



# SPEC CPU®2017 Floating Point Rate Result

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## Hewlett Packard Enterprise

(Test Sponsor: HPE)

### ProLiant DL385 Gen11

(2.40 GHz, AMD EPYC 9654)

SPECrate®2017\_fp\_base = 1350

SPECrate®2017\_fp\_peak = 1460

CPU2017 License: 3

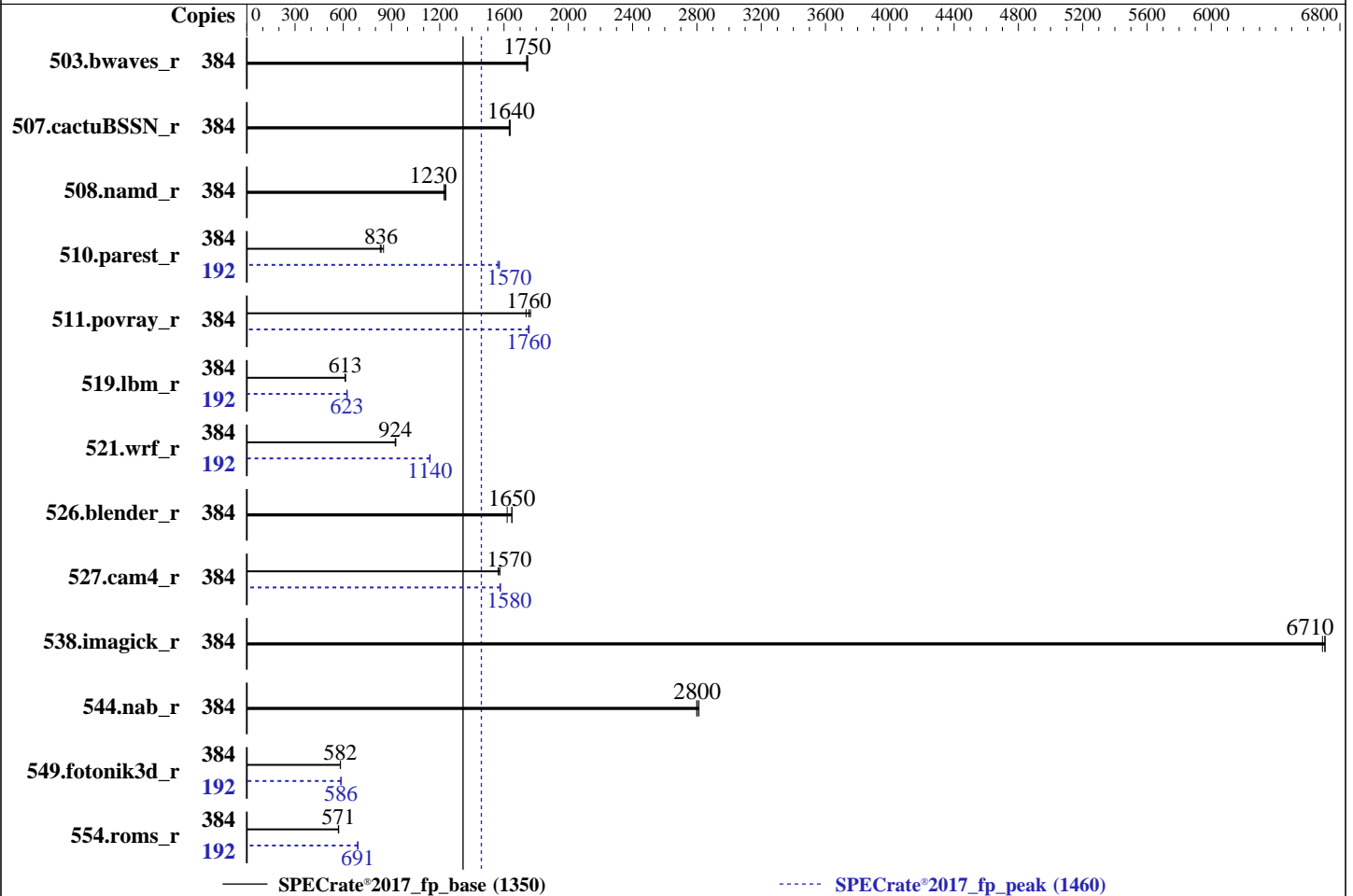
Test Sponsor: HPE

Tested by: HPE

Test Date: Oct-2022

Hardware Availability: Dec-2022

Software Availability: Nov-2022



### Hardware

CPU Name: AMD EPYC 9654  
 Max MHz: 3700  
 Nominal: 2400  
 Enabled: 192 cores, 2 chips, 2 threads/core  
 Orderable: 1, 2 chips  
 Cache L1: 32 KB I + 32 KB D on chip per core  
 L2: 1 MB I+D on chip per core  
 L3: 384 MB I+D on chip per chip, 32 MB shared / 8 cores  
 Other: None  
 Memory: 768 GB (24 x 32 GB 2Rx8 PC5-4800B-R)  
 Storage: 1 x 480 GB SATA SSD  
 Other: None

### Software

OS: Ubuntu 22.04.1 LTS  
 Kernel 5.15.0-52-generic  
 Compiler: C/C++/Fortran: Version 4.0.0 of AOCC  
 Parallel: No  
 Firmware: HPE BIOS Version v1.10 10/06/2022 released Oct-2022  
 File System: ext4  
 System State: Run level 5 (multi-user)  
 Base Pointers: 64-bit  
 Peak Pointers: 64-bit  
 Other: None  
 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	384	2204	1750	<u>2207</u>	<u>1750</u>	2213	1740	384	2204	1750	<u>2207</u>	<u>1750</u>	2213	1740
507.cactuBSSN_r	384	297	1640	298	1630	<u>297</u>	<u>1640</u>	384	297	1640	298	1630	<u>297</u>	<u>1640</u>
508.namd_r	384	297	1230	295	1240	<u>296</u>	<u>1230</u>	384	297	1230	295	1240	<u>296</u>	<u>1230</u>
510.parest_r	384	1181	851	<u>1202</u>	<u>836</u>	1210	830	192	320	1570	322	1560	<u>320</u>	<u>1570</u>
511.povray_r	384	508	1770	516	1740	<u>511</u>	<u>1760</u>	384	512	1750	511	1760	<u>511</u>	<u>1760</u>
519.lbm_r	384	<u>661</u>	<u>613</u>	661	612	660	613	192	324	624	325	623	<u>325</u>	<u>623</u>
521.wrf_r	384	928	927	931	924	<u>931</u>	<u>924</u>	192	378	1140	<u>377</u>	<u>1140</u>	377	1140
526.blender_r	384	361	1620	<u>355</u>	<u>1650</u>	355	1650	384	361	1620	<u>355</u>	<u>1650</u>	355	1650
527.cam4_r	384	430	1560	<u>427</u>	<u>1570</u>	427	1570	384	426	1580	427	1570	<u>426</u>	<u>1580</u>
538.imagick_r	384	<u>142</u>	<u>6710</u>	143	6690	142	6710	384	<u>142</u>	<u>6710</u>	143	6690	142	6710
544.nab_r	384	230	2810	231	2800	<u>231</u>	<u>2800</u>	384	230	2810	231	2800	<u>231</u>	<u>2800</u>
549.fotonik3d_r	384	<u>2571</u>	<u>582</u>	2573	582	2569	583	192	1277	586	<u>1277</u>	<u>586</u>	1276	586
554.roms_r	384	1068	571	<u>1069</u>	<u>571</u>	1072	569	192	<u>442</u>	<u>691</u>	441	692	443	689

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

## Compiler Notes

The AMD64 AOCC Compiler Suite is available at  
<http://developer.amd.com/amd-aocc/>

## Submit Notes

The config file option 'submit' was used.  
'numactl' was used to bind copies to the cores.  
See the configuration file for details.

## Operating System Notes

'ulimit -s unlimited' was used to set environment stack size limit  
'ulimit -l 2097152' was used to set environment locked pages in memory limit

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

To limit dirty cache to 8% of memory, 'sysctl -w vm.dirty\_ratio=8' run as root.  
To limit swap usage to minimum necessary, 'sysctl -w vm.swappiness=1' run as root.  
To free node-local memory and avoid remote memory usage,  
'sysctl -w vm.zone\_reclaim\_mode=1' run as root.

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## Operating System Notes (Continued)

To clear filesystem caches, 'sync; sysctl -w vm.drop\_caches=3' run as root.  
To disable address space layout randomization (ASLR) to reduce run-to-run variability, 'sysctl -w kernel.randomize\_va\_space=0' run as root.

To enable Transparent Hugepages (THP) for all allocations, 'echo always > /sys/kernel/mm/transparent\_hugepage/enabled' and 'echo always > /sys/kernel/mm/transparent\_hugepage/defrag' run as root.

## Environment Variables Notes

Environment variables set by runcpu before the start of the run:  
LD\_LIBRARY\_PATH =  
"/home/cpu2017/amd\_rate\_aocc400\_genoa\_B\_lib/lib:/home/cpu2017/amd\_rate\_aocc400\_genoa\_B\_lib/lib32:"  
MALLOC\_CONF = "retain:true"

## General Notes

Binaries were compiled on a system with 2x AMD EPYC 9174F CPU + 1.5TiB Memory using RHEL 8.6  
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.

## Platform Notes

BIOS Configuration  
Workload Profile set to General Throughput Compute  
Determinism Control set to Manual  
Performance Determinism set to Power Deterministic  
Last-Level Cache (LLC) as NUMA Node set to Enabled  
NUMA memory domains per socket set to Four memory domains per socket  
ACPI CST C2 Latency set to 18 microseconds  
Thermal Configuration set to Maximum Cooling  
Workload Profile set to Custom  
L2 HW Prefetcher set to Disabled  
Power Regulator set to OS Control Mode

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## Platform Notes (Continued)

The system ROM used for this result contains microcode version 0xa10110d for the AMD EPYC 9nn4X family of processors. The reference code/AGESA version used in this ROM is version GenoAPI 1.0.0.1-L2

```
Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acafc64d
running on dl385gen11 Fri Oct 21 00:33:47 2022
```

SUT (System Under Test) info as seen by some common utilities.  
For more information on this section, see  
<https://www.spec.org/cpu2017/Docs/config.html#sysinfo>

```
From /proc/cpuinfo
model name : AMD EPYC 9654 96-Core Processor
 2 "physical id"s (chips)
384 "processors"
cores, siblings (Caution: counting these is hw and system dependent. The following
excerpts from /proc/cpuinfo might not be reliable. Use with caution.)
cpu cores : 96
siblings : 192
physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52
53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80
81 82 83 84 85 86 87 88 89 90 91 92 93 94 95
physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52
53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80
81 82 83 84 85 86 87 88 89 90 91 92 93 94 95
```

```
From lscpu from util-linux 2.37.2:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Address sizes: 52 bits physical, 57 bits virtual
Byte Order: Little Endian
CPU(s): 384
On-line CPU(s) list: 0-383
Vendor ID: AuthenticAMD
Model name: AMD EPYC 9654 96-Core Processor
CPU family: 25
Model: 17
Thread(s) per core: 2
Core(s) per socket: 96
Socket(s): 2
Stepping: 1
Frequency boost: enabled
CPU max MHz: 3709.0000
CPU min MHz: 400.0000
```

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## Platform Notes (Continued)

```

BogoMIPS:                4792.64
Flags:                    fpu vme de pse tsc msr pae mce cx8 apic sep mtrr
pge mca cmov pat pse36 clflush mmx fxsr sse sse2 ht syscall nx mmxext fxsr_opt
pdpe1gb rdtscp lm constant_tsc rep_good nopl nonstop_tsc cpuid extd_apicid
aperfmpperf rapl pni pclmulqdq monitor ssse3 fma cx16 pcid sse4_1 sse4_2 x2apic movbe
popcnt aes xsave avx f16c rdrand lahf_lm cmp_legacy svm extapic cr8_legacy abm sse4a
misalignsse 3dnowprefetch osvw ibs skinit wdt tce topoext perfctr_core perfctr_nb
bpxt perfctr_llc mwaitx cpb cat_l3 cdp_l3 invpcid_single hw_pstate ssbd mba ibrs
ibpb stibp vmmcall fsgsbase bmi1 avx2 smep bmi2 erms invpcid cqm rdt_a avx512f
avx512dq rdseed adx smap avx512ifma clflushopt clwb avx512cd sha_ni avx512bw
avx512vl xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total
cqm_mbm_local avx512_bf16 clzero irperf xsaveerptr rdpru wbnoinvd amd_ppin cppc arat
npt lbrv svm_lock nrip_save tsc_scale vmcb_clean flushbyasid decodeassists
pausefilter pfthreshold avic v_vmsave_vmload vgif v_spec_ctrl avx512vbmi umip pku
ospke avx512_vbmi2 gfni vaes vpclmulqdq avx512_vnni avx512_bitalg avx512_vpopcntdq
la57 rdpid overflow_recov succor smca fsrm flush_lld
Virtualization:          AMD-V
L1d cache:                6 MiB (192 instances)
L1i cache:                6 MiB (192 instances)
L2 cache:                 192 MiB (192 instances)
L3 cache:                 768 MiB (24 instances)
NUMA node(s):            24
NUMA node0 CPU(s):       0-7,192-199
NUMA node1 CPU(s):       8-15,200-207
NUMA node2 CPU(s):       16-23,208-215
NUMA node3 CPU(s):       24-31,216-223
NUMA node4 CPU(s):       32-39,224-231
NUMA node5 CPU(s):       40-47,232-239
NUMA node6 CPU(s):       48-55,240-247
NUMA node7 CPU(s):       56-63,248-255
NUMA node8 CPU(s):       64-71,256-263
NUMA node9 CPU(s):       72-79,264-271
NUMA node10 CPU(s):      80-87,272-279
NUMA node11 CPU(s):      88-95,280-287
NUMA node12 CPU(s):      96-103,288-295
NUMA node13 CPU(s):     104-111,296-303
NUMA node14 CPU(s):     112-119,304-311
NUMA node15 CPU(s):     120-127,312-319
NUMA node16 CPU(s):     128-135,320-327
NUMA node17 CPU(s):     136-143,328-335
NUMA node18 CPU(s):     144-151,336-343
NUMA node19 CPU(s):     152-159,344-351
NUMA node20 CPU(s):     160-167,352-359
NUMA node21 CPU(s):     168-175,360-367
NUMA node22 CPU(s):     176-183,368-375
NUMA node23 CPU(s):     184-191,376-383
Vulnerability Itlb multihit:  Not affected

```

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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/swapgs barriers and \_\_user pointer sanitization  
 Vulnerability Spectre v2: Mitigation; Retpolines, IBPB conditional, IBRS\_FW, STIBP always-on, RSB filling, PBRSE-eIBRS Not affected  
 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	32K	6M	8	Data	1	64	1	64
L1i	32K	6M	8	Instruction	1	64	1	64
L2	1M	192M	8	Unified	2	2048	1	64
L3	32M	768M	16	Unified	3	32768	1	64

/proc/cpuinfo cache data  
cache size : 1024 KB

From numactl --hardware

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

available: 24 nodes (0-23)  
 node 0 cpus: 0 1 2 3 4 5 6 7 192 193 194 195 196 197 198 199  
 node 0 size: 31941 MB  
 node 0 free: 31647 MB  
 node 1 cpus: 8 9 10 11 12 13 14 15 200 201 202 203 204 205 206 207  
 node 1 size: 32252 MB  
 node 1 free: 32015 MB  
 node 2 cpus: 16 17 18 19 20 21 22 23 208 209 210 211 212 213 214 215  
 node 2 size: 32252 MB  
 node 2 free: 31878 MB  
 node 3 cpus: 24 25 26 27 28 29 30 31 216 217 218 219 220 221 222 223  
 node 3 size: 32252 MB  
 node 3 free: 32014 MB  
 node 4 cpus: 32 33 34 35 36 37 38 39 224 225 226 227 228 229 230 231  
 node 4 size: 32252 MB  
 node 4 free: 32019 MB  
 node 5 cpus: 40 41 42 43 44 45 46 47 232 233 234 235 236 237 238 239  
 node 5 size: 32252 MB  
 node 5 free: 32020 MB  
 node 6 cpus: 48 49 50 51 52 53 54 55 240 241 242 243 244 245 246 247  
 node 6 size: 32252 MB

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## Platform Notes (Continued)

```

node 6 free: 31927 MB
node 7 cpus: 56 57 58 59 60 61 62 63 248 249 250 251 252 253 254 255
node 7 size: 32252 MB
node 7 free: 32046 MB
node 8 cpus: 64 65 66 67 68 69 70 71 256 257 258 259 260 261 262 263
node 8 size: 32252 MB
node 8 free: 32046 MB
node 9 cpus: 72 73 74 75 76 77 78 79 264 265 266 267 268 269 270 271
node 9 size: 32252 MB
node 9 free: 32049 MB
node 10 cpus: 80 81 82 83 84 85 86 87 272 273 274 275 276 277 278 279
node 10 size: 32252 MB
node 10 free: 31919 MB
node 11 cpus: 88 89 90 91 92 93 94 95 280 281 282 283 284 285 286 287
node 11 size: 32252 MB
node 11 free: 32056 MB
node 12 cpus: 96 97 98 99 100 101 102 103 288 289 290 291 292 293 294 295
node 12 size: 32252 MB
node 12 free: 31970 MB
node 13 cpus: 104 105 106 107 108 109 110 111 296 297 298 299 300 301 302 303
node 13 size: 32252 MB
node 13 free: 31980 MB
node 14 cpus: 112 113 114 115 116 117 118 119 304 305 306 307 308 309 310 311
node 14 size: 32252 MB
node 14 free: 32044 MB
node 15 cpus: 120 121 122 123 124 125 126 127 312 313 314 315 316 317 318 319
node 15 size: 32252 MB
node 15 free: 32035 MB
node 16 cpus: 128 129 130 131 132 133 134 135 320 321 322 323 324 325 326 327
node 16 size: 32252 MB
node 16 free: 31976 MB
node 17 cpus: 136 137 138 139 140 141 142 143 328 329 330 331 332 333 334 335
node 17 size: 32252 MB
node 17 free: 31902 MB
node 18 cpus: 144 145 146 147 148 149 150 151 336 337 338 339 340 341 342 343
node 18 size: 32252 MB
node 18 free: 32055 MB
node 19 cpus: 152 153 154 155 156 157 158 159 344 345 346 347 348 349 350 351
node 19 size: 32252 MB
node 19 free: 32047 MB
node 20 cpus: 160 161 162 163 164 165 166 167 352 353 354 355 356 357 358 359
node 20 size: 32252 MB
node 20 free: 31932 MB
node 21 cpus: 168 169 170 171 172 173 174 175 360 361 362 363 364 365 366 367
node 21 size: 32193 MB
node 21 free: 31943 MB
node 22 cpus: 176 177 178 179 180 181 182 183 368 369 370 371 372 373 374 375

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```

node 22 size: 32252 MB
node 22 free: 32037 MB
node 23 cpus: 184 185 186 187 188 189 190 191 376 377 378 379 380 381 382 383
node 23 size: 32216 MB
node 23 free: 32023 MB
node distances:
node 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
20 21 22 23
0: 10 12 12 12 11 12 12 12 11 12 12 12 32 32 32 32 32 32 32 32
32 32 32 32
1: 12 10 12 12 12 11 12 12 12 11 12 12 32 32 32 32 32 32 32 32
32 32 32 32
2: 12 12 10 12 12 12 11 12 12 12 11 12 32 32 32 32 32 32 32 32
32 32 32 32
3: 12 12 12 10 12 12 12 11 12 12 12 11 32 32 32 32 32 32 32 32
32 32 32 32
4: 11 12 12 12 10 12 12 12 11 12 12 12 32 32 32 32 32 32 32 32
32 32 32 32
5: 12 11 12 12 12 10 12 12 12 11 12 12 32 32 32 32 32 32 32 32
32 32 32 32
6: 12 12 11 12 12 12 10 12 12 12 11 12 32 32 32 32 32 32 32 32
32 32 32 32
7: 12 12 12 11 12 12 12 10 12 12 12 11 32 32 32 32 32 32 32 32
32 32 32 32
8: 11 12 12 12 11 12 12 12 10 12 12 12 32 32 32 32 32 32 32 32
32 32 32 32
9: 12 11 12 12 12 11 12 12 12 10 12 12 32 32 32 32 32 32 32 32
32 32 32 32
10: 12 12 11 12 12 12 11 12 12 12 10 12 32 32 32 32 32 32 32 32
32 32 32 32
11: 12 12 12 11 12 12 12 11 12 12 12 10 32 32 32 32 32 32 32 32
32 32 32 32
12: 32 32 32 32 32 32 32 32 32 32 32 32 10 12 12 12 11 12 12 12
11 12 12 12
13: 32 32 32 32 32 32 32 32 32 32 32 32 12 10 12 12 12 11 12 12
12 11 12 12
14: 32 32 32 32 32 32 32 32 32 32 32 32 12 12 10 12 12 12 11 12
12 12 11 12
15: 32 32 32 32 32 32 32 32 32 32 32 32 12 12 12 10 12 12 12 11
12 12 12 11
16: 32 32 32 32 32 32 32 32 32 32 32 32 11 12 12 12 10 12 12 12
11 12 12 12
17: 32 32 32 32 32 32 32 32 32 32 32 32 12 11 12 12 12 10 12 12
12 11 12 12
18: 32 32 32 32 32 32 32 32 32 32 32 32 12 12 11 12 12 12 10 12
12 12 11 12
19: 32 32 32 32 32 32 32 32 32 32 32 32 12 12 12 11 12 12 12 10

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## Platform Notes (Continued)

```

12 12 12 11
20: 32 32 32 32 32 32 32 32 32 32 32 32 32 11 12 12 12 11 12 12 12
10 12 12 12
21: 32 32 32 32 32 32 32 32 32 32 32 32 32 12 11 12 12 12 11 12 12
12 10 12 12
22: 32 32 32 32 32 32 32 32 32 32 32 32 32 12 12 11 12 12 12 11 12
12 12 10 12
23: 32 32 32 32 32 32 32 32 32 32 32 32 32 12 12 12 11 12 12 12 11
12 12 12 10

```

```

From /proc/meminfo
MemTotal:      792212924 kB
HugePages_Total:      0
Hugepagesize:    2048 kB

```

```

/sys/devices/system/cpu/cpu*/cpufreq/scaling_governor has
performance

```

```

/usr/bin/lsb_release -d
Ubuntu 22.04.1 LTS

```

```

From /etc/*release* /etc/*version*
debian_version: bookworm/sid
os-release:
PRETTY_NAME="Ubuntu 22.04.1 LTS"
NAME="Ubuntu"
VERSION_ID="22.04"
VERSION="22.04.1 LTS (Jammy Jellyfish)"
VERSION_CODENAME=jammy
ID=ubuntu
ID_LIKE=debian
HOME_URL="https://www.ubuntu.com/"

```

```

uname -a:
Linux dl385gen11 5.15.0-52-generic #58-Ubuntu SMP Thu Oct 13 08:03:55 UTC 2022 x86_64
x86_64 x86_64 GNU/Linux

```

Kernel self-reported vulnerability status:

```

CVE-2018-12207 (iTLB Multihit):      Not affected
CVE-2018-3620 (L1 Terminal Fault):   Not affected
Microarchitectural Data Sampling:   Not affected
CVE-2017-5754 (Meltdown):           Not affected
mmio_stale_data:                     Not affected
retbleed:                             Not affected
CVE-2018-3639 (Speculative Store Bypass): Mitigation: Speculative Store
Bypass disabled via prctl and

```

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## Platform Notes (Continued)

```

CVE-2017-5753 (Spectre variant 1):          seccomp
                                              Mitigation: usercopy/swapgs
                                              barriers and __user pointer
                                              sanitization
CVE-2017-5715 (Spectre variant 2):          Mitigation: Retpolines, IBPB:
                                              conditional, IBRS_FW, STIBP:
                                              always-on, RSB filling,
                                              PBRSE-eIBRS: Not affected
CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
CVE-2019-11135 (TSX Asynchronous Abort):    Not affected

```

run-level 5 Oct 21 00:26

SPEC is set to: /home/cpu2017

Filesystem	Type	Size	Used	Avail	Use%	Mounted on
/dev/mapper/ubuntu--vg-ubuntu--lv	ext4	437G	29G	390G	7%	/

```

From /sys/devices/virtual/dmi/id
Vendor:          HPE
Product:         ProLiant DL385 Gen11
Product Family: ProLiant
Serial:          DL385G11-005

```

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:
  24x Hynix HMC88MEBRA113N 32 GB 2 rank 4800

```

```

BIOS:
  BIOS Vendor:      HPE
  BIOS Version:     1.10
  BIOS Date:        10/06/2022
  BIOS Revision:    1.10
  Firmware Revision: 1.10

```

(End of data from sysinfo program)

## Compiler Version Notes

```

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

```

AMD clang version 14.0.6 (CLANG: AOCC\_4.0.0-Build#389 2022\_10\_07) (based on

(Continued on next page)



# SPEC CPU®2017 Floating Point Rate Result

Copyright 2017-2022 Standard Performance Evaluation Corporation

**Hewlett Packard Enterprise**

(Test Sponsor: HPE)

ProLiant DL385 Gen11

(2.40 GHz, AMD EPYC 9654)

SPECrate®2017\_fp\_base = 1350

SPECrate®2017\_fp\_peak = 1460

**CPU2017 License:** 3

**Test Sponsor:** HPE

**Tested by:** HPE

**Test Date:** Oct-2022

**Hardware Availability:** Dec-2022

**Software Availability:** Nov-2022

## Compiler Version Notes (Continued)

```

LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
-----

```

```

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

```

```

AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on
LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
-----

```

```

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

```

```

AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on
LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on
LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
-----

```

```

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

```

```

AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on
LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on
LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on
LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu

```

(Continued on next page)



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**Test Sponsor:** HPE

**Tested by:** HPE

**Test Date:** Oct-2022

**Hardware Availability:** Dec-2022

**Software Availability:** Nov-2022

## Compiler Version Notes (Continued)

Thread model: posix

InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin

```

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

```

AMD clang version 14.0.6 (CLANG: AOCC\_4.0.0-Build#389 2022\_10\_07) (based on LLVM Mirror.Version.14.0.6)

Target: x86\_64-unknown-linux-gnu

Thread model: posix

InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin

```

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

```

AMD clang version 14.0.6 (CLANG: AOCC\_4.0.0-Build#389 2022\_10\_07) (based on LLVM Mirror.Version.14.0.6)

Target: x86\_64-unknown-linux-gnu

Thread model: posix

InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin

AMD clang version 14.0.6 (CLANG: AOCC\_4.0.0-Build#389 2022\_10\_07) (based on LLVM Mirror.Version.14.0.6)

Target: x86\_64-unknown-linux-gnu

Thread model: posix

InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin

## Base Compiler Invocation

C benchmarks:

clang

C++ benchmarks:

clang++

Fortran benchmarks:

flang

Benchmarks using both Fortran and C:

flang clang

Benchmarks using both C and C++:

clang++ clang

(Continued on next page)



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**CPU2017 License:** 3

**Test Sponsor:** HPE

**Tested by:** HPE

**Test Date:** Oct-2022

**Hardware Availability:** Dec-2022

**Software Availability:** Nov-2022

## Base Compiler Invocation (Continued)

Benchmarks using Fortran, C, and C++:

clang++ clang flang

## 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_CASE_FLAG -Mbyteswapio -DSPEC_LP64
526.blender_r: -funsigned-char -DSPEC_LP64
527.cam4_r: -DSPEC_CASE_FLAG -DSPEC_LP64
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:

```

-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-ldist-scalar-expand -fenable-aggressive-gather -O3
-march=znver4 -fveclib=AMDLIBM -ffast-math -fstruct-layout=7
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-fremap-arrays -fstrip-mining -mllvm -reduce-array-computations=3
-zopt -lamdlibm -lamdalloc -lflang

```

C++ benchmarks:

```

-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -mllvm -unroll-threshold=100
-finline-aggressive -mllvm -loop-unswitch-threshold=200000
-mllvm -reduce-array-computations=3 -zopt -lamdlibm -lamdalloc
-lflang

```

(Continued on next page)



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SPECrate®2017\_fp\_peak = 1460

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

**Test Date:** Oct-2022  
**Hardware Availability:** Dec-2022  
**Software Availability:** Nov-2022

## Base Optimization Flags (Continued)

Fortran benchmarks:

```
-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-enable-X86-prefetching -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -Kieee -Mrecursive -funroll-loops
-mllvm -lsr-in-nested-loop -mllvm -reduce-array-computations=3
-fepilog-vectorization-of-inductions -zopt -lamdlibm -lamdalloc
-lflang
```

Benchmarks using both Fortran and C:

```
-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-enable-X86-prefetching -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -fstruct-layout=7
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-freemap-arrays -fstrip-mining -mllvm -reduce-array-computations=3
-zopt -Kieee -Mrecursive -funroll-loops -mllvm -lsr-in-nested-loop
-fepilog-vectorization-of-inductions -lamdlibm -lamdalloc -lflang
```

Benchmarks using both C and C++:

```
-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -fstruct-layout=7
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-freemap-arrays -fstrip-mining -mllvm -reduce-array-computations=3
-zopt -mllvm -unroll-threshold=100 -finline-aggressive
-mllvm -loop-unswitch-threshold=200000 -lamdlibm -lamdalloc -lflang
```

Benchmarks using Fortran, C, and C++:

```
-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -fstruct-layout=7
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-freemap-arrays -fstrip-mining -mllvm -reduce-array-computations=3
-zopt -mllvm -unroll-threshold=100 -finline-aggressive
-mllvm -loop-unswitch-threshold=200000 -Kieee -Mrecursive
-funroll-loops -mllvm -lsr-in-nested-loop
-fepilog-vectorization-of-inductions -lamdlibm -lamdalloc -lflang
```



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SPECrate®2017\_fp\_peak = 1460

**CPU2017 License:** 3

**Test Sponsor:** HPE

**Tested by:** HPE

**Test Date:** Oct-2022

**Hardware Availability:** Dec-2022

**Software Availability:** Nov-2022

## Base Other Flags

C benchmarks:

-Wno-unused-command-line-argument

C++ benchmarks:

-Wno-unused-command-line-argument

Fortran benchmarks:

-Wno-unused-command-line-argument

Benchmarks using both Fortran and C:

-Wno-unused-command-line-argument

Benchmarks using both C and C++:

-Wno-unused-command-line-argument

Benchmarks using Fortran, C, and C++:

-Wno-unused-command-line-argument

## Peak Compiler Invocation

C benchmarks:

clang

C++ benchmarks:

clang++

Fortran benchmarks:

flang

Benchmarks using both Fortran and C:

flang clang

Benchmarks using both C and C++:

clang++ clang

Benchmarks using Fortran, C, and C++:

clang++ clang flang

## Peak Portability Flags

Same as Base Portability Flags



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SPECrate®2017\_fp\_base = 1350

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**CPU2017 License:** 3

**Test Sponsor:** HPE

**Tested by:** HPE

**Test Date:** Oct-2022

**Hardware Availability:** Dec-2022

**Software Availability:** Nov-2022

## Peak Optimization Flags

C benchmarks:

```
519.lbm_r: -m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast
-march=znver4 -fveclib=AMDLIBM -ffast-math
-fstruct-layout=7 -mllvm -unroll-threshold=50
-fremap-arrays -fstrip-mining
-mllvm -inline-threshold=1000
-mllvm -reduce-array-computations=3 -zopt -lamdlibm
-lamdalloc
```

538.imagick\_r: basepeak = yes

544.nab\_r: basepeak = yes

C++ benchmarks:

508.namd\_r: basepeak = yes

```
510.parest_r: -m64 -flto -Wl,-mllvm -Wl,-suppress-fmas
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -Ofast
-march=znver4 -fveclib=AMDLIBM -ffast-math
-finline-aggressive -mllvm -unroll-threshold=100
-mllvm -reduce-array-computations=3 -zopt -lamdlibm
-lamdalloc
```

Fortran benchmarks:

503.bwaves\_r: basepeak = yes

```
549.fotonik3d_r: -m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-enable-X86-prefetching -Ofast
-march=znver4 -fveclib=AMDLIBM -ffast-math -Kieee
-Mrecursive -mllvm -reduce-array-computations=3
-fepilog-vectorization-of-inductions -fvector-transform
-fscalar-transform -lamdlibm -lamdalloc -lflang
```

```
554.roms_r: -m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-enable-X86-prefetching -Ofast
-march=znver4 -fveclib=AMDLIBM -ffast-math -Mrecursive
-mllvm -reduce-array-computations=3
-fepilog-vectorization-of-inductions -zopt -lamdlibm
-lamdalloc -lflang
```

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**Test Sponsor:** HPE

**Tested by:** HPE

**Test Date:** Oct-2022

**Hardware Availability:** Dec-2022

**Software Availability:** Nov-2022

## Peak Optimization Flags (Continued)

Benchmarks using both Fortran and C:

```
521.wrf_r: -m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-enable-X86-prefetching -Ofast
-march=znver4 -fveclib=AMDLIBM -ffast-math
-fstruct-layout=7 -mllvm -unroll-threshold=50
-freemap-arrays -fstrip-mining
-mllvm -inline-threshold=1000
-mllvm -reduce-array-computations=3 -zopt -Mrecursive
-fepilog-vectorization-of-inductions -lamdlibm -lamdalloc
-lflang
```

```
527.cam4_r: -m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-enable-X86-prefetching -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -fstruct-layout=7
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-freemap-arrays -mllvm -reduce-array-computations=3 -zopt
-Kieee -Mrecursive -funroll-loops
-mllvm -lsr-in-nested-loop
-fepilog-vectorization-of-inductions -lamdlibm -lamdalloc
-lflang
```

Benchmarks using both C and C++:

```
511.povray_r: -m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -fstruct-layout=7
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-freemap-arrays -mllvm -reduce-array-computations=3 -zopt
-mllvm -unroll-threshold=100 -finline-aggressive
-mllvm -loop-unswitch-threshold=200000 -lamdlibm
-lamdalloc
```

526.blender\_r: basepeak = yes

Benchmarks using Fortran, C, and C++:

507.cactuBSSN\_r: basepeak = yes



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**Tested by:** HPE

**Test Date:** Oct-2022

**Hardware Availability:** Dec-2022

**Software Availability:** Nov-2022

## Peak Other Flags

C benchmarks:

-Wno-unused-command-line-argument

C++ benchmarks:

-Wno-unused-command-line-argument

Fortran benchmarks:

-Wno-unused-command-line-argument

Benchmarks using both Fortran and C:

-Wno-unused-command-line-argument

Benchmarks using both C and C++:

-Wno-unused-command-line-argument

Benchmarks using Fortran, C, and C++:

-Wno-unused-command-line-argument

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

<http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-AMD-Genoa-rev2.0.html>

<http://www.spec.org/cpu2017/flags/aocc400-flags.html>

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

<http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-AMD-Genoa-rev2.0.xml>

<http://www.spec.org/cpu2017/flags/aocc400-flags.xml>

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