SPEC CPU®2017 Integer Rate Result

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Dell Inc.

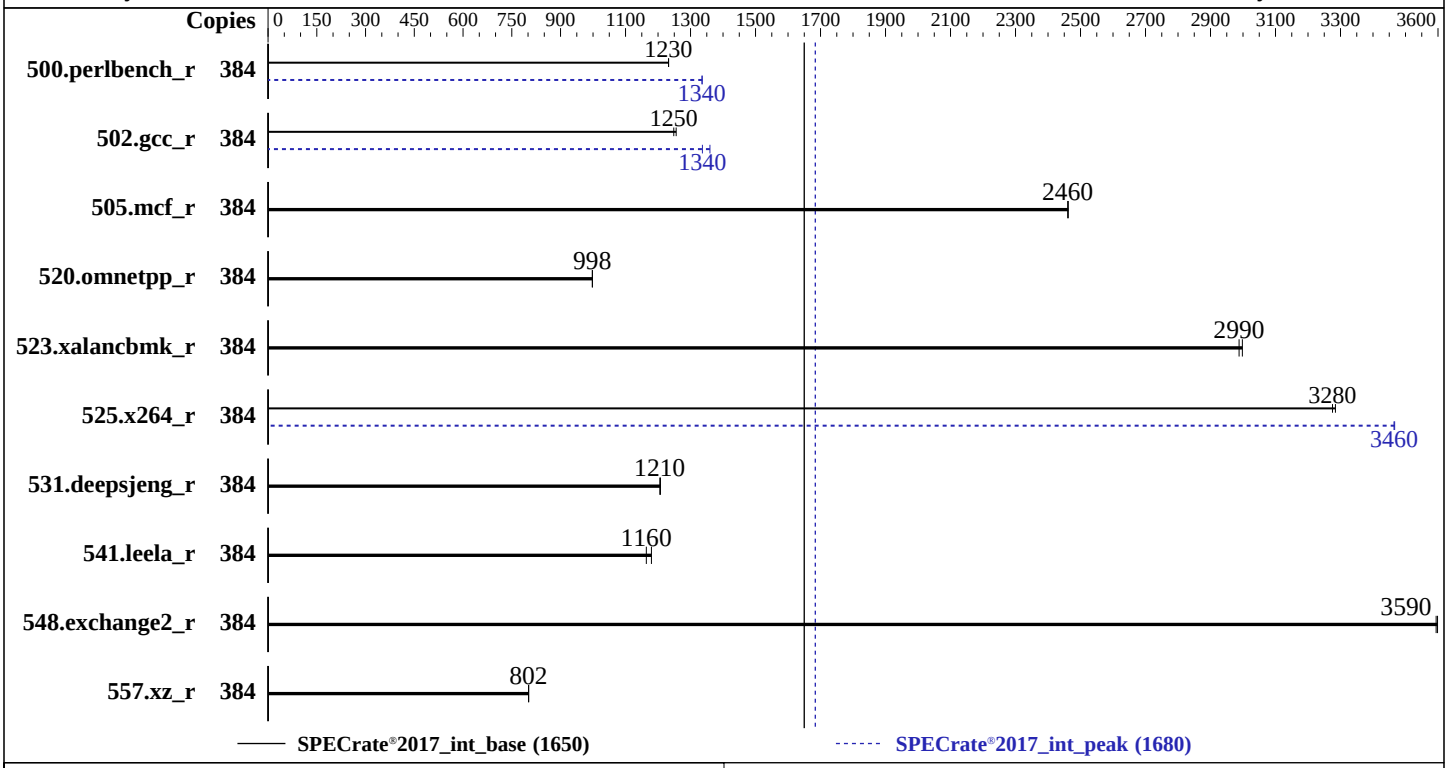
PowerEdge R960 (Intel Xeon Platinum 8468H)

SPECrate®2017_int_base = 1650

SPECrate®2017_int_peak = 1680

CPU2017 License: 6573
Test Sponsor: Dell Inc.
Tested by: Dell Inc.

Test Date: May-2023
Hardware Availability: May-2023
Software Availability: Dec-2022



Hardware

CPU Name:	Intel Xeon Platinum 8468H
Max MHz:	3800
Nominal:	2100
Enabled:	192 cores, 4 chips, 2 threads/core
Orderable:	2,4 chips
Cache L1:	32 KB I + 48 KB D on chip per core
L2:	2 MB I+D on chip per core
L3:	105 MB I+D on chip per chip
Other:	None
Memory:	2 TB (32 x 64 GB 2Rx4 PC5-4800B-R)
Storage:	190 GB on tmpfs
Other:	None

Software

OS:	Red Hat Enterprise Linux 9.0 (Plow) 5.14.0-70.13.1.el9_0.x86_64
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:	Version 1.4.3 released May-2023
File System:	tmpfs
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

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
500.perlbench_r	384	496	1230	**496**	**1230**			384	**458**	**1340**	458	1340		
502.gcc_r	384	**436**	**1250**	433	1260			384	400	1360	**407**	**1340**		
505.mcf_r	384	**252**	**2460**	252	2460			384	**252**	**2460**	252	2460		
520.omnetpp_r	384	**505**	**998**	505	998			384	**505**	**998**	505	998		
523.xalancbmk_r	384	135	3000	**136**	**2990**			384	135	3000	**136**	**2990**		
525.x264_r	384	**205**	**3280**	205	3280			384	**194**	**3460**	194	3470		
531.deepsjeng_r	384	**365**	**1210**	364	1210			384	**365**	**1210**	364	1210		
541.leela_r	384	**546**	**1160**	539	1180			384	**546**	**1160**	539	1180		
548.exchange2_r	384	280	3600	**280**	**3590**			384	280	3600	**280**	**3590**		
557.xz_r	384	517	802	**517**	**802**			384	517	802	**517**	**802**		

SPECrate®2017_int_base = **1650**

SPECrate®2017_int_peak = **1680**

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

Compiler Notes

```
SPEC has ruled that the compiler used for this result was performing a compilation
that specifically improves the performance of the 523.xalancbmk_r / 623.xalancbmk_s
benchmarks using a priori knowledge of the SPEC code and dataset to perform a
transformation that has narrow applicability.

In order to encourage optimizations that have wide applicability (see rule 1.4
https://www.spec.org/cpu2017/Docs/runrules.html#rule_1.4), SPEC will no longer
publish results using this optimization.

This result is left in the SPEC results database for historical reference.
```

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"
```

Environment Variables Notes

```
Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH =
     "/mnt/ramdisk/cpu2017-1.1.9-ic2023.0/lib/intel64:/mnt/ramdisk/cpu2017-1.1.9-ic2023.0/lib/ia32:/mnt/ram
     disk/cpu2017-1.1.9-ic2023.0/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
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>
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

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.

Benchmark run from a 190 GB ramdisk created with the cmd: "mount -t tmpfs -o size=190G tmpfs /mnt/ramdisk"
```

Platform Notes

```
BIOS settings:
                 ADDDC Setting : Disabled
        DIMM Self Healing on
    Uncorrectable Memory Error : Disabled
       DCU Streamer Prefetcher : Disabled
              Sub NUMA Cluster : 4-way Clustering
                  LLC Prefetch : Disabled
           Dead Line LLC Alloc : Disabled
                Optimizer Mode : Enabled

                System Profile : Custom
          CPU Power Management : Maximum Performance
                           C1E : Disabled
                      C States : Autonomous
           Memory Patrol Scrub : Disabled
      Energy Efficiency Policy : Performance
            PCI ASPM L1 Link
              Power Management : Disabled

Sysinfo program /mnt/ramdisk/cpu2017-1.1.9-ic2023.0/bin/sysinfo
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
running on localhost.localdomain Mon May  8 17:04:33 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
```

(Continued on next page)

Platform Notes (Continued)

```
 8. numactl --hardware
 9. /proc/meminfo
10. who -r
11. Systemd service manager version: systemd 250 (250-6.el9_0)
12. Services, from systemctl list-unit-files
13. Linux kernel boot-time arguments, from /proc/cmdline
14. cpupower frequency-info
15. sysctl
16. /sys/kernel/mm/transparent_hugepage
17. /sys/kernel/mm/transparent_hugepage/khugepaged
18. OS release
19. Disk information
20. /sys/devices/virtual/dmi/id
21. dmidecode
22. BIOS
------------------------------------------------------------

------------------------------------------------------------
1. uname -a
  Linux localhost.localdomain 5.14.0-70.13.1.el9_0.x86_64 #1 SMP PREEMPT Thu Apr 14 12:42:38 EDT 2022 x86_64
  x86_64 x86_64 GNU/Linux

------------------------------------------------------------
2. w
   17:04:33 up 2 min,  1 user,  load average: 0.59, 0.30, 0.12
  USER     TTY        LOGIN@   IDLE   JCPU   PCPU WHAT
  root     tty1      17:03   25.00s  1.09s  0.00s /bin/bash ./dell-run-speccpu.sh rate --define
  DL-BIOSinc=Dell-BIOS_Xeon-4.inc --define DL-BIOS-adddcD=1 --define DL-BIOS-SNC=4 --define DL-VERS=v4.5
  --define DL-LQC=1 --output_format html,pdf,txt

------------------------------------------------------------
3. Username
  From environment variable $USER:  root

------------------------------------------------------------
4. ulimit -a
  real-time non-blocking time  (microseconds, -R) unlimited
  core file size              (blocks, -c) 0
  data seg size               (kbytes, -d) unlimited
  scheduling priority                 (-e) 0
  file size                   (blocks, -f) unlimited
  pending signals                     (-i) 8252460
  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) 8252460
  virtual memory              (kbytes, -v) unlimited
  file locks                          (-x) unlimited

------------------------------------------------------------
5. sysinfo process ancestry
 /usr/lib/systemd/systemd rhgb --switched-root --system --deserialize 31
 login -- root
 -bash
 /bin/bash ./DELL_rate.sh
```

(Continued on next page)

Platform Notes (Continued)

```
 /bin/bash ./dell-run-main.sh rate
 /bin/bash ./dell-run-main.sh rate
 /bin/bash ./dell-run-speccpu.sh rate --define DL-BIOSinc=Dell-BIOS_Xeon-4.inc --define DL-BIOS-adddcD=1
   --define DL-BIOS-SNC=4 --define DL-VERS=v4.5 --define DL-LQC=1 --output_format html,pdf,txt
 /bin/bash ./dell-run-speccpu.sh rate --define DL-BIOSinc=Dell-BIOS_Xeon-4.inc --define DL-BIOS-adddcD=1
   --define DL-BIOS-SNC=4 --define DL-VERS=v4.5 --define DL-LQC=1 --output_format html,pdf,txt
 runcpu --nobuild --action validate --define default-platform-flags --define numcopies=384 -c
   ic2023.0-lin-sapphirerapids-rate-20221201.cfg --define smt-on --define cores=192 --define physicalfirst
   --define invoke_with_interleave --define drop_caches --tune base,peak -o all --iterations 2 --define
   DL-BIOSinc=Dell-BIOS_Xeon-4.inc --define DL-BIOS-adddcD=1 --define DL-BIOS-SNC=4 --define DL-VERS=v4.5
   --define DL-LQC=1 --output_format html,pdf,txt intrate
 runcpu --nobuild --action validate --define default-platform-flags --define numcopies=384 --configfile
   ic2023.0-lin-sapphirerapids-rate-20221201.cfg --define smt-on --define cores=192 --define physicalfirst
   --define invoke_with_interleave --define drop_caches --tune base,peak --output_format all --iterations 2
   --define DL-BIOSinc=Dell-BIOS_Xeon-4.inc --define DL-BIOS-adddcD=1 --define DL-BIOS-SNC=4 --define
   DL-VERS=v4.5 --define DL-LQC=1 --output_format html,pdf,txt --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 = /mnt/ramdisk/cpu2017-1.1.9-ic2023.0

------------------------------------------------------------
6. /proc/cpuinfo
    model name      : Intel(R) Xeon(R) Platinum 8468H
    vendor_id       : GenuineIntel
    cpu family      : 6
    model           : 143
    stepping        : 8
    microcode       : 0x2b0001b0
    bugs            : spectre_v1 spectre_v2 spec_store_bypass swapgs
    cpu cores       : 48
    siblings        : 96
    4 physical ids (chips)
    384 processors (hardware threads)
    physical id 0: core ids 0-47
    physical id 1: core ids 0-47
    physical id 2: core ids 0-47
    physical id 3: core ids 0-47
    physical id 0: apicids 0-95
    physical id 1: apicids 128-223
    physical id 2: apicids 256-351
    physical id 3: apicids 384-479
  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):                          384
  On-line CPU(s) list:             0-383
  Vendor ID:                       GenuineIntel
  BIOS Vendor ID:                  Intel
  Model name:                      Intel(R) Xeon(R) Platinum 8468H
  BIOS Model name:                 Intel(R) Xeon(R) Platinum 8468H
  CPU family:                      6
```

(Continued on next page)

Platform Notes (Continued)

```
Model:                   143
Thread(s) per core:      2
Core(s) per socket:      48
Socket(s):               4
Stepping:                8
BogoMIPS:                4200.00
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 avx512_fp16 amx_tile flush_l1d arch_capabilities
Virtualization:          VT-x
L1d cache:               9 MiB (192 instances)
L1i cache:               6 MiB (192 instances)
L2 cache:                384 MiB (192 instances)
L3 cache:                420 MiB (4 instances)
NUMA node(s):            16
NUMA node0 CPU(s):       0,16,28,44,64,92,108,120,132,148,164,176,192,208,220,236,256,284,300,312,3
                         24,340,356,368
NUMA node1 CPU(s):       8,36,52,72,84,100,112,128,140,156,168,184,200,228,244,264,276,292,304,320,
                         332,348,360,376
NUMA node2 CPU(s):       4,20,32,48,56,68,80,96,124,136,152,180,196,212,224,240,248,260,272,288,316
                         ,328,344,372
NUMA node3 CPU(s):       12,24,40,60,76,88,104,116,144,160,172,188,204,216,232,252,268,280,296,308,
                         336,352,364,380
NUMA node4 CPU(s):       1,17,25,37,65,81,97,121,133,149,165,177,193,209,217,229,257,273,289,313,32
                         5,341,357,369
NUMA node5 CPU(s):       9,33,45,57,73,89,105,117,125,141,157,185,201,225,237,249,265,281,297,309,3
                         17,333,349,377
NUMA node6 CPU(s):       5,29,41,53,69,85,101,113,137,153,169,181,197,221,233,245,261,277,293,305,3
                         29,345,361,373
NUMA node7 CPU(s):       13,21,49,61,77,93,109,129,145,161,173,189,205,213,241,253,269,285,301,321,
                         337,353,365,381
NUMA node8 CPU(s):       2,18,34,50,62,90,106,118,130,142,158,178,194,210,226,242,254,282,298,310,3
                         22,334,350,370
NUMA node9 CPU(s):       10,26,42,58,70,82,98,122,134,150,166,186,202,218,234,250,262,274,290,314,3
                         26,342,358,378
NUMA node10 CPU(s):      6,22,38,54,66,78,94,110,146,162,174,182,198,214,230,246,258,270,286,302,33
                         8,354,366,374
NUMA node11 CPU(s):      14,30,46,74,86,102,114,126,138,154,170,190,206,222,238,266,278,294,306,318
                         ,330,346,362,382
NUMA node12 CPU(s):      3,19,35,51,83,99,115,127,131,139,155,179,195,211,227,243,275,291,307,319,3
                         23,331,347,371
NUMA node13 CPU(s):      11,27,43,63,75,91,107,119,147,163,175,187,203,219,235,255,267,283,299,311,
                         339,355,367,379
NUMA node14 CPU(s):      7,23,39,55,59,71,87,103,143,159,171,183,199,215,231,247,251,263,279,295,33
                         5,351,363,375
NUMA node15 CPU(s):      15,31,47,67,79,95,111,123,135,151,167,191,207,223,239,259,271,287,303,315,
```

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Platform Notes (Continued)

```
                                 327,343,359,383
  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
  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       9M   12 Data            1     64        1             64
     L1i       32K       6M    8 Instruction     1     64        1             64
     L2         2M     384M   16 Unified         2   2048        1             64
     L3       105M     420M   15 Unified         3 114688        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: 0,16,28,44,64,92,108,120,132,148,164,176,192,208,220,236,256,284,300,312,324,340,356,368
  node 0 size: 127959 MB
  node 0 free: 127220 MB
  node 1 cpus: 8,36,52,72,84,100,112,128,140,156,168,184,200,228,244,264,276,292,304,320,332,348,360,376
  node 1 size: 129018 MB
  node 1 free: 128646 MB
  node 2 cpus: 4,20,32,48,56,68,80,96,124,136,152,180,196,212,224,240,248,260,272,288,316,328,344,372
  node 2 size: 128982 MB
  node 2 free: 119758 MB
  node 3 cpus: 12,24,40,60,76,88,104,116,144,160,172,188,204,216,232,252,268,280,296,308,336,352,364,380
  node 3 size: 129018 MB
  node 3 free: 128673 MB
  node 4 cpus: 1,17,25,37,65,81,97,121,133,149,165,177,193,209,217,229,257,273,289,313,325,341,357,369
  node 4 size: 129018 MB
  node 4 free: 127308 MB
  node 5 cpus: 9,33,45,57,73,89,105,117,125,141,157,185,201,225,237,249,265,281,297,309,317,333,349,377
  node 5 size: 129018 MB
  node 5 free: 128608 MB
  node 6 cpus: 5,29,41,53,69,85,101,113,137,153,169,181,197,221,233,245,261,277,293,305,329,345,361,373
  node 6 size: 129018 MB
  node 6 free: 128606 MB
  node 7 cpus: 13,21,49,61,77,93,109,129,145,161,173,189,205,213,241,253,269,285,301,321,337,353,365,381
  node 7 size: 129018 MB
  node 7 free: 128552 MB
  node 8 cpus: 2,18,34,50,62,90,106,118,130,142,158,178,194,210,226,242,254,282,298,310,322,334,350,370
  node 8 size: 129018 MB
  node 8 free: 128640 MB
  node 9 cpus: 10,26,42,58,70,82,98,122,134,150,166,186,202,218,234,250,262,274,290,314,326,342,358,378
  node 9 size: 129018 MB
  node 9 free: 128676 MB
  node 10 cpus: 6,22,38,54,66,78,94,110,146,162,174,182,198,214,230,246,258,270,286,302,338,354,366,374
  node 10 size: 129018 MB
  node 10 free: 128660 MB
  node 11 cpus: 14,30,46,74,86,102,114,126,138,154,170,190,206,222,238,266,278,294,306,318,330,346,362,382
  node 11 size: 129018 MB
  node 11 free: 128663 MB
  node 12 cpus: 3,19,35,51,83,99,115,127,131,139,155,179,195,211,227,243,275,291,307,319,323,331,347,371
  node 12 size: 129018 MB
```

(Continued on next page)

Platform Notes (Continued)

```
  node 12 free: 128174 MB
  node 13 cpus: 11,27,43,63,75,91,107,119,147,163,175,187,203,219,235,255,267,283,299,311,339,355,367,379
  node 13 size: 129018 MB
  node 13 free: 128700 MB
  node 14 cpus: 7,23,39,55,59,71,87,103,143,159,171,183,199,215,231,247,251,263,279,295,335,351,363,375
  node 14 size: 129018 MB
  node 14 free: 128667 MB
  node 15 cpus: 15,31,47,67,79,95,111,123,135,151,167,191,207,223,239,259,271,287,303,315,327,343,359,383
  node 15 size: 128989 MB
  node 15 free: 128630 MB
  node distances:
  node   0   1   2   3   4   5   6   7   8   9  10  11  12  13  14  15
    0:  10  12  12  12  21  21  21  21  21  21  21  21  21  21  21  21
    1:  12  10  12  12  21  21  21  21  21  21  21  21  21  21  21  21
    2:  12  12  10  12  21  21  21  21  21  21  21  21  21  21  21  21
    3:  12  12  12  10  21  21  21  21  21  21  21  21  21  21  21  21
    4:  21  21  21  21  10  12  12  12  21  21  21  21  21  21  21  21
    5:  21  21  21  21  12  10  12  12  21  21  21  21  21  21  21  21
    6:  21  21  21  21  12  12  10  12  21  21  21  21  21  21  21  21
    7:  21  21  21  21  12  12  12  10  21  21  21  21  21  21  21  21
    8:  21  21  21  21  21  21  21  21  10  12  12  12  21  21  21  21
    9:  21  21  21  21  21  21  21  21  12  10  12  12  21  21  21  21
   10:  21  21  21  21  21  21  21  21  12  12  10  12  21  21  21  21
   11:  21  21  21  21  21  21  21  21  12  12  12  10  21  21  21  21
   12:  21  21  21  21  21  21  21  21  21  21  21  21  10  12  12  12
   13:  21  21  21  21  21  21  21  21  21  21  21  21  12  10  12  12
   14:  21  21  21  21  21  21  21  21  21  21  21  21  12  12  10  12
   15:  21  21  21  21  21  21  21  21  21  21  21  21  12  12  12  10

------------------------------------------------------------
9. /proc/meminfo
   MemTotal:       2112691768 kB

------------------------------------------------------------
10. who -r
  run-level 3 May 8 17:03

------------------------------------------------------------
11. Systemd service manager version: systemd 250 (250-6.el9_0)
  Default Target  Status
  multi-user      running

------------------------------------------------------------
12. Services, from systemctl list-unit-files
  STATE            UNIT FILES
  enabled          ModemManager NetworkManager NetworkManager-dispatcher NetworkManager-wait-online
                   accounts-daemon atd auditd avahi-daemon bluetooth chronyd crond cups dbus-broker firewalld
                   gdm getty@ insights-client-boot irqbalance iscsi iscsi-onboot kdump libstoragemgmt
                   low-memory-monitor lvm2-monitor mcelog mdmonitor microcode multipathd nis-domainname
                   nvmefc-boot-connections ostree-remount power-profiles-daemon qemu-guest-agent rhsmcertd
                   rsyslog rtkit-daemon selinux-autorelabel-mark smartd sshd sssd switcheroo-control
                   systemd-network-generator udisks2 upower vgauthd vmtoolsd
  enabled-runtime  systemd-remount-fs
  disabled         arp-ethers blk-availability brltty canberra-system-bootup canberra-system-shutdown
                   canberra-system-shutdown-reboot chrony-wait cni-dhcp console-getty cpupower cups-browsed
                   dbus-daemon debug-shell dnsmasq iprdump iprinit iprupdate iscsid iscsiuio kpatch kvm_stat
                   ledmon man-db-restart-cache-update nftables nvmf-autoconnect podman podman-auto-update
                   podman-restart psacct ras-mc-ctl rasdaemon rdisc rhcd rhsm rhsm-facts rpmdb-rebuild
                   serial-getty@ speech-dispatcherd sshd-keygen@ systemd-boot-check-no-failures
                   systemd-pstore systemd-sysext wpa_supplicant
```

(Continued on next page)

Platform Notes (Continued)

```
  indirect         spice-vdagentd sssd-autofs sssd-kcm sssd-nss sssd-pac sssd-pam sssd-ssh sssd-sudo

------------------------------------------------------------
13. Linux kernel boot-time arguments, from /proc/cmdline
  BOOT_IMAGE=(hd0,gpt2)/vmlinuz-5.14.0-70.13.1.el9_0.x86_64
  root=/dev/mapper/rhel-root
  ro
  crashkernel=1G-4G:192M,4G-64G:256M,64G-:512M
  resume=/dev/mapper/rhel-swap
  rd.lvm.lv=rhel/root
  rd.lvm.lv=rhel/swap
  rhgb
  quiet

------------------------------------------------------------
14. cpupower frequency-info
  analyzing CPU 0:
    Unable to determine current policy
    boost state support:
      Supported: yes
      Active: yes

------------------------------------------------------------
15. sysctl
  kernel.numa_balancing              1
  kernel.randomize_va_space          2
  vm.compaction_proactiveness       20
  vm.dirty_background_bytes          0
  vm.dirty_background_ratio         10
  vm.dirty_bytes                     0
  vm.dirty_expire_centisecs       3000
  vm.dirty_ratio                    20
  vm.dirty_writeback_centisecs      500
  vm.dirtytime_expire_seconds     43200
  vm.extfrag_threshold              500
  vm.min_unmapped_ratio               1
  vm.nr_hugepages                     0
  vm.nr_hugepages_mempolicy           0
  vm.nr_overcommit_hugepages          0
  vm.swappiness                      60
  vm.watermark_boost_factor       15000
  vm.watermark_scale_factor          10
  vm.zone_reclaim_mode                0

------------------------------------------------------------
16. /sys/kernel/mm/transparent_hugepage
  defrag          always defer defer+madvise [madvise] never
  enabled         [always] madvise never
  hpage_pmd_size  2097152
  shmem_enabled   always within_size advise [never] deny force

------------------------------------------------------------
17. /sys/kernel/mm/transparent_hugepage/khugepaged
  alloc_sleep_millisecs   60000
  defrag                      1
  max_ptes_none             511
  max_ptes_shared           256
  max_ptes_swap              64
  pages_to_scan            4096
  scan_sleep_millisecs    10000
```

(Continued on next page)

Platform Notes (Continued)

```
 ------------------------------------------------------------
 18. OS release
   From /etc/*-release /etc/*-version
   os-release     Red Hat Enterprise Linux 9.0 (Plow)
   redhat-release Red Hat Enterprise Linux release 9.0 (Plow)
   system-release Red Hat Enterprise Linux release 9.0 (Plow)

 ------------------------------------------------------------
 19. Disk information
 SPEC is set to: /mnt/ramdisk/cpu2017-1.1.9-ic2023.0
   Filesystem     Type   Size  Used Avail Use% Mounted on
   tmpfs          tmpfs  190G  4.2G  186G   3% /mnt/ramdisk

 ------------------------------------------------------------
 20. /sys/devices/virtual/dmi/id
     Vendor:         Dell Inc.
     Product:        PowerEdge R960
     Product Family: PowerEdge
     Serial:         SLR9601

 ------------------------------------------------------------
 21. 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:
     31x 00AD063200AD HMCG94AEBRA109N 64 GB 2 rank 4800
     1x 00AD063200AD HMCG94MEBRA109N 64 GB 2 rank 4800


 ------------------------------------------------------------
 22. BIOS
 (This section combines info from /sys/devices and dmidecode.)
    BIOS Vendor:       Dell Inc.
    BIOS Version:      1.4.3
    BIOS Date:         05/04/2023
    BIOS Revision:     1.4
```

Compiler Version Notes

```
==============================================================================================================
C       | 502.gcc_r(peak)
--------------------------------------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on IA-32, Version 2023.0.0 Build 20221201
Copyright (C) 1985-2022 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)
--------------------------------------------------------------------------------------------------------------
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.
--------------------------------------------------------------------------------------------------------------

==============================================================================================================
C       | 502.gcc_r(peak)
```

(Continued on next page)

Compiler Version Notes (Continued)

```
------------------------------------------------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on IA-32, Version 2023.0.0 Build 20221201
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------------------------------------------------------------------------------------------------------------------------

========================================================================================================================
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)
------------------------------------------------------------------------------------------------------------------------
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.
------------------------------------------------------------------------------------------------------------------------

========================================================================================================================
C++     | 520.omnetpp_r(base, peak) 523.xalancbmk_r(base, peak) 531.deepsjeng_r(base, peak)
        | 541.leela_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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------------------------------------------------------------------------------------------------------------------------

========================================================================================================================
Fortran | 548.exchange2_r(base, peak)
------------------------------------------------------------------------------------------------------------------------
Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------------------------------------------------
```

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

(Continued on next page)

Base Portability Flags (Continued)

541.leela_r: -DSPEC_LP64
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/usr/local/intel/compiler/2023.0.0/linux/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/usr/local/intel/compiler/2023.0.0/linux/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/usr/local/intel/compiler/2023.0.0/linux/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

(Continued on next page)

Peak Portability Flags (Continued)

502.gcc_r: -D_FILE_OFFSET_BITS=64
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
-fprofile-generate(pass 1)
-fprofile-use=default.profdata(pass 2) -xCORE-AVX2(pass 1)
-flto -Ofast -xCORE-AVX512 -ffast-math -mfpmath=sse
-funroll-loops -qopt-mem-layout-trans=4
-fno-strict-overflow
-L/usr/local/intel/compiler/2023.0.0/linux/compiler/lib/intel64_lin
-lqkmalloc

502.gcc_r: -m32
-L/usr/local/intel/compiler/2023.0.0/linux/compiler/lib/ia32_lin
-std=gnu89 -Wl,-z,muldefs -fprofile-generate(pass 1)
-fprofile-use=default.profdata(pass 2) -xCORE-AVX2(pass 1)
-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/usr/local/intel/compiler/2023.0.0/linux/compiler/lib/intel64_lin
-lqkmalloc

557.xz_r: basepeak = yes

C++ benchmarks:

(Continued on next page)

Peak Optimization Flags (Continued)

520.omnetpp_r: `basepeak = yes`

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-ic2023-official-linux64.html`
`http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge-Intel-Xeon-v1.3.html`

You can also download the XML flags sources by saving the following links:
`http://www.spec.org/cpu2017/flags/Intel-ic2023-official-linux64.xml`
`http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge-Intel-Xeon-v1.3.xml`

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