



SPEC CPU®2017 Floating Point Rate Result

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant DL560 Gen11

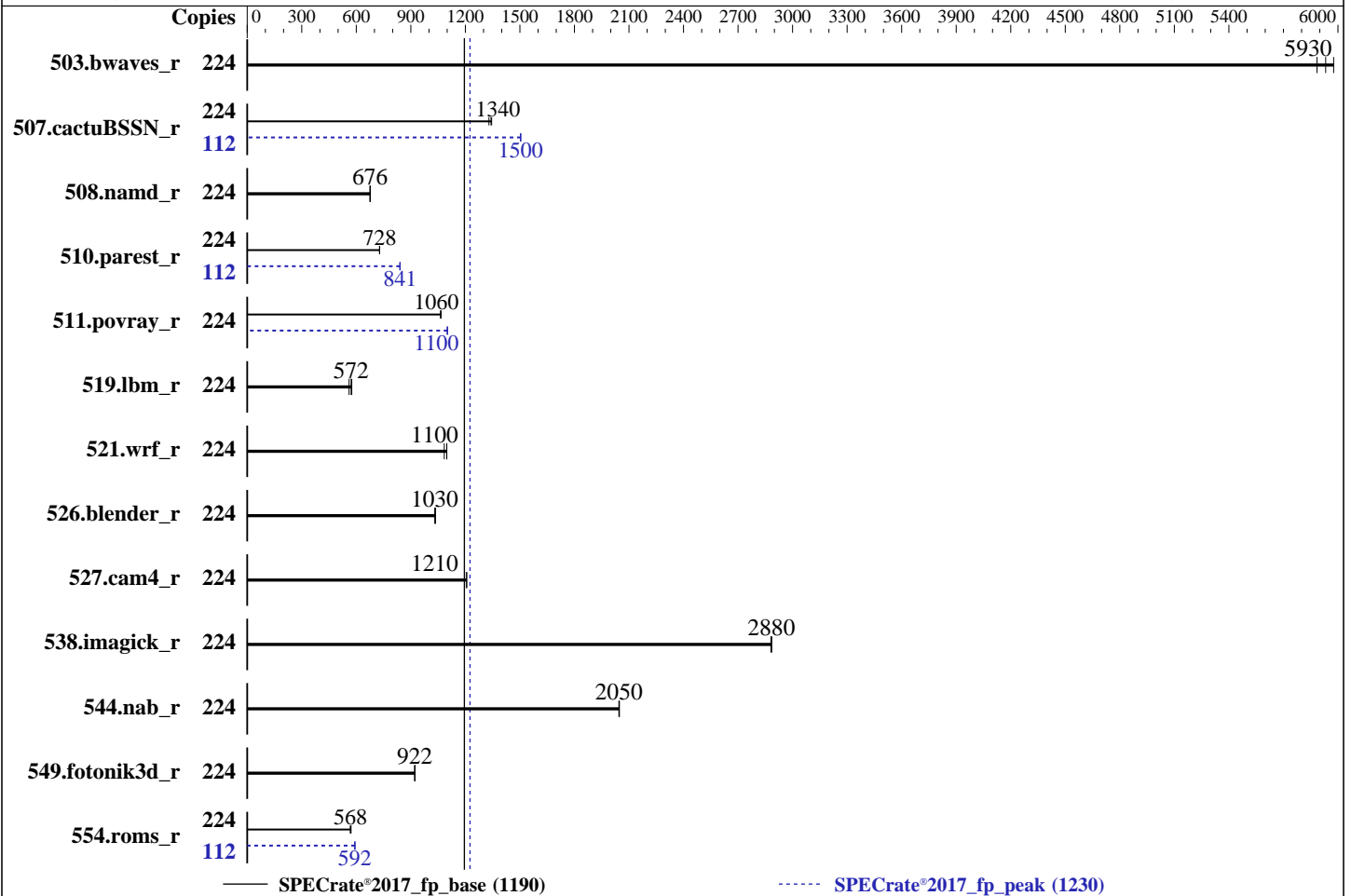
(2.00 GHz, Intel Xeon Platinum 8450H)

SPECrate®2017_fp_base = 1190

SPECrate®2017_fp_peak = 1230

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

Test Date: Apr-2023
Hardware Availability: May-2023
Software Availability: Mar-2023



Hardware

CPU Name: Intel Xeon Platinum 8450H
 Max MHz: 3500
 Nominal: 2000
 Enabled: 112 cores, 4 chips, 2 threads/core
 Orderable: 1, 2, 4 chip(s)
 Cache L1: 32 KB I + 48 KB D on chip per core
 L2: 2 MB I+D on chip per core
 L3: 75 MB I+D on chip per chip
 Other: None
 Memory: 1 TB (32 x 32 GB 2Rx8 PC5-4800B-R)
 Storage: 1 x 480 GB SATA SSD
 Other: None

Software

OS: Ubuntu 22.04.1 LTS
 Kernel 5.15.0-69-generic
 Compiler: C/C++: Version 2023.0 of Intel oneAPI DPC++/C++ Compiler for Linux;
 Fortran: Version 2023.0 of Intel Fortran Compiler for Linux;
 Parallel: No
 Firmware: HPE BIOS Version v1.30 03/01/2023 released Mar-2023
 File System: ext4
 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 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 |
| 503.bwaves_r | 224 | 379 | 5930 | 376 | 5980 | 382 | 5880 | 224 | 379 | 5930 | 376 | 5980 | 382 | 5880 |
| 507.cactuBSSN_r | 224 | 211 | 1340 | 213 | 1330 | 211 | 1340 | 112 | 94.3 | 1500 | 94.2 | 1510 | 94.4 | 1500 |
| 508.namd_r | 224 | 315 | 676 | 315 | 676 | 314 | 677 | 224 | 315 | 676 | 315 | 676 | 314 | 677 |
| 510.parest_r | 224 | 805 | 728 | 804 | 728 | 804 | 728 | 112 | 349 | 841 | 349 | 841 | 349 | 840 |
| 511.povray_r | 224 | 491 | 1060 | 491 | 1070 | 492 | 1060 | 224 | 475 | 1100 | 475 | 1100 | 475 | 1100 |
| 519.lbm_r | 224 | 421 | 560 | 413 | 572 | 410 | 575 | 224 | 421 | 560 | 413 | 572 | 410 | 575 |
| 521.wrf_r | 224 | 463 | 1080 | 457 | 1100 | 457 | 1100 | 224 | 463 | 1080 | 457 | 1100 | 457 | 1100 |
| 526.blender_r | 224 | 329 | 1040 | 330 | 1030 | 330 | 1030 | 224 | 329 | 1040 | 330 | 1030 | 330 | 1030 |
| 527.cam4_r | 224 | 325 | 1210 | 324 | 1210 | 328 | 1200 | 224 | 325 | 1210 | 324 | 1210 | 328 | 1200 |
| 538.imagick_r | 224 | 193 | 2880 | 193 | 2880 | 193 | 2880 | 224 | 193 | 2880 | 193 | 2880 | 193 | 2880 |
| 544.nab_r | 224 | 184 | 2050 | 184 | 2050 | 184 | 2050 | 224 | 184 | 2050 | 184 | 2050 | 184 | 2050 |
| 549.fotonik3d_r | 224 | 948 | 921 | 947 | 922 | 946 | 923 | 224 | 948 | 921 | 947 | 922 | 946 | 923 |
| 554.roms_r | 224 | 627 | 568 | 626 | 568 | 623 | 571 | 112 | 300 | 593 | 300 | 592 | 301 | 592 |

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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.:
numactl --interleave=all runcpu <etc>
IRQ balance service was stopped using "systemctl stop irqbalance.service"
tuned-adm profile was set to Throughput-Performance using "tuned-adm profile throughput-performance"
perf-bias for all the CPUs is set using "cpupower set -b 0"
```

Environment Variables Notes

Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH = "/home/cpu2017/lib/intel64:/home/cpu2017/je5.0.1-64"
MALLOC_CONF = "retain:true"



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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>

Platform Notes

The system ROM used for this result contains Intel microcode version 0x2b0001b0 for the Intel Xeon Platinum 8450H Processor

BIOS Configuration

Workload Profile set to General Throughput Compute

Memory Patrol Scrubbing set to Disabled

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

Adjacent Sector Prefetch set to Disabled

DCU Stream Prefetcher set to Disabled

Minimum Processor Idle Power Package C-State set to Package C6 (non-retention) State

The reported date by sysinfo is incorrect due to computer clock being not set correctly.

The correct test date is: Apr-2023

Sysinfo program /home/cpu2017/bin/sysinfo

Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197

running on admin1 Thu Mar 2 13:05:04 2023

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 (249.11-0ubuntu3.7)
12. Failed units, from systemctl list-units --state=failed
13. Services, from systemctl list-unit-files
14. Linux kernel boot-time arguments, from /proc/cmdline
15. cpupower frequency-info
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17. sysctl
18. /sys/kernel/mm/transparent_hugepage
19. /sys/kernel/mm/transparent_hugepage/khugepaged
20. OS release
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Platform Notes (Continued)

22. /sys/devices/virtual/dmi/id
23. dmidecode
24. BIOS

1. uname -a
Linux admin1 5.15.0-69-generic #76-Ubuntu SMP Fri Mar 17 17:19:29 UTC 2023 x86_64 x86_64 x86_64 GNU/Linux

2. w
13:05:04 up 7 min, 3 users, load average: 0.01, 0.05, 0.02
USER TTY FROM LOGIN@ IDLE JCPU PCPU WHAT
admin1 tty1 - 13:02 3:03 0.05s 0.01s -bash
admin1 pts/0 172.16.0.100 13:02 2:31 0.02s 0.01s sshd: admin1 [priv]
admin1 pts/1 172.16.0.100 13:02 8.00s 1.02s 0.01s sudo -i

3. Username
From environment variable \$USER: root
From the command 'logname': admin1

4. ulimit -a
time(seconds) unlimited
file(blocks) unlimited
data(kbytes) unlimited
stack(kbytes) unlimited
coredump(blocks) 0
memory(kbytes) unlimited
locked memory(kbytes) 132054632
process 4126251
nofiles 1024
vmemory(kbytes) unlimited
locks unlimited
rtprio 0

5. sysinfo process ancestry
/sbin/init
sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups
sshd: admin1 [priv]
sshd: admin1@pts/0
-bash
sudo -i
sudo -i
-bash
-bash
runcpu --nobuild --action validate --define default-platform-flags --define numcopies=224 -c
ic2023.0-lin-sapphirerapids-rate-20221201.cfg --define smt-on --define cores=112 --define physicalfirst
--define invoke_with_interleave --define drop_caches --tune base,peak -o all fprate
runcpu --nobuild --action validate --define default-platform-flags --define numcopies=224 --configfile
ic2023.0-lin-sapphirerapids-rate-20221201.cfg --define smt-on --define cores=112 --define physicalfirst
--define invoke_with_interleave --define drop_caches --tune base,peak --output_format all --nopower
--runmode rate --tune base:peak --size refrate fprate --nopreenv --note-preenv --logfile
\$SPEC/tmp/CPU2017.024/templogs/preenv.fprate.024.0.log --lognum 024.0 --from_runcpu 2
specperl \$SPEC/bin/sysinfo
\$SPEC = /home/cpu2017

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Platform Notes (Continued)

6. /proc/cpuinfo

```

model name      : Intel(R) Xeon(R) Platinum 8450H
vendor_id      : GenuineIntel
cpu family     : 6
model          : 143
stepping       : 6
microcode      : 0x2b0001b0
bugs           : spectre_v1 spectre_v2 spec_store_bypass swapgs eibrs_pbrsb
cpu cores      : 28
siblings       : 56
4 physical ids (chips)
224 processors (hardware threads)
physical id 0: core ids 0-27
physical id 1: core ids 0-27
physical id 2: core ids 0-27
physical id 3: core ids 0-27
physical id 0: apicids 0-55
physical id 1: apicids 128-183
physical id 2: apicids 256-311
physical id 3: apicids 384-439

```

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:

```

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):                224
On-line CPU(s) list:   0-223
Vendor ID:             GenuineIntel
Model name:            Intel(R) Xeon(R) Platinum 8450H
CPU family:            6
Model:                 143
Thread(s) per core:    2
Core(s) per socket:    28
Socket(s):             4
Stepping:              6
BogoMIPS:              4000.00
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
                        invpcid_single cdp_l2 ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow
                        vnmi flexpriority ept vpid ept_ad fsgsbase tsc_adjust bmi1 avx2 smep bmi2
                        erms invpcid 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 avx_vnni avx512_bf16 wbnoinvd dtherm ida arat pln pts
                        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 amx_bf16 avx512_fp16 amx_tile amx_int8 flush_lld
                        arch_capabilities

```

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Platform Notes (Continued)

```

Virtualization:          VT-x
L1d cache:              5.3 MiB (112 instances)
L1i cache:              3.5 MiB (112 instances)
L2 cache:               224 MiB (112 instances)
L3 cache:               300 MiB (4 instances)
NUMA node(s):          16
NUMA node0 CPU(s):     0-6,112-118
NUMA node1 CPU(s):     7-13,119-125
NUMA node2 CPU(s):     14-20,126-132
NUMA node3 CPU(s):     21-27,133-139
NUMA node4 CPU(s):     28-34,140-146
NUMA node5 CPU(s):     35-41,147-153
NUMA node6 CPU(s):     42-48,154-160
NUMA node7 CPU(s):     49-55,161-167
NUMA node8 CPU(s):     56-62,168-174
NUMA node9 CPU(s):     63-69,175-181
NUMA node10 CPU(s):    70-76,182-188
NUMA node11 CPU(s):    77-83,189-195
NUMA node12 CPU(s):    84-90,196-202
NUMA node13 CPU(s):    91-97,203-209
NUMA node14 CPU(s):    98-104,210-216
NUMA node15 CPU(s):    105-111,217-223
Vulnerability Itlb multihit: Not affected
Vulnerability L1tf:      Not affected
Vulnerability Mds:       Not affected
Vulnerability Meltdown:  Not affected
Vulnerability Mmio 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/swaps barriers and __user pointer sanitization
Vulnerability Spectre v2: Mitigation; Enhanced IBRS, IBPB conditional, RSB filling, PBRB-eIBRS SW
sequence
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 | 5.3M | 12 | Data | 1 | 64 | 1 | 64 |
| L1i | 32K | 3.5M | 8 | Instruction | 1 | 64 | 1 | 64 |
| L2 | 2M | 224M | 16 | Unified | 2 | 2048 | 1 | 64 |
| L3 | 75M | 300M | 15 | Unified | 3 | 81920 | 1 | 64 |

8. `numactl --hardware`

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

```

available: 16 nodes (0-15)
node 0 cpus: 0-6,112-118
node 0 size: 64095 MB
node 0 free: 63670 MB
node 1 cpus: 7-13,119-125
node 1 size: 64508 MB
node 1 free: 63868 MB
node 2 cpus: 14-20,126-132
node 2 size: 64508 MB
node 2 free: 64264 MB
node 3 cpus: 21-27,133-139
node 3 size: 64508 MB
node 3 free: 64256 MB
node 4 cpus: 28-34,140-146
node 4 size: 64508 MB

```

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Platform Notes (Continued)

```

node 4 free: 64239 MB
node 5 cpus: 35-41,147-153
node 5 size: 64508 MB
node 5 free: 64284 MB
node 6 cpus: 42-48,154-160
node 6 size: 64508 MB
node 6 free: 64313 MB
node 7 cpus: 49-55,161-167
node 7 size: 64508 MB
node 7 free: 64276 MB
node 8 cpus: 56-62,168-174
node 8 size: 64473 MB
node 8 free: 64248 MB
node 9 cpus: 63-69,175-181
node 9 size: 64508 MB
node 9 free: 64253 MB
node 10 cpus: 70-76,182-188
node 10 size: 64508 MB
node 10 free: 64219 MB
node 11 cpus: 77-83,189-195
node 11 size: 64508 MB
node 11 free: 64157 MB
node 12 cpus: 84-90,196-202
node 12 size: 64508 MB
node 12 free: 64289 MB
node 13 cpus: 91-97,203-209
node 13 size: 64508 MB
node 13 free: 64306 MB
node 14 cpus: 98-104,210-216
node 14 size: 64508 MB
node 14 free: 64288 MB
node 15 cpus: 105-111,217-223
node 15 size: 64497 MB
node 15 free: 64275 MB

```

node distances:

```

node  0  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15
0:  10 20 30 30 30 30 30 30 30 30 30 30 30 30 30 30
1:  20 10 30 30 30 30 30 30 30 30 30 30 30 30 30 30
2:  30 30 10 20 30 30 30 30 30 30 30 30 30 30 30 30
3:  30 30 20 10 30 30 30 30 30 30 30 30 30 30 30 30
4:  30 30 30 30 10 20 30 30 30 30 30 30 30 30 30 30
5:  30 30 30 30 20 10 30 30 30 30 30 30 30 30 30 30
6:  30 30 30 30 30 30 10 20 30 30 30 30 30 30 30 30
7:  30 30 30 30 30 30 20 10 30 30 30 30 30 30 30 30
8:  30 30 30 30 30 30 30 30 10 20 30 30 30 30 30 30
9:  30 30 30 30 30 30 30 30 20 10 30 30 30 30 30 30
10: 30 30 30 30 30 30 30 30 30 30 10 20 30 30 30 30
11: 30 30 30 30 30 30 30 30 30 30 20 10 30 30 30 30
12: 30 30 30 30 30 30 30 30 30 30 30 10 20 30 30 30
13: 30 30 30 30 30 30 30 30 30 30 30 20 10 30 30 30
14: 30 30 30 30 30 30 30 30 30 30 30 30 20 10 30 30
15: 30 30 30 30 30 30 30 30 30 30 30 30 30 20 10 30

```

```

-----
9. /proc/meminfo
   MemTotal:      1056437076 kB

```

```

-----
10. who -r
    run-level 5 Mar 2 13:00

```

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Platform Notes (Continued)

11. Systemd service manager version: systemd 249 (249.11-0ubuntu3.7)

```
Default Target  Status
graphical      degraded
```

12. Failed units, from systemctl list-units --state=failed

```
UNIT                                LOAD  ACTIVE SUB  DESCRIPTION
* systemd-networkd-wait-online.service loaded failed failed Wait for Network to be Configured
```

13. Services, from systemctl list-unit-files

```
STATE      UNIT FILES
enabled    ModemManager apparmor blk-availability cloud-config cloud-final cloud-init
cloud-init-local console-setup cron dmesg e2scrub_reap finalrd getty@ gpu-manager
grub-common grub-initrd-fallback irqbalance keyboard-setup lvm2-monitor lxd-agent
multipathd networkd-dispatcher open-iscsi open-vm-tools pollinate rsyslog secureboot-db
setvtrgb snapd ssh systemd-networkd systemd-networkd-wait-online systemd-pstore
systemd-resolved systemd-timesyncd thermald tuned ua-reboot-cmds ubuntu-advantage udisks2
ufw unattended-upgrades vgauth
enabled-runtime netplan-ovs-cleanup systemd-fsck-root systemd-remount-fs
disabled    console-getty debug-shell iscsid nftables powertop rsync serial-getty@
systemd-boot-check-no-failures systemd-network-generator systemd-sysext
systemd-time-wait-sync upower
generated   apport
indirect    uidd
masked      cryptdisks cryptdisks-early hwclock lvm2 multipath-tools-boot rc rcS screen-cleanup sudo
x11-common
```

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

```
BOOT_IMAGE=/vmlinuz-5.15.0-69-generic
root=/dev/mapper/ubuntu--vg-ubuntu--lv
ro
```

15. cpupower frequency-info

```
analyzing CPU 0:
Unable to determine current policy
boost state support:
Supported: yes
Active: yes
```

16. tuned-adm active

```
Current active profile: throughput-performance
```

17. 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                 40
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                 10
vm.watermark_boost_factor    15000
vm.watermark_scale_factor    10
vm.zone_reclaim_mode         0

```

```

-----
18. /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

```

```

-----
19. /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

```

```

-----
20. OS release
From /etc/*-release /etc/*-version
os-release Ubuntu 22.04.1 LTS

```

```

-----
21. Disk information
SPEC is set to: /home/cpu2017
Filesystem                Type      Size  Used Avail Use% Mounted on
/dev/mapper/ubuntu--vg-ubuntu--lv ext4      437G  349G   70G  84% /

```

```

-----
22. /sys/devices/virtual/dmi/id
Vendor:          HPE
Product:         ProLiant DL560 Gen11
Product Family: ProLiant
Serial:          CNX2250G5V

```

```

-----
23. dmidecode
Additional information from dmidecode 3.3 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:
 3x Samsung M321R4GA3BB0-CQKDG 32 GB 2 rank 4800
29x Samsung M321R4GA3BB6-CQKDG 32 GB 2 rank 4800
32x UNKNOWN NOT AVAILABLE

```

```

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

```

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SPECrate®2017_fp_peak = 1230

CPU2017 License: 3
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Tested by: HPE

Test Date: Apr-2023
Hardware Availability: May-2023
Software Availability: Mar-2023

Platform Notes (Continued)

BIOS Vendor: HPE
BIOS Version: 1.30
BIOS Date: 03/01/2023
BIOS Revision: 1.30
Firmware Revision: 1.30

Compiler Version Notes

=====
C | 519.lbm_r(base, peak) 538.imagick_r(base, peak) 544.nab_r(base, peak)
=====

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
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=====

=====
C++ | 508.namd_r(base, peak) 510.parest_r(base, peak)
=====

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
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=====

=====
C++, C | 511.povray_r(base, peak) 526.blender_r(base, peak)
=====

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=====

=====
C++, C, Fortran | 507.cactuBSSN_r(base, peak)
=====

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
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Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
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=====

=====
Fortran | 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak) 554.roms_r(base, peak)
=====

Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
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=====

=====
Fortran, C | 521.wrf_r(base, peak) 527.cam4_r(base, peak)
=====

Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
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Base Compiler Invocation

C benchmarks:

icx

C++ benchmarks:

icpx

Fortran benchmarks:

ifx

Benchmarks using both Fortran and C:

ifx icx

Benchmarks using both C and C++:

icpx icx

Benchmarks using Fortran, C, and C++:

icpx icx ifx

Base Portability Flags

```

503.bwaves_r: -DSPEC_LP64
507.cactuBSSN_r: -DSPEC_LP64
508.namd_r: -DSPEC_LP64
510.parest_r: -DSPEC_LP64
511.povray_r: -DSPEC_LP64
519.lbm_r: -DSPEC_LP64
521.wrf_r: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
526.blender_r: -DSPEC_LP64 -DSPEC_LINUX -funsigned-char
527.cam4_r: -DSPEC_LP64 -DSPEC_CASE_FLAG
538.imagick_r: -DSPEC_LP64
544.nab_r: -DSPEC_LP64
549.fotonik3d_r: -DSPEC_LP64
554.roms_r: -DSPEC_LP64

```

Base Optimization Flags

C benchmarks:

```

-w -std=c11 -m64 -Wl,-z,muldefs -xsapphirerapids -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-Wno-implicit-int -mprefer-vector-width=512 -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

```

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Base Optimization Flags (Continued)

C++ benchmarks:

```
-w -std=c++14 -m64 -Wl,-z,muldefs -xsapphirerapids -Ofast
-ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -mprefer-vector-width=512 -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib
```

Fortran benchmarks:

```
-w -m64 -Wl,-z,muldefs -xsapphirerapids -Ofast -ffast-math -flto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-nostandard-realloc-lhs -align array32byte -auto -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib
```

Benchmarks using both Fortran and C:

```
-w -m64 -std=c11 -Wl,-z,muldefs -xsapphirerapids -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-Wno-implicit-int -mprefer-vector-width=512 -nostandard-realloc-lhs
-align array32byte -auto -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib
```

Benchmarks using both C and C++:

```
-w -std=c++14 -m64 -std=c11 -Wl,-z,muldefs -xsapphirerapids -Ofast
-ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -Wno-implicit-int -mprefer-vector-width=512
-ljemalloc -L/usr/local/jemalloc64-5.0.1/lib
```

Benchmarks using Fortran, C, and C++:

```
-w -m64 -std=c++14 -std=c11 -Wl,-z,muldefs -xsapphirerapids -Ofast
-ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -Wno-implicit-int -mprefer-vector-width=512
-nostandard-realloc-lhs -align array32byte -auto -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib
```

Peak Compiler Invocation

C benchmarks:

icx

C++ benchmarks:

icpx

Fortran benchmarks:

ifx

Benchmarks using both Fortran and C:

ifx icx

(Continued on next page)



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Peak Compiler Invocation (Continued)

Benchmarks using both C and C++:

icpx icx

Benchmarks using Fortran, C, and C++:

icpx icx ifx

Peak Portability Flags

Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:

519.lbm_r: basepeak = yes

538.imagick_r: basepeak = yes

544.nab_r: basepeak = yes

C++ benchmarks:

508.namd_r: basepeak = yes

510.parest_r: -w -std=c++14 -m64 -Wl,-z,muldefs -xsapphirerapids
-Ofast -ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -mprefer-vector-width=512
-ljemalloc -L/usr/local/jemalloc64-5.0.1/lib

Fortran benchmarks:

503.bwaves_r: basepeak = yes

549.fotonik3d_r: basepeak = yes

554.roms_r: -w -m64 -Wl,-z,muldefs -xsapphirerapids -Ofast
-ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -nostandard-realloc-lhs
-align array32byte -auto -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

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Peak Optimization Flags (Continued)

Benchmarks using both Fortran and C:

521.wrf_r: basepeak = yes

527.cam4_r: basepeak = yes

Benchmarks using both C and C++:

```
511.povray_r: -w -std=c++14 -m64 -std=c11 -Wl,-z,muldefs
-fprofile-generate(pass 1)
-fprofile-use=default.profddata(pass 2) -xCORE-AVX2(pass 1)
-flto -Ofast -xCORE-AVX512 -ffast-math -mfpmath=sse
-funroll-loops -qopt-mem-layout-trans=4 -Wno-implicit-int
-mprefer-vector-width=512 -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib
```

526.blender_r: basepeak = yes

Benchmarks using Fortran, C, and C++:

```
-w -m64 -std=c++14 -std=c11 -Wl,-z,muldefs -xsaphirerapids -Ofast
-ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -Wno-implicit-int -mprefer-vector-width=512
-nostandard-realloc-lhs -align array32byte -auto -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib
```

The flags files that were used to format this result can be browsed at

<http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-SPR-rev1.2.html>

<http://www.spec.org/cpu2017/flags/Intel-ic2023-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-SPR-rev1.2.xml>

<http://www.spec.org/cpu2017/flags/Intel-ic2023-official-linux64.xml>

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