# SPEC CPU®2017 Integer Rate Result

## Hewlett Packard Enterprise

*(Test Sponsor: HPE)*

**ProLiant DL380a Gen11**

*(2.80 GHz, Intel Xeon Gold 6526Y)*

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### CPU2017 License: 3

**Test Sponsor:** HPE

**Tested by:** HPE

**Test Date:** Feb-2024

**Hardware Availability:** Feb-2024

**Software Availability:** Dec-2023

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### SPECrate®2017 int_base = 340

### SPECrate®2017 int_peak = 350

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<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>SPECrate®2017_int_base</th>
<th>SPECrate®2017_int_peak</th>
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<tbody>
<tr>
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<td>64</td>
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<tr>
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<tr>
<td>557.xz_r</td>
<td>64</td>
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</tr>
</tbody>
</table>

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### Hardware

**CPU Name:** Intel Xeon Gold 6526Y

**Max MHz:** 3900

**Nominal:** 2800

**Enabled:** 32 cores, 2 chips, 2 threads/core

**Orderable:** 1, 2 chip(s)

**Cache L1:** 32 KB I + 48 KB D on chip per core

**L2:** 2 MB I+D on chip per core

**L3:** 37.5 MB I+D on chip per chip

**Other:** None

**Memory:** 512 GB (16 x 32 GB 2Rx8 PC5-5600B-R, running at 5200)

**Storage:** 1 x 1.6 TB NVMe SSD

**Other:** Cooling: Air

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### Software

**OS:** SUSE Linux Enterprise Server 15 SP5

**Kernel:** 5.14.21-150500.53-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 v2.12 12/19/2023 released Dec-2023

**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

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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
runcpu command invoked through numactl i.e.:
umactl --interleave=all runcpu <etc>
tuned-adm profile was set to throughput-performance using "tuned-adm profile throughput-performance"

### 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)
Hewlett Packard Enterprise
(Test Sponsor: HPE)
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General Notes (Continued)

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

Platform Notes

The system ROM used for this result contains Intel microcode version 0x21000200 for
the Intel Xeon Gold 6526Y processor.
BIOS Configuration:
Workload Profile set to General Throughput Compute
Memory Patrol Scrubbing set to Disabled
Intel UPI Link Enablement set to Single Link
Last Level Cache (LLC) Dead Line Allocation set to Disabled
Enhanced Processor Performance Profile set to Aggressive
Thermal Configuration set to Maximum Cooling
Workload Profile set to Custom
DCU Stream Prefetcher set to Disabled
Adjacent Sector Prefetch set to Disabled
Intel UPI Link Power Management set to Enabled

Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r6732 of 2022-11-07 fe91c89b7ed5c6ae2c92cc097bec197
running on localhost Thu Feb 22 23:17:49 2024

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

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15. tuned-adm active
16. systemctl
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Platform Notes (Continued)

2. 23:17:50 up 1 min, 0 users, load average: 0.08, 0.05, 0.01

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) 2062779
   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) 2062779
   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@notty
   bash -c cd $SPEC/ && $SPEC/intrate.sh
   runcpu --nobuild --action validate --define default-platform-flags --define numcopies=64 -c
   ic2023.2.3-lin-sapphirerapids-rate-20231121.cfg --define smt-on --define cores=32 --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=64 --configfile
   ic2023.2.3-lin-sapphirerapids-rate-20231121.cfg --define smt-on --define cores=32 --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/CPU2017.001/templogs/preenv.intrate.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) GOLD 6526Y
   vendor_id : GenuineIntel
   cpu family : 6
   model : 207
   stepping : 2
   microcode : 0x21000200
   bugs : spectre_v1 spectre_v2 spec_store_bypass swapgs eibrs_pbrsb
   cpu cores : 16
   siblings : 32
   2 physical ids (chips)
   64 processors (hardware threads)
   physical id 0: core ids 0-15

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Platform Notes (Continued)

physical id 1: core ids 0-15
physical id 0: apicids 0-31
physical id 1: apicids 128-159
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 2.37.4:
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): 64
On-line CPU(s) list: 0-63
Vendor ID: GenuineIntel
Model name: INTEL(R) XEON(R) GOLD 6526Y
CPU family: 6
Model: 207
Thread(s) per core: 2
Core(s) per socket: 16
Socket(s): 2
BogoMIPS: 5600.00

Flags:

Virtualization: VT-x
L1d cache: 1.5 MiB (32 instances)
L1i cache: 1 MiB (32 instances)
L2 cache: 64 MiB (32 instances)
L3 cache: 75 MiB (2 instances)
NUMA node(s): 4
NUMA node0 CPU(s): 0-7,32-39
NUMA node1 CPU(s): 8-15,40-47
NUMA node2 CPU(s): 16-23,48-55
NUMA node3 CPU(s): 24-31,56-63

Vulnerability Itlb multihit: Not affected
Vulnerability L1tf: Not affected
Vulnerability Mds: Not affected
Vulnerability Meltdown: Not affected
Vulnerability Mmi0 stale data: Not affected
Vulnerability Retbleed: 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

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**Platform Notes (Continued)**

Vulnerability Spectre v2: Mitigation; Enhanced IBRS, IBPB conditional, RSB filling, PBRSB-eIBRS SW sequence  
Vulnerability Srbds: Not affected  
Vulnerability Tax async abort: Not affected

```
From lscpu --cache:
NAME ONE-SIZE ALL-SIZE WAYS TYPE        LEVEL  SETS PHY-LINE COHERENCY-SIZE
L1d  48K   1.5M  12 Data            1    64        1             64
L1i  32K       1M    8 Instruction     1    64        1             64
L2    2M   64M   16 Unified         2  2048        1             64
L3  37.5M   75M   15 Unified         3 40960        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: 0-7,32-39  
node 0 size: 128713 MB  
node 0 free: 128232 MB  
node 1 cpus: 8-15,40-47  
node 1 size: 128919 MB  
node 1 free: 128487 MB  
node 2 cpus: 16-23,48-55  
node 2 size: 128985 MB  
node 2 free: 128170 MB  
node 3 cpus: 24-31,56-63  
node 3 size: 128999 MB  
node 3 free: 128634 MB  
node distances:  
   node   0   1   2   3  
   0:  10  20  30  30  
   1:  20  10  30  30  
   2:  30  30  10  20  
   3:  30  30  20  10
```

9. /proc/meminfo  
MemTotal: 528095084 kB

10. who -r  
run-level 3 Feb 22 23:16

11. Systemd service manager version: systemd 249 (249.16+suse.171.gdad0071f15)  
Default Target Status  
multi-user running

12. Services, from systemctl list-unit-files  
<table>
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<th>STATE</th>
<th>UNIT FILES</th>
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<td>enabled</td>
<td>apparmor auditd cron getty@ irqbalance issue-generator kbsdsettings lvm2-monitor nvmef-connection postfix purge-kernels rollback sshd systemd-pstore wicked wickedd-auto4 wickedd-dhcp4 wickedd-dhcp6 wickedd-nanny</td>
</tr>
<tr>
<td>enabled-runtime</td>
<td>systemd-remount-fs</td>
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(Continued on next page)
### Platform Notes (Continued)

13. Linux kernel boot-time arguments, from /proc/cmdline
   - `root=UUID=8ceaf0f2-51cb-41d3-956f-66e764c9dda6`
   - `splash=silent`
   - `resume=/dev/disk/by-uuid/f2fb83d-34e7-4b60-be82-95ecb061302c`
   - `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`
   - Current active profile: `throughput-performance`

16. `sysctl`
   - `kernel.numa_balancing`: 1
   - `kernel.randomize_va_space`: 2
   - `vm.compaction_proactive`: 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`: 10
   - `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+advise [advise] 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

(Continued on next page)
platform_notes

19. OS release
   From /etc/*-release /etc/*-version
   os-release SUSE Linux Enterprise Server 15 SP5

20. Disk information
   SPEC is set to: /home/cpu2017
   Filesystem     Type  Size  Used Avail Use% Mounted on
   /dev/nvme0n1p3 xfs   946G  295G  652G  32% /home

21. /sys/devices/virtual/dmi/id
   Vendor:         HPE
   Product:        ProLiant DL380a Gen11
   Product Family: ProLiant
   Serial:         CNX22602MZ

22. 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 Hynix HMCG88AGBRA193N 32 GB 2 rank 5600, configured at 5200

23. BIOS
   (This section combines info from /sys/devices and dmidecode.)
   BIOS Vendor:       HPE
   BIOS Version:      2.12
   BIOS Date:         12/19/2023
   BIOS Revision:     2.12
   Firmware Revision: 1.56

Compiler Version Notes

C       | 502.gcc_r(peak)
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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)
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Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.2.3 Build x
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### Compiler Version Notes (Continued)

Intel(R) oneAPI DPC++/C++ Compiler for applications running on IA-32, Version 2023.2.3 Build x
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Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.2.3 Build x
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<table>
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<tr>
<th>C++</th>
<th>520.omnetpp_r(base, peak) 523.xalancbmk_r(base, peak) 531.deepsjeng_r(base, peak) 541.leela_r(base, peak)</th>
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<th>Fortran</th>
<th>548.exchange2_r(base, peak)</th>
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</table>

Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2023.2.3 Build x
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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

(Continued on next page)
**SPEC CPU®2017 Integer Rate Result**

Hewlett Packard Enterprise  
(Test Sponsor: HPE)  
ProLiant DL380a Gen11  
(2.80 GHz, Intel Xeon Gold 6526Y)  

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<td>SPECrate®2017_int_peak</td>
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<td>HPE</td>
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<td>Tested by</td>
<td>HPE</td>
</tr>
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</table>

**Test Date:** Feb-2024  
**Hardware Availability:** Feb-2024  
**Software Availability:** Dec-2023

---

### Base Portability Flags (Continued)

- 548.exchange2_r: -DSPEC_LP64
- 557.xz_r: -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`
- `-L/home/specdev/new_compilers/ic2023.2.3/compiler/lib/intel64_lin`
- `-lqkmalloc`

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

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

---

### 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`

(Continued on next page)
Peak Portability Flags (Continued)

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
-ffast-math -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)
-ffast-math -flto -Ofast -xCORE-AVX512 -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

525.x264_r: -w -std=c11 -m64 -Wl,-z,muldefs -xsapphirerapids -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

(Continued on next page)
SPEC CPU®2017 Integer Rate Result

Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL380a Gen11
(2.80 GHz, Intel Xeon Gold 6526Y)

SPECrate®2017_int_base = 340
SPECrate®2017_int_peak = 350

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

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

Peak Optimization Flags (Continued)

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/HPE-Platform-Flags-Intel-EMR-rev1.0.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/HPE-Platform-Flags-Intel-EMR-rev1.0.xml

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For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

Tested with SPEC CPU®2017 v1.1.9 on 2024-02-22 12:47:49-0500.
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