



SPEC CPU®2017 Integer Speed Result

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant Compute DL360 Gen12

(3.10 GHz, Intel Xeon 6745P)

SPECspeed®2017_int_base = 15.2

SPECspeed®2017_int_peak = 15.5

CPU2017 License: 3

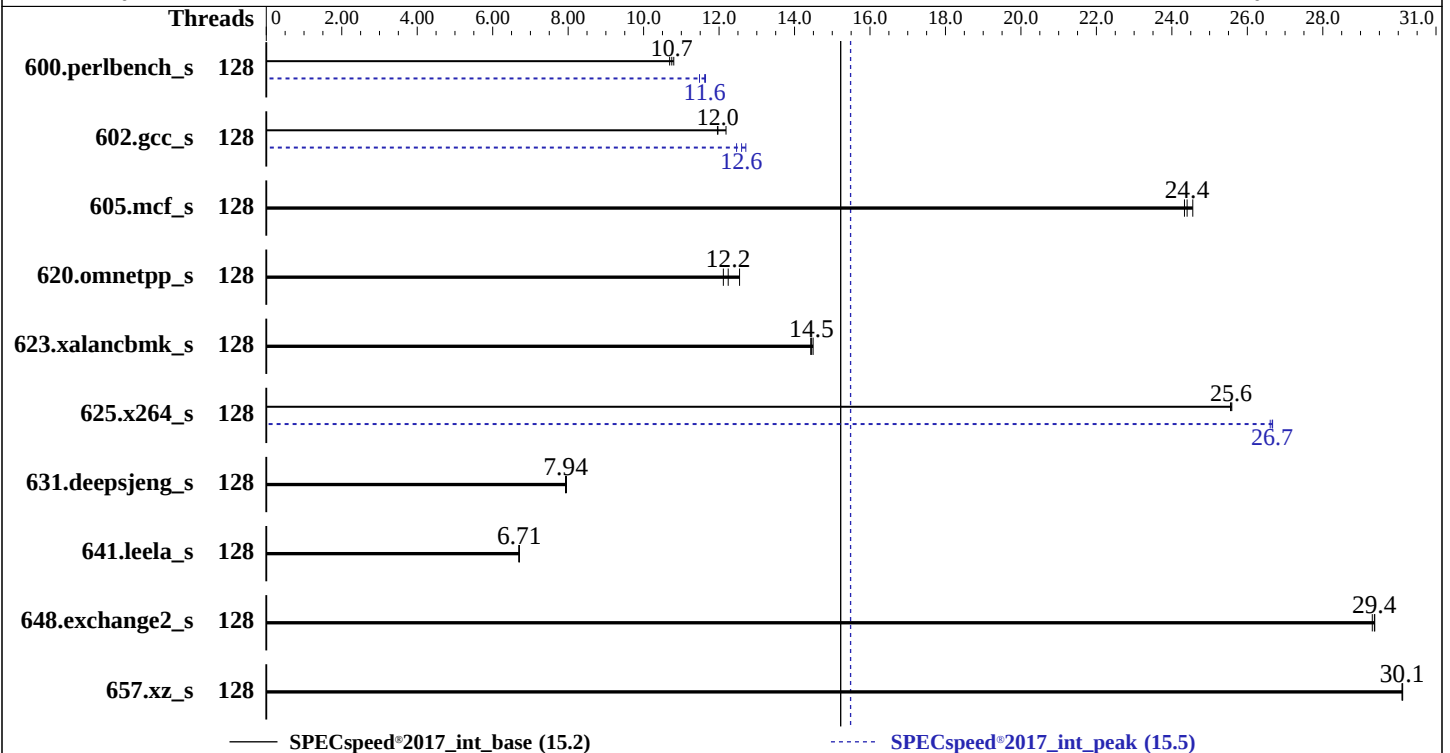
Test Sponsor: HPE

Tested by: HPE

Test Date: May-2025

Hardware Availability: Mar-2025

Software Availability: Jun-2024



Hardware

CPU Name: Intel Xeon 6745P
Max MHz: 4300
Nominal: 3100
Enabled: 64 cores, 2 chips, 2 threads/core
Orderable: 1,2 Chips
Cache L1: 64 KB I + 48 KB D on chip per core
L2: 2 MB I+D on chip per core
L3: 336 MB I+D on chip per chip
Other: None
Memory: 512 GB (16 x 32 GB 2Rx8 PC5-6400B-R)
Storage: 1 x 3.2 TB NVMe SSD
Other: CPU Cooling: CLC

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: Yes
Firmware: HPE BIOS Version v1.20 02/14/2025 released Feb-2025
File System: xfs
System State: Run level 5 (multi-user)
Base Pointers: 64-bit
Peak Pointers: 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						
	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
600.perlbench_s	128	165	10.7	166	10.7	164	10.8	128	155	11.5	153	11.6	152	11.6
602.gcc_s	128	333	12.0	333	12.0	327	12.2	128	313	12.7	316	12.6	319	12.5
605.mcf_s	128	194	24.3	192	24.6	193	24.4	128	194	24.3	192	24.6	193	24.4
620.omnetpp_s	128	135	12.1	133	12.2	130	12.5	128	135	12.1	133	12.2	130	12.5
623.xalancbmk_s	128	98.2	14.4	97.8	14.5	98.0	14.5	128	98.2	14.4	97.8	14.5	98.0	14.5
625.x264_s	128	69.0	25.6	68.9	25.6	69.0	25.6	128	66.3	26.6	66.1	26.7	66.2	26.7
631.deepsjeng_s	128	180	7.96	181	7.93	181	7.94	128	180	7.96	181	7.93	181	7.94
641.leela_s	128	254	6.71	255	6.69	254	6.71	128	254	6.71	255	6.69	254	6.71
648.exchange2_s	128	100	29.4	100	29.4	100	29.3	128	100	29.4	100	29.4	100	29.3
657.xz_s	128	205	30.1	205	30.1	205	30.1	128	205	30.1	205	30.1	205	30.1

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

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
runcpu command invoked through numactl i.e.:
numactl --interleave=all runcpu <etc>

Environment Variables Notes

Environment variables set by runcpu before the start of the run:
KMP_AFFINITY = "granularity=fine,scatter"
LD_LIBRARY_PATH = "/home/cpu2017/lib/intel64:/home/cpu2017/je5.0.1-64"
MALLOC_CONF = "retain:true"
OMP_STACKSIZE = "192M"

General Notes

Binaries compiled on a system with 2x Intel Xeon Platinum 8280M CPU + 384GB RAM
memory using Redhat Enterprise Linux 8.0
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 Configurations : Parameters are selected in the order shown below
Workload Profile set to General Peak Frequency Compute
Enhanced Processor Performance Profile set to Aggressive
Thermal Configuration set to Maximum Cooling
Memory Patrol Scrubbing set to Disabled
Last Level Cache (LLC) Prefetch set to Enabled
Intel UPI Prefetch set to Disabled

Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
running on localhost Sat May 31 05:33:57 2025

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 254 (254.10+suse.84.ge8d77af424)
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

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
05:33:57 up 2 min, 4 users, load average: 2.72, 2.60, 1.09
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

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Platform Notes (Continued)

```
file size                (blocks, -f) unlimited
pending signals          (-i) 2062712
max locked memory        (kbytes, -l) 8192
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) 2062712
virtual memory           (kbytes, -v) unlimited
file locks               (-x) unlimited
```

```
-----
5. sysinfo process ancestry
/usr/lib/systemd/systemd --switched-root --system --deserialize=42
sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups
sshd: root [priv]
sshd: root@notty
bash -c cd $SPEC/ && $SPEC/intspeed_sapphire.sh
runcpu --nobuild --action validate --define default-platform-flags -c
ic2024.1-lin-sapphirerapids-speed-20240308.cfg --define cores=128 --tune base,peak -o all --define
intspeedaffinity --define drop_caches intspeed
runcpu --nobuild --action validate --define default-platform-flags --configfile
ic2024.1-lin-sapphirerapids-speed-20240308.cfg --define cores=128 --tune base,peak --output_format all
--define intspeedaffinity --define drop_caches --nopower --runmode speed --tune base:peak --size refspped
intspeed --nopreenv --note-preenv --logfile $SPEC/tmp/CPU2017.001/templogs/preenv.intspeed.001.0.log
--lognum 001.0 --from_runcpu 2
specperl $SPEC/bin/sysinfo
$SPEC = /home/cpu2017
```

```
-----
6. /proc/cpuinfo
model name      : Intel(R) Xeon(R) 6745P
vendor_id      : GenuineIntel
cpu family     : 6
model          : 173
stepping       : 1
microcode      : 0x1000380
bugs           : spectre_v1 spectre_v2 spec_store_bypass swapgs bhi
cpu cores      : 32
siblings       : 64
2 physical ids (chips)
128 processors (hardware threads)
physical id 0: core ids 0-15,64-79
physical id 1: core ids 0-15,64-79
physical id 0: apicids 0-31,128-159
physical id 1: apicids 256-287,384-415
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, 57 bits virtual
Byte Order:         Little Endian
```

(Continued on next page)



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Platform Notes (Continued)

CPU(s): 128
On-line CPU(s) list: 0-127
Vendor ID: GenuineIntel
BIOS Vendor ID: Intel(R) Corporation
Model name: Intel(R) Xeon(R) 6745P
BIOS Model name: Intel(R) Xeon(R) 6745P CPU @ 3.1GHz
BIOS CPU family: 179
CPU family: 6
Model: 173
Thread(s) per core: 2
Core(s) per socket: 32
Socket(s): 2
Stepping: 1
BogoMIPS: 6200.00
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 intel_ppin cdp_l2 ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow 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 user_shstk avx_vnni avx512_bf16 wbnoinvd dtherm ida arat pln pts hfi vnni 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 ibt amx_bf16 avx512_fp16 amx_tile amx_int8 flush_l1d arch_capabilities

Virtualization: VT-x
L1d cache: 3 MiB (64 instances)
L1i cache: 4 MiB (64 instances)
L2 cache: 128 MiB (64 instances)
L3 cache: 672 MiB (2 instances)
NUMA node(s): 4
NUMA node0 CPU(s): 0-15,64-79
NUMA node1 CPU(s): 16-31,80-95
NUMA node2 CPU(s): 32-47,96-111
NUMA node3 CPU(s): 48-63,112-127
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; PBRSB-eIBRS Not affected; BHI BHI_DIS_S

Vulnerability Srbds: Not affected
Vulnerability Tsx async abort: Not affected

From lscpu --cache:

(Continued on next page)



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Platform Notes (Continued)

NAME	ONE-SIZE	ALL-SIZE	WAYS	TYPE	LEVEL	SETS	PHY-LINE	COHERENCY-SIZE
L1d	48K	3M	12	Data	1	64	1	64
L1i	64K	4M	16	Instruction	1	64	1	64
L2	2M	128M	16	Unified	2	2048	1	64
L3	336M	672M	16	Unified	3	344064	1	64

8. numactl --hardware

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

available: 4 nodes (0-3)

node 0 cpus: 0-15,64-79

node 0 size: 128741 MB

node 0 free: 127380 MB

node 1 cpus: 16-31,80-95

node 1 size: 129015 MB

node 1 free: 127551 MB

node 2 cpus: 32-47,96-111

node 2 size: 128976 MB

node 2 free: 127915 MB

node 3 cpus: 48-63,112-127

node 3 size: 128974 MB

node 3 free: 128461 MB

node distances:

node 0 1 2 3

0: 10 12 21 21

1: 12 10 21 21

2: 21 21 10 12

3: 21 21 12 10

9. /proc/meminfo

MemTotal: 528086000 kB

10. who -r

run-level 5 May 31 05:32

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

Default Target Status

graphical running

12. Services, from systemctl list-unit-files

STATE UNIT FILES

enabled ModemManager YaST2-Firstboot YaST2-Second-Stage apparmor appstream-sync-cache auditd
bluetooth cron display-manager getty@ irqbalance issue-generator kbdsettings klog
lvm2-monitor nsd nvme-fc-boot-connections nvme-autoconnect postfix purge-kernels rollback
rsyslog smartd sshd systemd-pstore wicked wickedd-auto4 wickedd-dhcp4 wickedd-dhcp6
wickedd-nanny wpa_supplicant
systemd-remount-fs

enabled-runtime

disabled NetworkManager NetworkManager-dispatcher NetworkManager-wait-online accounts-daemon autofs
autoyast-initscripts blk-availability bluetooth-mesh boot-sysctl ca-certificates
chrony-wait chronyd console-getty cups cups-browsed debug-shell dnsmasq ebtables
exchange-bmc-os-info firewalld fsidd gpm grub2-once haveged hwloc-dump-hwdata ipmi ipmiev
issue-add-ssh-keys kexec-load lunmask man-db-create multipathd nfs nfs-blkmap nmb openvpn@
ostree-remount rpcbind rpmconfigcheck rsyncd rtkit-daemon serial-getty@
smartd-generate_opts smb snmpd snmptrapd speech-dispatcherd systemd-boot-check-no-failures
systemd-confext systemd-network-generator systemd-sysextd systemd-time-wait-sync
systemd-timesyncd udisks2 update-system-flatpaks upower vncserver@ wpa_supplicant@

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Platform Notes (Continued)

indirect pcscd saned@ systemd-userdbd wickedd

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

```
BOOT_IMAGE=/boot/vmlinuz-6.4.0-150600.21-default
root=UUID=6f38f8cb-6744-4bb2-980a-6e692ebdf8b4
splash=silent
resume=/dev/disk/by-uuid/3188516f-5c98-4497-afe7-d252ff459ba8
mitigations=auto
quiet
security=apparmor
```

14. cpupower frequency-info

```
analyzing CPU 44:
  Unable to determine current policy
  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
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+madvice [madvice] never
enabled         [always] madvice 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
```

(Continued on next page)



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Platform Notes (Continued)

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/nvme2n1p3	xfs	2.0T	215G	1.8T	11%	/home

20. /sys/devices/virtual/dmi/id

Vendor: HPE

Product: HPE ProLiant Compute DL360 Gen12

Product Family: ProLiant

Serial: D249RP0053

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:

16x Micron MTC20F2085S1RC64BD2 QSFF 32 GB 2 rank 6400

22. BIOS

(This section combines info from /sys/devices and dmidecode.)

BIOS Vendor: HPE

BIOS Version: 1.20

BIOS Date: 02/14/2025

BIOS Revision: 1.20

Firmware Revision: 1.11

Compiler Version Notes

```
C      | 600.perlbench_s(base, peak) 602.gcc_s(base, peak) 605.mcf_s(base, peak) 625.x264_s(base, peak)
      | 657.xz_s(base, peak)
```

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2024.1.0 Build 20240308
Copyright (C) 1985-2024 Intel Corporation. All rights reserved.

```
C++    | 620.omnetpp_s(base, peak) 623.xalancbmk_s(base, peak) 631.deepsjeng_s(base, peak)
      | 641.leela_s(base, peak)
```

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2024.1.0 Build 20240308
Copyright (C) 1985-2024 Intel Corporation. All rights reserved.

```
Fortran | 648.exchange2_s(base, peak)
```

Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2024.1.0 Build 20240308
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(Continued on next page)



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Compiler Version Notes (Continued)

Base Compiler Invocation

C benchmarks:

icx

C++ benchmarks:

icpx

Fortran benchmarks:

ifx

Base Portability Flags

600.perlbench_s: -DSPEC_LP64 -DSPEC_LINUX_X64

602.gcc_s: -DSPEC_LP64

605.mcf_s: -DSPEC_LP64

620.omnetpp_s: -DSPEC_LP64

623.xalancbmk_s: -DSPEC_LP64 -DSPEC_LINUX

625.x264_s: -DSPEC_LP64

631.deepsjeng_s: -DSPEC_LP64

641.leela_s: -DSPEC_LP64

648.exchange2_s: -DSPEC_LP64

657.xz_s: -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 -fiopenmp

-DSPEC_OPENMP -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

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/jemalloc64-5.0.1/lib -ljemalloc

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

(Continued on next page)



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Software Availability: Jun-2024

Base Optimization Flags (Continued)

Fortran benchmarks (continued):

-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

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:

```
600.perlbench_s: -w -m64 -std=c11 -Wl, -z,muldefs
-fprofile-generate(pass 1)
-fprofile-use=default.profdata(pass 2) -xCORE-AVX2(pass 1)
-flto -Ofast(pass 1) -xCORE-AVX512 -O3 -ffast-math
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-fiopenmp -DSPEC_OPENMP -fno-strict-overflow
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

```
602.gcc_s: -w -m64 -std=c11 -Wl, -z,muldefs
-fprofile-generate(pass 1)
-fprofile-use=default.profdata(pass 2) -xCORE-AVX2(pass 1)
-flto -Ofast(pass 1) -xCORE-AVX512 -O3 -ffast-math
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-fiopenmp -DSPEC_OPENMP -L/usr/local/jemalloc64-5.0.1/lib
-ljemalloc
```

605.mcf_s: basepeak = yes

(Continued on next page)



SPEC CPU®2017 Integer Speed Result

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(Test Sponsor: HPE)

ProLiant Compute DL360 Gen12

(3.10 GHz, Intel Xeon 6745P)

SPECspeed®2017_int_base = 15.2

SPECspeed®2017_int_peak = 15.5

CPU2017 License: 3

Test Sponsor: HPE

Tested by: HPE

Test Date: May-2025

Hardware Availability: Mar-2025

Software Availability: Jun-2024

Peak Optimization Flags (Continued)

625.x264_s: -w -std=c11 -m64 -Wl,-z,muldefs -xsapphirerapids -O3
-ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -fiopenmp -DSPEC_OPENMP
-fno-alias -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

657.xz_s: basepeak = yes

C++ benchmarks:

620.omnetpp_s: basepeak = yes

623.xalancbmk_s: basepeak = yes

631.deepsjeng_s: basepeak = yes

641.leela_s: basepeak = yes

Fortran benchmarks:

648.exchange2_s: 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-GNR-rev1.3.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/HPE-Platform-Flags-Intel-GNR-rev1.3.xml>

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

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