22. BIOS

1. uname -a
Linux localhost 6.4.0-150600.21-default #1 SMP PREEMPT_DYNAMIC Thu May 16 11:09:22 UTC 2024 (36c1e09)
x86_64 x86_64 x86_64 GNU/Linux

2. w
20:46:07 up 2 min, 3 users, load average: 0.00, 0.00, 0.00
USER TTY FROM LOGIN@ IDLE JCPU PCPU WHAT

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) 256713
max locked memory (kbytes, -l) 8192

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Platform Notes (Continued)

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) 256713
virtual memory (kbytes, -v) unlimited
file locks (-x) unlimited

5. sysinfo process ancestry

```
/usr/lib/systemd/systemd --switched-root --system --deserialize=31
sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups
sshd: root [priv]
sshd: root@notty
bash -c cd $SPEC/ && $SPEC/intrate.sh
runcpu --nobuild --action validate --define default-platform-flags --define numcopies=12 -c
ic2024.1-lin-core-avx2-rate-20240308.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
ic2024.1-lin-core-avx2-rate-20240308.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/CPU2017.003/templogs/preenv.intrate.003.0.log --lognum 003.0 --from_runcpu 2
specperl $SPEC/bin/sysinfo
$SPEC = /home/cpu2017
```

6. /proc/cpuinfo

```
model name      : Intel(R) Xeon(R) 6349P
vendor_id       : GenuineIntel
cpu family      : 6
model           : 183
stepping        : 1
microcode       : 0x12c
bugs             : spectre_v1 spectre_v2 spec_store_bypass swapgs eibrs_pbrsb bhi
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 2.39.3:

```
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
BIOS Vendor ID:        Intel(R) Corporation
Model name:            Intel(R) Xeon(R) 6349P
```

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Platform Notes (Continued)

BIOS Model name: Intel(R) Xeon(R) 6349P To Be Filled By O.E.M. CPU @ 3.6GHz
BIOS CPU family: 179
CPU family: 6
Model: 183
Thread(s) per core: 2
Core(s) per socket: 6
Socket(s): 1
Stepping: 1
BogoMIPS: 7219.20
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 sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes
xsave avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault epb ssbd
ibrs ibpb stibp ibrs_enhanced tpr_shadow 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
split_lock_detect user_shstk avx_vnni dtherm ida arat pln pts hfi
vmmi umip pku ospke waitpkg gfni vaes vpclmulqdq tme rdpid movdiri
movdir64b fsrm md_clear serialize pconfig arch_lbr ibt 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 Gather data sampling: Not affected
Vulnerability Itlb multihit: Not affected
Vulnerability L1tf: Not affected
Vulnerability Mds: Not affected
Vulnerability Meltdown: Not affected
Vulnerability Mmio stale data: Not affected
Vulnerability Reg file data sampling: Not affected
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/swapgs barriers and __user pointer sanitization
Vulnerability Spectre v2: Mitigation; Enhanced / Automatic IBRS; IBPB conditional; RSB filling;
PBRSE-eIBRS SW sequence; BHI BHI_DIS_S
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: 63579 MB

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Platform Notes (Continued)

node distances:

node 0

0: 10

9. /proc/meminfo

MemTotal: 65744248 kB

10. who -r

run-level 3 Feb 21 20:44

11. Systemd service manager version: systemd 254 (254.10+suse.84.ge8d77af424)

Default Target Status

multi-user running

12. Services, from systemctl list-unit-files

STATE UNIT FILES

enabled apparmor auditd cron getty@ irqbalance issue-generator kbdsettings lvm2-monitor postfix
purge-kernels rollback sshd systemd-pstore wicked wickedd-auto4 wickedd-dhcp4
wickedd-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 hwloc-dump-hwdata issue-add-ssh-keys kexec-load lunmask rpmconfigcheck
serial-getty@ systemd-boot-check-no-failures systemd-confext systemd-network-generator
systemd-sysext systemd-time-wait-sync systemd-timesyncd

indirect systemd-userdbd wickedd

13. Linux kernel boot-time arguments, from /proc/cmdline

BOOT_IMAGE=/boot/vmlinuz-6.4.0-150600.21-default

root=UUID=a6e890e9-5edf-48d7-8bed-5dfa2a74df8c

splash=silent

resume=/dev/disk/by-uuid/afc21d61-6b6e-462f-bfa8-ef7c975f7ad3

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. 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

vm.dirty_expire_centisecs 3000

vm.dirty_ratio 20

vm.dirty_writeback_centisecs 500

vm.dirtytime_expire_seconds 43200

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Platform Notes (Continued)

```
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 SP6
```

```
-----
19. Disk information
SPEC is set to: /home/cpu2017
Filesystem      Type  Size  Used Avail Use% Mounted on
/dev/sda3       xfs   344G   66G  279G  20% /home
```

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

```
-----
21. dmidecode
Additional information from dmidecode 3.4 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 HMC688AGBEA084N 32 GB 2 rank 5600, configured at 4400
```

```
-----
22. BIOS
(This section combines info from /sys/devices and dmidecode.)
   BIOS Vendor:      HPE
   BIOS Version:     2.10
```

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Platform Notes (Continued)

BIOS Date: 12/06/2024

BIOS Revision: 2.10

Firmware Revision: 1.62

Compiler Version Notes

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

Intel(R) oneAPI DPC++/C++ Compiler for applications running on IA-32, Version 2024.1.0 Build 20240308
Copyright (C) 1985-2024 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)
=====

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| 557.xz_r(base, peak)
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=====

=====
C++ | 520.omnettp_r(base, peak) 523.xalancbmk_r(base, peak) 531.deepsjeng_r(base, peak)
| 541.leela_r(base, peak)
=====

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=====

=====
Fortran | 548.exchange2_r(base, peak)
=====

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=====

Base Compiler Invocation

C benchmarks:

icx

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Base Compiler Invocation (Continued)

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/opt/intel/oneapi/compiler/2024.1/lib -lqkmalloc

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/opt/intel/oneapi/compiler/2024.1/lib -lqkmalloc

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/opt/intel/oneapi/compiler/2024.1/lib -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 -flto

-Ofast -ffast-math -mfpmath=sse -funroll-loops

-qopt-mem-layout-trans=4 -fno-strict-overflow

-L/opt/intel/oneapi/compiler/2024.1/lib -lqkmalloc

502.gcc_r: -m32 -L/opt/intel/oneapi/compiler/2024.1/lib32 -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

505.mcf_r: basepeak = yes

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SPEC CPU®2017 Integer Rate Result

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant DL20 Gen11

(3.60 GHz, Intel Xeon 6349P)

SPECrate®2017_int_base = 86.6

SPECrate®2017_int_peak = 90.2

CPU2017 License: 3

Test Sponsor: HPE

Tested by: HPE

Test Date: Feb-2025

Hardware Availability: Mar-2025

Software Availability: Jun-2024

Peak Optimization Flags (Continued)

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/opt/intel/oneapi/compiler/2024.1/lib -lqkmallo

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-ic2024-official-linux64.html>

<http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-CatlowRefresh-rev1.0.html>

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

<http://www.spec.org/cpu2017/flags/Intel-ic2024-official-linux64.xml>

<http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-CatlowRefresh-rev1.0.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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