



# SPEC CPU®2017 Integer Speed Result

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## Hewlett Packard Enterprise

(Test Sponsor: HPE)

### ProLiant DL20 Gen11

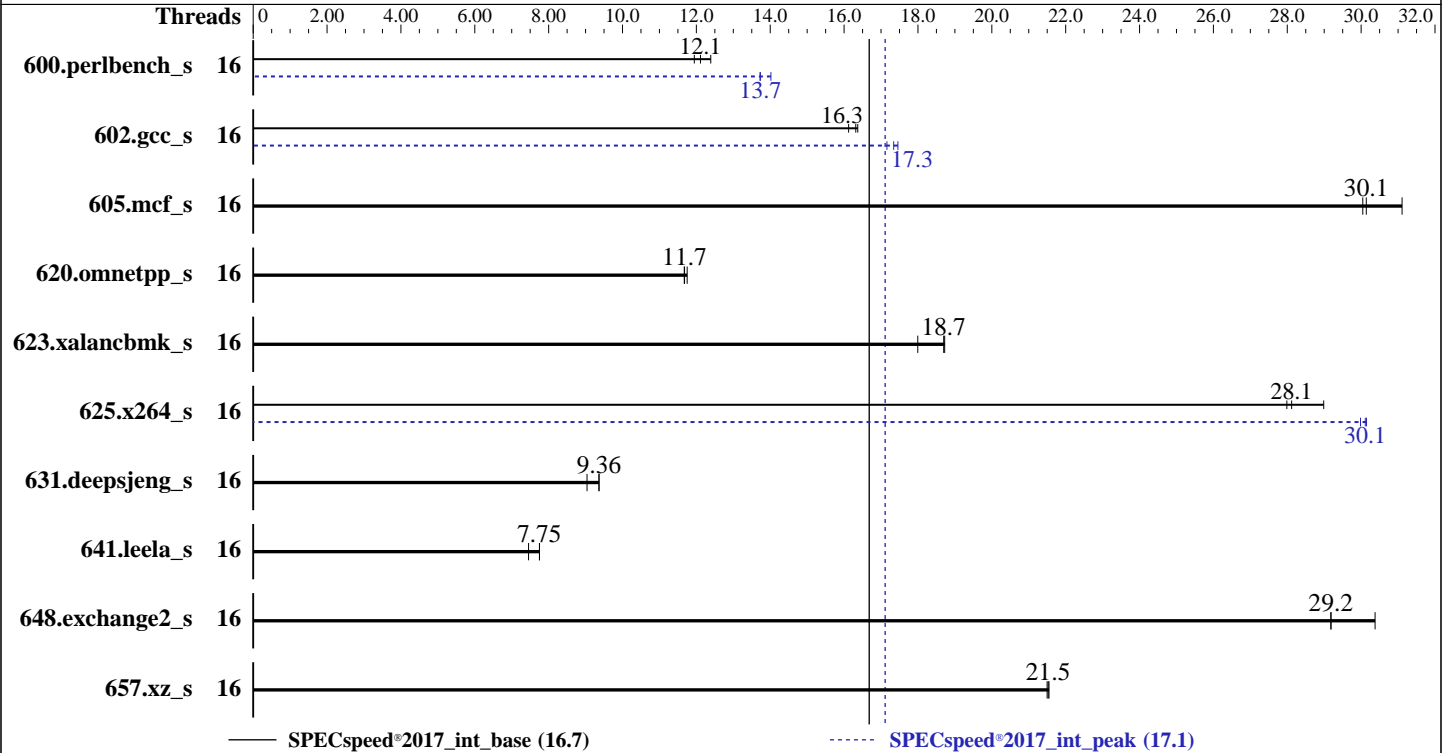
(2.80 GHz, Intel Xeon E-2478)

SPECspeed®2017\_int\_base = 16.7

SPECspeed®2017\_int\_peak = 17.1

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-2478  
 Max MHz: 5200  
 Nominal: 2800  
 Enabled: 8 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: 24 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: Yes  
 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: 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						
	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
600.perlbench_s	16	143	12.4	<u>147</u>	<u>12.1</u>	149	11.9	16	<u>129</u>	<u>13.7</u>	127	14.0	129	13.7
602.gcc_s	16	<u>244</u>	<u>16.3</u>	243	16.4	247	16.1	16	232	17.2	<u>230</u>	<u>17.3</u>	228	17.5
605.mcf_s	16	<u>157</u>	<u>30.1</u>	157	30.0	152	31.1	16	<u>157</u>	<u>30.1</u>	157	30.0	152	31.1
620.omnetpp_s	16	<u>140</u>	<u>11.7</u>	140	11.7	139	11.8	16	<u>140</u>	<u>11.7</u>	140	11.7	139	11.8
623.xalancbmk_s	16	78.7	18.0	75.7	18.7	<u>75.8</u>	<u>18.7</u>	16	78.7	18.0	75.7	18.7	<u>75.8</u>	<u>18.7</u>
625.x264_s	16	60.9	29.0	63.0	28.0	<u>62.7</u>	<u>28.1</u>	16	58.5	30.1	<u>58.6</u>	<u>30.1</u>	58.8	30.0
631.deepsjeng_s	16	159	9.04	<u>153</u>	<u>9.36</u>	153	9.36	16	159	9.04	<u>153</u>	<u>9.36</u>	153	9.36
641.leela_s	16	229	7.46	220	7.75	<u>220</u>	<u>7.75</u>	16	229	7.46	220	7.75	<u>220</u>	<u>7.75</u>
648.exchange2_s	16	96.8	30.4	<u>101</u>	<u>29.2</u>	101	29.2	16	96.8	30.4	<u>101</u>	<u>29.2</u>	101	29.2
657.xz_s	16	287	21.5	288	21.5	<u>287</u>	<u>21.5</u>	16	287	21.5	288	21.5	<u>287</u>	<u>21.5</u>

SPECspeed®2017\_int\_base = **16.7**

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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:
KMP_AFFINITY = "granularity=fine,scatter"
LD_LIBRARY_PATH = "/home/cpu2017_new/lib/intel64:/home/cpu2017_new/lib/ia32:/home/cpu2017_new/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 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.

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## General Notes (Continued)

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>

## Platform Notes

The system ROM used for this result contains Intel microcode version 0x121 for the Intel Xeon E-2478 processor.

Workload Profile set to General Peak Frequency Compute  
Thermal Configuration set to Maximum Cooling  
Enhanced Processor Performance Profile set to Enabled  
Workload Profile set to Custom  
Power Regulator set to OS Control Mode

Sysinfo program /home/cpu2017\_new/bin/sysinfo  
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197  
running on localhost Thu Jan 18 11:25:58 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  
11:25:58 up 4:25, 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 07:06 6.00s 0.69s 0.00s -bash  
-----

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## Platform Notes (Continued)

-----  
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) 256720
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) 256720
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 -c
ic2023.2.3-lin-core-avx2-speed-20231121.cfg --define cores=8 --tune base,peak -o all --define
intspeedaffinity --define smt-on --define drop_caches intspeed
runcpu --nobuild --action validate --define default-platform-flags --configfile
ic2023.2.3-lin-core-avx2-speed-20231121.cfg --define cores=8 --tune base,peak --output_format all --define
intspeedaffinity --define smt-on --define drop_caches --nopower --runmode speed --tune base:peak --size
refspeed intspeed --nopreenv --note-preenv --logfile
$SPEC/tmp/CPU2017.006/temlogs/preenv.intspeed.006.0.log --lognum 006.0 --from_runcpu 2
specperl $SPEC/bin/sysinfo
$SPEC = /home/cpu2017_new
```

-----  
6. /proc/cpuinfo

```
model name      : Intel(R) Xeon(R) E E-2478
vendor_id      : GenuineIntel
cpu family     : 6
model          : 183
stepping      : 1
microcode     : 0x121
bugs           : spectre_v1 spectre_v2 spec_store_bypass swapgs
cpu cores     : 8
siblings      : 16
1 physical ids (chips)
16 processors (hardware threads)
physical id 0: core ids 0-7
physical id 0: apicids 0-15
Caution: /proc/cpuinfo data regarding chips, cores, and threads is not necessarily reliable, especially for
virtualized systems. Use the above data carefully.
```

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(Continued on next page)



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## Platform Notes (Continued)

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, 48 bits virtual
Byte Order:             Little Endian
CPU(s):                 16
On-line CPU(s) list:   0-15
Vendor ID:              GenuineIntel
Model name:             Intel(R) Xeon(R) E E-2478
CPU family:             6
Model:                  183
Thread(s) per core:    2
Core(s) per socket:    8
Socket(s):              1
Stepping:               1
Frequency boost:        enabled
CPU max MHz:            2801.0000
CPU min MHz:            800.0000
BogoMIPS:               5606.40
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_lld
                        arch_capabilities

Virtualization:         VT-x
L1d cache:              384 KiB (8 instances)
L1i cache:              256 KiB (8 instances)
L2 cache:               16 MiB (8 instances)
L3 cache:               24 MiB (1 instance)
NUMA node(s):          1
NUMA node0 CPU(s):     0-15
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	384K	12	Data	1	64	1	64
L1i	32K	256K	8	Instruction	1	64	1	64
L2	2M	16M	16	Unified	2	2048	1	64
L3	24M	24M	12	Unified	3	32768	1	64

8. numactl --hardware

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## Platform Notes (Continued)

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

```
available: 1 nodes (0)
node 0 cpus: 0-15
node 0 size: 64202 MB
node 0 free: 56919 MB
node distances:
node 0
0: 10
```

9. /proc/meminfo  
MemTotal: 65743620 kB

10. who -r  
run-level 3 Jan 18 07:01

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 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-switch-root hwloc-dump-hwdata issue-add-ssh-keys kexec-load lunmask rpmconfigcheck serial-getty@ systemd-boot-check-no-failures systemd-network-generator systemd-sysext 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:  
current policy: frequency should be within 800 MHz and 2.80 GHz.  
The governor "ondemand" may decide which speed to use within this range.  
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

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## Platform Notes (Continued)

```

-----
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
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+madvice [madvice] never
enabled         [always] madvice 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.

```

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## Platform Notes (Continued)

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

### 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 | 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 2023.2.3 Build x  
Copyright (C) 1985-2023 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 2023.2.3 Build x  
Copyright (C) 1985-2023 Intel Corporation. All rights reserved.

Fortran | 648.exchange2\_s(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.

## Base Compiler Invocation

C benchmarks:

icx

C++ benchmarks:

icpx

Fortran benchmarks:

ifx





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## 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 -xCORE-AVX2 -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 -xCORE-AVX2 -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 -xCORE-AVX2 -O3 -ffast-math -flto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-nostandard-realloc-lhs -align array32byte
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

## Peak Compiler Invocation

C benchmarks:

icx

C++ benchmarks:

icpx

Fortran benchmarks:

ifx



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**Tested by:** HPE

**Test Date:** Jan-2024

**Hardware Availability:** Dec-2023

**Software Availability:** Dec-2023

## 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 -flto
-Ofast(pass 1) -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 -flto
-Ofast(pass 1) -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

```
625.x264_s: -w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX2 -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



# SPEC CPU®2017 Integer Speed Result

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**Hewlett Packard Enterprise**

(Test Sponsor: HPE)

ProLiant DL20 Gen11

(2.80 GHz, Intel Xeon E-2478)

SPECspeed®2017\_int\_base = 16.7

SPECspeed®2017\_int\_peak = 17.1

**CPU2017 License:** 3

**Test Sponsor:** HPE

**Tested by:** HPE

**Test Date:** Jan-2024

**Hardware Availability:** Dec-2023

**Software Availability:** Dec-2023

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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