SPEC CPU®2017 Floating Point Speed Result

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Dell Inc.

PowerEdge R960 (Intel Xeon Platinum 8460H)

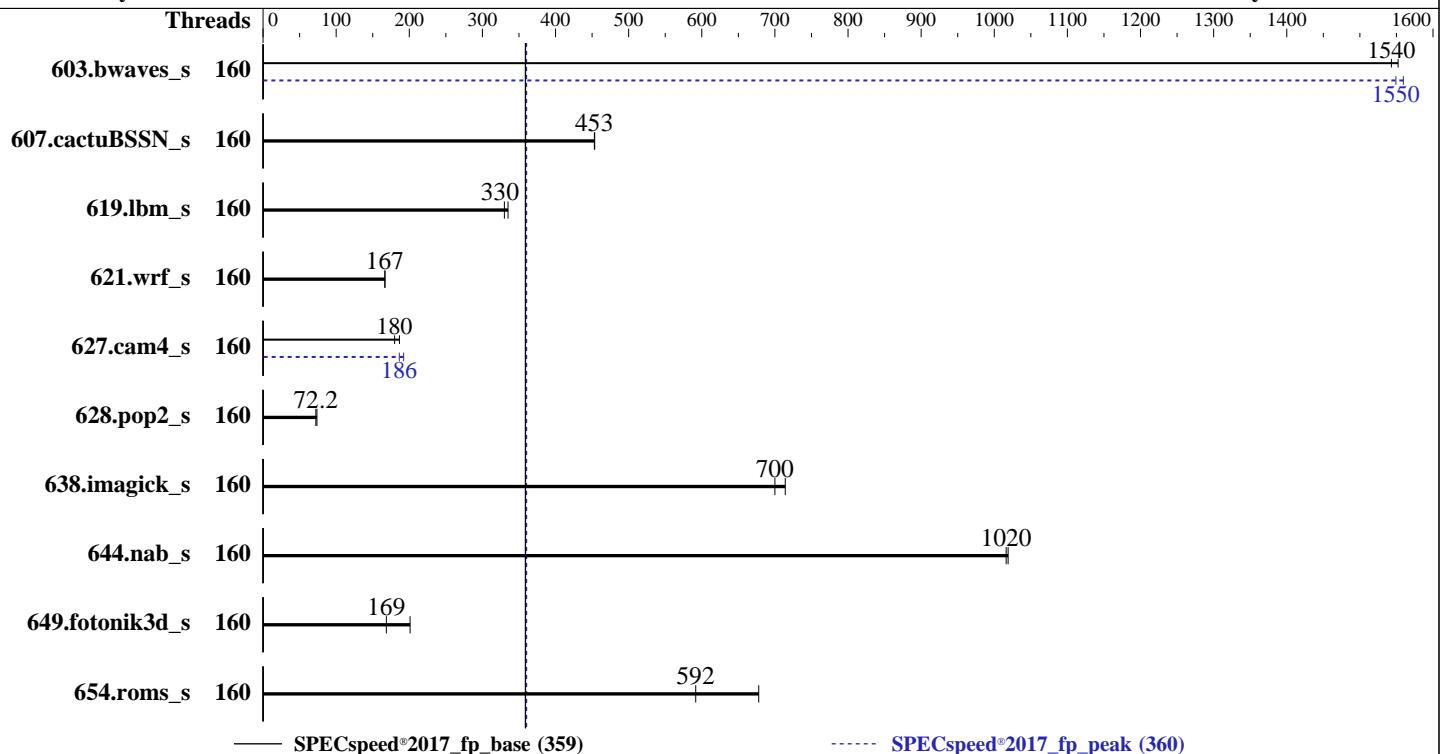$SPECspeed^{®}2017\_fp\_base = 359$

$SPECspeed^{®}2017\_fp\_peak = 360$

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

Threads

Benchmark	Threads	Value (base)	Value (peak)
603.bwaves_s	160	1540	1550
607.cactuBSSN_s	160	453	
619.lbm_s	160	330	
621.wrf_s	160	167	
627.cam4_s	160	180	186
628.pop2_s	160	72.2	
638.imagick_s	160	700	
644.nab_s	160	1020	
649.fotonik3d_s	160	169	
654.roms_s	160	592	

SPECspeed®2017_fp_base (359)   SPECspeed®2017_fp_peak (360)

Hardware

CPU Name: Intel Xeon Platinum 8460H
 Max MHz: 3800
 Nominal: 2200
Enabled: 160 cores, 4 chips
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: 100 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: Yes
Firmware: Version 1.4.0 released Mar-2023
File System: tmpfs
System State: Run level 5 (graphical 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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Test Date: Mar-2023
Hardware Availability: May-2023
Software Availability: Dec-2022

Results Table

Benchmark	Base							Peak						
	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
603.bwaves_s	160	38.0	1550	**38.2**	**1540**			160	37.8	1560	**38.1**	**1550**		
607.cactuBSSN_s	160	**36.8**	**453**	36.8	454			160	**36.8**	**453**	36.8	454		
619.lbm_s	160	**15.9**	**330**	15.6	335			160	**15.9**	**330**	15.6	335		
621.wrf_s	160	**79.4**	**167**	79.3	167			160	**79.4**	**167**	79.3	167		
627.cam4_s	160	47.5	187	**49.3**	**180**			160	**47.6**	**186**	46.1	192		
628.pop2_s	160	161	73.7	**164**	**72.2**			160	161	73.7	**164**	**72.2**		
638.imagick_s	160	20.2	714	**20.6**	**700**			160	20.2	714	**20.6**	**700**		
644.nab_s	160	**17.2**	**1020**	17.1	1020			160	**17.2**	**1020**	17.1	1020		
649.fotonik3d_s	160	45.3	201	**54.1**	**169**			160	45.3	201	**54.1**	**169**		
654.roms_s	160	**26.6**	**592**	23.2	678			160	**26.6**	**592**	23.2	678		
SPECspeed®2017_fp_base =			**359**											
SPECspeed®2017_fp_peak =			**360**											

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

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:
KMP_AFFINITY = "granularity=fine,compact"
LD_LIBRARY_PATH =
      "/mnt/ramdisk/cpu2017-1.1.9-ic2023.0/lib/intel64:/mnt/ramdisk/cpu2017-1.1.9-ic2023.0/je5.0.1-64"
MALLOC_CONF = "retain:true"
OMP_STACKSIZE = "192M"
```

General Notes

```
Binaries compiled on a system with 2x Intel Xeon Platinum 8280M CPU + 384GB RAM
memory using Redhat Enterprise Linux 8.0
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
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 100 GB ramdisk created with the cmd: "mount -t tmpfs -o size=100G tmpfs /mnt/ramdisk"
```

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Platform Notes

```
BIOS settings:
                  ADDDC Setting : Disabled
        DIMM Self Healing on
  Uncorrectable Memory Error : Disabled
          Logical Processor : Disabled
          Sub NUMA Cluster : 2-way Clustering
            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 Wed Mar 29 17:25:39 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 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
   17:25:39 up  2:21,  1 user,  load average: 5.61, 4.98, 2.99
   USER     TTY         LOGIN@   IDLE   JCPU   PCPU WHAT
```

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Platform Notes (Continued)

```
   root     :1      15:09   ?xdm?   8:28   0.00s /usr/libexec/gdm-x-session --register-session --run-script
 gnome-session


  -------------------------------------------------------------
 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) 8252170
   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) 8252170
   virtual memory              (kbytes, -v) unlimited
   file locks                        (-x) unlimited


  -------------------------------------------------------------
 5. sysinfo process ancestry
  /usr/lib/systemd/systemd rhgb --switched-root --system --deserialize 31
  /usr/lib/systemd/systemd --user
  /usr/libexec/gnome-terminal-server
  bash
  /bin/bash ./DELL_speed.sh
  /bin/bash ./dell-run-main.sh speed
  /bin/bash ./dell-run-main.sh speed
  /bin/bash ./dell-run-speccpu.sh speed --define DL-BIOSinc=Dell-BIOS_Xeon-4.inc --define DL-BIOS-LogProcD=1
    --define DL-BIOS-adddcD=1 --define DL-BIOS-SNC=2 --output_format csv,html,pdf,txt
  /bin/bash ./dell-run-speccpu.sh speed --define DL-BIOSinc=Dell-BIOS_Xeon-4.inc --define DL-BIOS-LogProcD=1
    --define DL-BIOS-adddcD=1 --define DL-BIOS-SNC=2 --output_format csv,html,pdf,txt
  runcpu --nobuild --action validate --define default-platform-flags -c
    ic2023.0-lin-sapphirerapids-speed-20221201.cfg --define cores=160 --tune base,peak -o all --define
    drop_caches --iterations 2 --define DL-BIOSinc=Dell-BIOS_Xeon-4.inc --define DL-BIOS-LogProcD=1 --define
    DL-BIOS-adddcD=1 --define DL-BIOS-SNC=2 --output_format csv,html,pdf,txt fpspeed
  runcpu --nobuild --action validate --define default-platform-flags --configfile
    ic2023.0-lin-sapphirerapids-speed-20221201.cfg --define cores=160 --tune base,peak --output_format all
    --define drop_caches --iterations 2 --define DL-BIOSinc=Dell-BIOS_Xeon-4.inc --define DL-BIOS-LogProcD=1
    --define DL-BIOS-adddcD=1 --define DL-BIOS-SNC=2 --output_format csv,html,pdf,txt --nopower --runmode
    speed --tune base:peak --size refspeed fpspeed --nopreenv --note-preenv --logfile
    $SPEC/tmp/CPU2017.002/templogs/preenv.fpspeed.002.0.log --lognum 002.0 --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 8460H
    vendor_id       : GenuineIntel
    cpu family      : 6
    model           : 143
    stepping        : 8
```

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

Platform Notes (Continued)

```
    microcode       : 0x2b0001b0
    bugs            : spectre_v1 spectre_v2 spec_store_bypass swapgs
    cpu cores       : 40
    siblings        : 40
    4 physical ids (chips)
    160 processors (hardware threads)
    physical id 0: core ids 0-39
    physical id 1: core ids 0-39
    physical id 2: core ids 0-39
    physical id 3: core ids 0-39
    physical id 0: apicids
    0,2,4,6,8,10,12,14,16,18,20,22,24,26,28,30,32,34,36,38,40,42,44,46,48,50,52,54,56,58,60,62,64,66,68,70,72
    ,74,76,78
    physical id 1: apicids
    128,130,132,134,136,138,140,142,144,146,148,150,152,154,156,158,160,162,164,166,168,170,172,174,176,178,1
    80,182,184,186,188,190,192,194,196,198,200,202,204,206
    physical id 2: apicids
    256,258,260,262,264,266,268,270,272,274,276,278,280,282,284,286,288,290,292,294,296,298,300,302,304,306,3
    08,310,312,314,316,318,320,322,324,326,328,330,332,334
    physical id 3: apicids
    384,386,388,390,392,394,396,398,400,402,404,406,408,410,412,414,416,418,420,422,424,426,428,430,432,434,4
    36,438,440,442,444,446,448,450,452,454,456,458,460,462
  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):                 160
    On-line CPU(s) list:    0-159
    Vendor ID:              GenuineIntel
    BIOS Vendor ID:         Intel
    Model name:             Intel(R) Xeon(R) Platinum 8460H
    BIOS Model name:        Intel(R) Xeon(R) Platinum 8460H
    CPU family:             6
    Model:                  143
    Thread(s) per core:     1
    Core(s) per socket:     40
    Socket(s):              4
    Stepping:               8
    BogoMIPS:               4400.00
    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
```

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Platform Notes (Continued)

```
                                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:                7.5 MiB (160 instances)
      L1i cache:                5 MiB (160 instances)
      L2 cache:                 320 MiB (160 instances)
      L3 cache:                 420 MiB (4 instances)
      NUMA node(s):             8
      NUMA node0 CPU(s):        0,8,16,24,32,40,48,56,64,72,80,88,96,104,112,120,128,136,144,152
      NUMA node1 CPU(s):        4,12,20,28,36,44,52,60,68,76,84,92,100,108,116,124,132,140,148,156
      NUMA node2 CPU(s):        1,9,17,25,33,41,49,57,65,73,81,89,97,105,113,121,129,137,145,153
      NUMA node3 CPU(s):        5,13,21,29,37,45,53,61,69,77,85,93,101,109,117,125,133,141,149,157
      NUMA node4 CPU(s):        2,10,18,26,34,42,50,58,66,74,82,90,98,106,114,122,130,138,146,154
      NUMA node5 CPU(s):        6,14,22,30,38,46,54,62,70,78,86,94,102,110,118,126,134,142,150,158
      NUMA node6 CPU(s):        3,11,19,27,35,43,51,59,67,75,83,91,99,107,115,123,131,139,147,155
      NUMA node7 CPU(s):        7,15,23,31,39,47,55,63,71,79,87,95,103,111,119,127,135,143,151,159
      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     7.5M   12 Data            1     64        1             64
      L1i       32K       5M    8 Instruction     1     64        1             64
      L2         2M     320M   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: 8 nodes (0-7)
    node 0 cpus: 0,8,16,24,32,40,48,56,64,72,80,88,96,104,112,120,128,136,144,152
    node 0 size: 256855 MB
    node 0 free: 255346 MB
    node 1 cpus: 4,12,20,28,36,44,52,60,68,76,84,92,100,108,116,124,132,140,148,156
    node 1 size: 258007 MB
    node 1 free: 257480 MB
    node 2 cpus: 1,9,17,25,33,41,49,57,65,73,81,89,97,105,113,121,129,137,145,153
    node 2 size: 258043 MB
    node 2 free: 257690 MB
    node 3 cpus: 5,13,21,29,37,45,53,61,69,77,85,93,101,109,117,125,133,141,149,157
    node 3 size: 258043 MB
    node 3 free: 257717 MB
    node 4 cpus: 2,10,18,26,34,42,50,58,66,74,82,90,98,106,114,122,130,138,146,154
    node 4 size: 258043 MB
    node 4 free: 247833 MB
    node 5 cpus: 6,14,22,30,38,46,54,62,70,78,86,94,102,110,118,126,134,142,150,158
    node 5 size: 258043 MB
    node 5 free: 257681 MB
    node 6 cpus: 3,11,19,27,35,43,51,59,67,75,83,91,99,107,115,123,131,139,147,155
    node 6 size: 258043 MB
    node 6 free: 257713 MB
    node 7 cpus: 7,15,23,31,39,47,55,63,71,79,87,95,103,111,119,127,135,143,151,159
```

(Continued on next page)

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Platform Notes (Continued)

```
   node 7 size: 258023 MB
   node 7 free: 257474 MB
   node distances:
   node    0    1    2    3    4    5    6    7
     0:   10   12   21   21   21   21   21   21
     1:   12   10   21   21   21   21   21   21
     2:   21   21   10   12   21   21   21   21
     3:   21   21   12   10   21   21   21   21
     4:   21   21   21   21   10   12   21   21
     5:   21   21   21   21   12   10   21   21
     6:   21   21   21   21   21   21   10   12
     7:   21   21   21   21   21   21   12   10


  ------------------------------------------------------------
  9. /proc/meminfo
     MemTotal:       2112618836 kB


  ------------------------------------------------------------
  10. who -r
    run-level 5 Mar 29 15:04


  ------------------------------------------------------------
  11. Systemd service manager version: systemd 250 (250-6.el9_0)
    Default Target  Status
    graphical       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 gdm
                    getty@ insights-client-boot irqbalance iscsi iscsi-onboot kdump libstoragemgmt lm_sensors
                    low-memory-monitor lvm2-monitor mcelog mdmonitor microcode multipathd nis-domainname
                    nvmefc-boot-connections ostree-remount pmcd pmie pmlogger power-profiles-daemon
                    qemu-guest-agent rhsmcertd rpcbind rsyslog rtkit-daemon selinux-autorelabel-mark smartd
                    sshd sssd switcheroo-control sysstat systemd-network-generator udisks2 upower vgauthd
                    virtqemud vmtoolsd
    enabled-runtime systemd-remount-fs
    disabled        arp-ethers autofs 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 dovecot fancontrol fcoe firewalld grafana-server gssproxy
                    httpd httpd@ ibacm iprdump iprinit iprupdate ipsec iscsid iscsiuio kpatch kvm_stat ledmon
                    libvirt-guests libvirtd lldpad man-db-restart-cache-update named named-chroot nfs-blkmap
                    nfs-server nftables nmb numad nvmf-autoconnect pmfind pmie_farm pmlogger_farm pmproxy
                    podman podman-auto-update podman-restart postfix powertop psacct ras-mc-ctl rasdaemon
                    rdisc rhcd rhsm rhsm-facts rpmdb-rebuild rrdcached saslauthd serial-getty@ smb snmpd
                    snmptrapd spamassassin speech-dispatcherd srp_daemon srp_daemon_port@ sshd-keygen@
                    systemd-boot-check-no-failures systemd-nspawn@ systemd-pstore systemd-sysext target
                    targetclid tog-pegasus trace-cmd virtinterfaced virtnetworkd virtnodedevd virtnwfilterd
                    virtproxyd virtsecretd virtstoraged vsftpd wpa_supplicant
    indirect        pcscd spice-vdagentd sssd-autofs sssd-kcm sssd-nss sssd-pac sssd-pam sssd-ssh sssd-sudo
                    virtlockd virtlogd vsftpd@


  ------------------------------------------------------------
  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
```

(Continued on next page)

Dell Inc.

PowerEdge R960 (Intel Xeon Platinum 8460H)

$SPECspeed®2017\_fp\_base = 359$

$SPECspeed®2017\_fp\_peak = 360$

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

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

Platform Notes (Continued)

```
  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


  ------------------------------------------------------------
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)

  ------------------------------------------------------------
```

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Dell Inc.

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Platform Notes (Continued)

```
   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  100G  4.2G   96G   5% /mnt/ramdisk


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


  ------------------------------------------------------------
   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:
      15x 00AD00B300AD HMCG94MEBRA121N 64 GB 2 rank 4800
      17x 00AD063200AD HMCG94MEBRA109N 64 GB 2 rank 4800


  ------------------------------------------------------------
   22. BIOS
  (This section combines info from /sys/devices and dmidecode.)
    BIOS Vendor:      Dell Inc.
    BIOS Version:     1.4.0
    BIOS Date:        03/15/2023
    BIOS Revision:    1.4
```

Compiler Version Notes

```
==============================================================================
C              | 619.lbm_s(base, peak) 638.imagick_s(base, peak) 644.nab_s(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++, C, Fortran | 607.cactuBSSN_s(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.
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
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------


==============================================================================
Fortran        | 603.bwaves_s(base, peak) 649.fotonik3d_s(base, peak) 654.roms_s(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.
------------------------------------------------------------------------------


==============================================================================
Fortran, C     | 621.wrf_s(base, peak) 627.cam4_s(base, peak) 628.pop2_s(base, peak)
```

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SPEC CPU®2017 Floating Point Speed Result

Dell Inc.

PowerEdge R960 (Intel Xeon Platinum 8460H)

$SPECspeed^{®}2017\_fp\_base = 359$

$SPECspeed^{®}2017\_fp\_peak = 360$

CPU2017 License: 6573　　　　　　　　　　　　　　　　　**Test Date:** Mar-2023
Test Sponsor: Dell Inc.　　　　　　　　　　　　　　**Hardware Availability:** May-2023
Tested by: Dell Inc.　　　　　　　　　　　　　　　**Software Availability:** Dec-2022

Compiler Version Notes (Continued)

```
----------------------------------------------------------------------------
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.
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.
----------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:
`icx`

Fortran benchmarks:
`ifx`

Benchmarks using both Fortran and C:
`ifx icx`

Benchmarks using Fortran, C, and C++:
`icpx icx ifx`

Base Portability Flags

603.bwaves_s: `-DSPEC_LP64`
607.cactuBSSN_s: `-DSPEC_LP64`
619.lbm_s: `-DSPEC_LP64`
621.wrf_s: `-DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian`
627.cam4_s: `-DSPEC_LP64 -DSPEC_CASE_FLAG`
628.pop2_s: `-DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian`
`-assume byterecl`
638.imagick_s: `-DSPEC_LP64`
644.nab_s: `-DSPEC_LP64`
649.fotonik3d_s: `-DSPEC_LP64`
654.roms_s: `-DSPEC_LP64`

Base Optimization Flags

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

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Dell Inc.

PowerEdge R960 (Intel Xeon Platinum 8460H)

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

Base Optimization Flags (Continued)

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

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

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

Peak Compiler Invocation

C benchmarks:
```
icx
```

Fortran benchmarks:
```
ifx
```

Benchmarks using both Fortran and C:
```
ifx icx
```

Benchmarks using Fortran, C, and C++:
```
icpx icx ifx
```

Peak Portability Flags

```
Same as Base Portability Flags
```

SPEC CPU®2017 Floating Point Speed Result

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Dell Inc.

PowerEdge R960 (Intel Xeon Platinum 8460H)

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Test Sponsor: Dell Inc.
Tested by: Dell Inc.

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

Peak Optimization Flags

C benchmarks:

619.lbm_s: basepeak = yes

638.imagick_s: basepeak = yes

644.nab_s: basepeak = yes

Fortran benchmarks:

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

649.fotonik3d_s: basepeak = yes

654.roms_s: basepeak = yes

Benchmarks using both Fortran and C:

621.wrf_s: basepeak = yes

627.cam4_s: -m64 -std=c11 -Wl,-z,muldefs -xsapphirerapids -Ofast
-ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -fiopenmp -DSPEC_OPENMP
-Wno-implicit-int -mprefer-vector-width=512
-nostandard-realloc-lhs -align array32byte -auto
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

628.pop2_s: basepeak = yes

Benchmarks using Fortran, C, and C++:

607.cactuBSSN_s: 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

Standard Performance Evaluation Corporation (info@spec.org)

https://www.spec.org/

SPEC CPU®2017 Floating Point Speed Result

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Dell Inc.

PowerEdge R960 (Intel Xeon Platinum 8460H)

$$\text{SPECspeed}^\circledR\text{2017\_fp\_base} = 359$$

$$\text{SPECspeed}^\circledR\text{2017\_fp\_peak} = 360$$

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

Test Date: Mar-2023
Hardware Availability: May-2023
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For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

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