SPEC CPU®2017 Floating Point Speed Result

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Dell Inc.

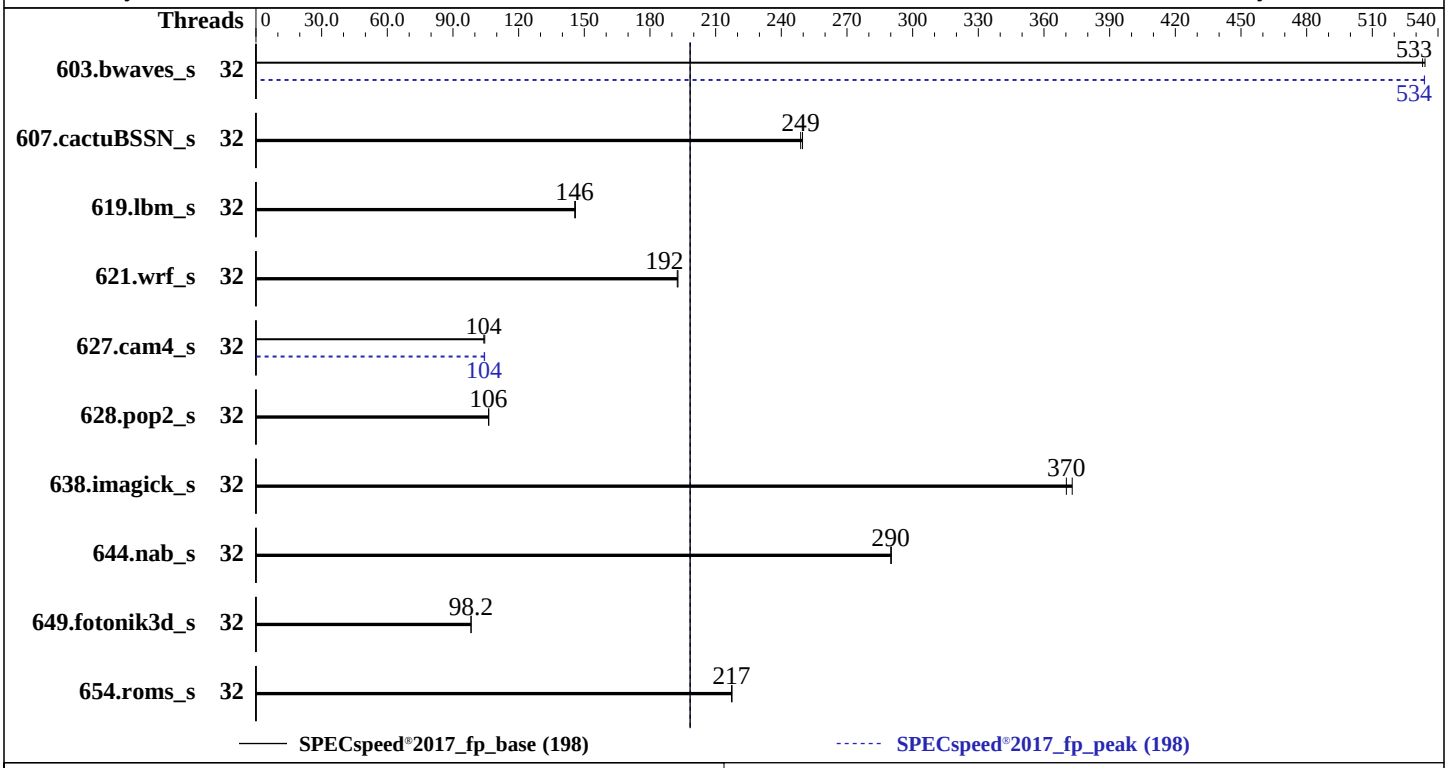
PowerEdge XR5610 (Intel Xeon Gold 6421N)

SPECspeed®2017_fp_base = 198

SPECspeed®2017_fp_peak = 198

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

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



Hardware

CPU Name:	Intel Xeon Gold 6421N
Max MHz:	3600
Nominal:	1800
Enabled:	32 cores, 1 chip
Orderable:	1 chip
Cache L1:	32 KB I + 48 KB D on chip per core
L2:	2 MB I+D on chip per core
L3:	60 MB I+D on chip per chip
Other:	None
Memory:	512 GB (8 x 64 GB 2Rx4 PC5-4800B-R, running at 4400)
Storage:	125 GB on tmpfs
Other:	None

Software

OS:	SUSE Linux Enterprise Server 15 SP4 5.14.21-150400.22-default
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 1.0.3 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.

Results Table

Benchmark	Base							Peak						
	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
603.bwaves_s	32	**111**	**533**	110	534			32	111	534	**111**	**534**		
607.cactuBSSN_s	32	66.8	250	**67.0**	**249**			32	66.8	250	**67.0**	**249**		
619.lbm_s	32	**36.0**	**146**	35.9	146			32	**36.0**	**146**	35.9	146		
621.wrf_s	32	**68.7**	**192**	68.6	193			32	**68.7**	**192**	68.6	193		
627.cam4_s	32	**85.1**	**104**	84.8	105			32	84.8	104	**85.0**	**104**		
628.pop2_s	32	**112**	**106**	112	106			32	**112**	**106**	112	106		
638.imagick_s	32	38.7	373	**39.0**	**370**			32	38.7	373	**39.0**	**370**		
644.nab_s	32	**60.2**	**290**	60.2	290			32	**60.2**	**290**	60.2	290		
649.fotonik3d_s	32	**92.8**	**98.2**	92.7	98.3			32	**92.8**	**98.2**	92.7	98.3		
654.roms_s	32	72.4	217	**72.5**	**217**			32	72.4	217	**72.5**	**217**		

SPECspeed®2017_fp_base = 198

SPECspeed®2017_fp_peak = 198

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 125 GB ramdisk created with the cmd: "mount -t tmpfs -o size=125G tmpfs /mnt/ramdisk"
```

Platform Notes

```
BIOS settings:
                  ADDDC Setting : Disabled
         DIMM Self Healing on
     Uncorrectable Memory Error : Disabled
              Logical Processor : Disabled
      Virtualization Technology : 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 Thu May  4 20:01:03 2023

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

------------------------------------------------------------
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15. cpupower frequency-info
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------------------------------------------------------------

------------------------------------------------------------
1. uname -a
  Linux localhost 5.14.21-150400.22-default #1 SMP PREEMPT_DYNAMIC Wed May 11 06:57:18 UTC 2022 (49db222/lp)
  x86_64 x86_64 x86_64 GNU/Linux

------------------------------------------------------------
2. w
   20:01:03 up  2:30,  2 users,  load average: 5.86, 6.00, 3.59
```

(Continued on next page)

Platform Notes (Continued)

```
  USER     TTY      FROM             LOGIN@   IDLE   JCPU   PCPU WHAT
  root     :        :                17:38   ?xdm?   1:25   0.01s gdm-session-worker [pam/gdm-password]
  root     :1       :1               17:38   ?xdm?   1:25   0.00s /usr/lib/gdm/gdm-x-session
  --register-session --run-script gnome

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

------------------------------------------------------------
4. ulimit -a
  core file size          (blocks, -c) unlimited
  data seg size           (kbytes, -d) unlimited
  scheduling priority             (-e) 0
  file size               (blocks, -f) unlimited
  pending signals                 (-i) 2059530
  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) 2059530
  virtual memory          (kbytes, -v) unlimited
  file locks                      (-x) unlimited

------------------------------------------------------------
5. sysinfo process ancestry
 /usr/lib/systemd/systemd --switched-root --system --deserialize 34
 /usr/lib/systemd/systemd --user
 /usr/lib/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-VirtD=1 --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-VirtD=1 --output_format csv,html,pdf,txt
 runcpu --nobuild --action validate --define default-platform-flags -c
   ic2023.0-lin-sapphirerapids-speed-20221201.cfg --define cores=32 --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-VirtD=1 --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=32 --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-VirtD=1 --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) Gold 6421N
    vendor_id       : GenuineIntel
    cpu family      : 6
    model           : 143
```

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Platform Notes (Continued)

```
     stepping        : 8
     microcode       : 0x2b0001b0
     bugs            : spectre_v1 spectre_v2 spec_store_bypass swapgs
     cpu cores       : 32
     siblings        : 32
     1 physical ids (chips)
     32 processors (hardware threads)
     physical id 0: core ids 0-31
     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
   Caution: /proc/cpuinfo data regarding chips, cores, and threads is not necessarily reliable, especially for
   virtualized systems.  Use the above data carefully.

------------------------------------------------------------
7. lscpu

From lscpu from util-linux 2.37.2:
   Architecture:                    x86_64
   CPU op-mode(s):                  32-bit, 64-bit
   Address sizes:                   46 bits physical, 57 bits virtual
   Byte Order:                      Little Endian
   CPU(s):                          32
   On-line CPU(s) list:             0-31
   Vendor ID:                       GenuineIntel
   Model name:                      Intel(R) Xeon(R) Gold 6421N
   CPU family:                      6
   Model:                           143
   Thread(s) per core:              1
   Core(s) per socket:              32
   Socket(s):                       1
   Stepping:                        8
   BogoMIPS:                        3600.00
   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 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 fsgsbase tsc_adjust bmi1 hle
                                    avx2 smep bmi2 erms invpcid rtm 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 flush_l1d arch_capabilities
   L1d cache:                       1.5 MiB (32 instances)
   L1i cache:                       1 MiB (32 instances)
   L2 cache:                        64 MiB (32 instances)
   L3 cache:                        60 MiB (1 instance)
   NUMA node(s):                    1
   NUMA node0 CPU(s):               0-31
   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 and seccomp
   Vulnerability Spectre v1:        Mitigation; usercopy/swapgs barriers and __user pointer sanitization
```

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Platform Notes (Continued)

```
  Vulnerability Spectre v2:         Mitigation; Enhanced IBRS, IBPB conditional, RSB filling
  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     1.5M   12 Data            1    64        1             64
     L1i       32K       1M    8 Instruction     1    64        1             64
     L2         2M      64M   16 Unified         2  2048        1             64
     L3        60M      60M   15 Unified         3 65536        1             64

------------------------------------------------------------
8. numactl --hardware
NOTE: a numactl 'node' might or might not correspond to a physical chip.
  available: 1 nodes (0)
  node 0 cpus: 0-31
  node 0 size: 514907 MB
  node 0 free: 500144 MB
  node distances:
  node   0
    0:  10

------------------------------------------------------------
9. /proc/meminfo
   MemTotal:       527265424 kB

------------------------------------------------------------
10. who -r
  run-level 5 May 4 17:30

------------------------------------------------------------
11. Systemd service manager version: systemd 249 (249.11+suse.124.g2bc0b2c447)
  Default Target  Status
  graphical       degraded

------------------------------------------------------------
12. Failed units, from systemctl list-units --state=failed
    UNIT                    LOAD   ACTIVE SUB    DESCRIPTION
  * issue-generator.path    loaded failed failed Watch for changes in issue snippets
  * issue-generator.service loaded failed failed Generate issue file for login session

------------------------------------------------------------
13. Services, from systemctl list-unit-files
  STATE            UNIT FILES
  enabled          ModemManager NetworkManager NetworkManager-dispatcher NetworkManager-wait-online
                   YaST2-Firstboot YaST2-Second-Stage apparmor auditd bluetooth cron display-manager
                   firewalld getty@ haveged irqbalance iscsi issue-generator kbdsettings kdump kdump-early
                   klog lvm2-monitor nscd nvmefc-boot-connections postfix purge-kernels rollback rsyslog
                   smartd sshd wpa_supplicant
  enabled-runtime  systemd-remount-fs
  disabled         accounts-daemon appstream-sync-cache autofs autoyast-initscripts blk-availability
                   bluetooth-mesh boot-sysctl ca-certificates chrony-wait chronyd console-getty cups
                   cups-browsed debug-shell dmraid-activation dnsmasq ebtables exchange-bmc-os-info gpm
                   grub2-once haveged-switch-root hwloc-dump-hwdata ipmi ipmievd iscsi-init iscsid iscsiuio
                   issue-add-ssh-keys kexec-load lunmask man-db-create multipathd nfs nfs-blkmap
                   nm-cloud-setup nmb nvmf-autoconnect openvpn@ ostree-remount pppoe pppoe-server rdisc
                   rpcbind rpmconfigcheck rsyncd rtkit-daemon serial-getty@ smartd_generate_opts smb snmpd
                   snmptrapd speech-dispatcherd svnserve systemd-boot-check-no-failures
                   systemd-network-generator systemd-sysext systemd-time-wait-sync systemd-timesyncd udisks2
                   upower wicked wickedd-auto4 wickedd-dhcp4 wickedd-dhcp6 wickedd-nanny wpa_supplicant@
```

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Platform Notes (Continued)

```
  indirect         pcscd saned@ wickedd

------------------------------------------------------------
14. Linux kernel boot-time arguments, from /proc/cmdline
  BOOT_IMAGE=/boot/vmlinuz-5.14.21-150400.22-default
  root=UUID=ad65e6a6-5b95-4228-81ca-aa6c652b873b
  splash=silent
  mitigations=auto
  quiet
  security=apparmor
  crashkernel=313M,high
  crashkernel=72M,low

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

------------------------------------------------------------
16. sysctl
  kernel.numa_balancing              0
  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

------------------------------------------------------------
17. /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

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

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Platform Notes (Continued)

```
------------------------------------------------------------
19. OS release
  From /etc/*-release /etc/*-version
  os-release SUSE Linux Enterprise Server 15 SP4

------------------------------------------------------------
20. Disk information
SPEC is set to: /mnt/ramdisk/cpu2017-1.1.9-ic2023.0
  Filesystem     Type   Size  Used Avail Use% Mounted on
  tmpfs          tmpfs  125G  4.2G  121G   4% /mnt/ramdisk

------------------------------------------------------------
21. /sys/devices/virtual/dmi/id
    Vendor:          Dell Inc.
    Product:         PowerEdge XR5610
    Product Family:  PowerEdge
    Serial:          1234567

------------------------------------------------------------
22. dmidecode
  Additional information from dmidecode 3.2 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:
    8x 00CE00B300CE M321R8GA0BB0-CQKDG 64 GB 2 rank 4800, configured at 4400


------------------------------------------------------------
23. BIOS
(This section combines info from /sys/devices and dmidecode.)
   BIOS Vendor:       Dell Inc.
   BIOS Version:      1.0.3
   BIOS Date:         03/15/2023
   BIOS Revision:     1.0
```

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)
--------------------------------------------------------------------------------------------------------------
```

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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.
------------------------------------------------------------------------------------------------------------

============================================================================================================
Fortran, C      | 621.wrf_s(base, peak) 627.cam4_s(base, peak) 628.pop2_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.
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
```

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

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

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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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