SPEC CPU®2017 Floating Point Speed Result

Copyright 2017-2019 Standard Performance Evaluation Corporation

Dell Inc.

PowerEdge T40 (Intel Pentium Gold G5400, 3.70GHz)

$SPECspeed®2017\_fp\_base = 13.3$
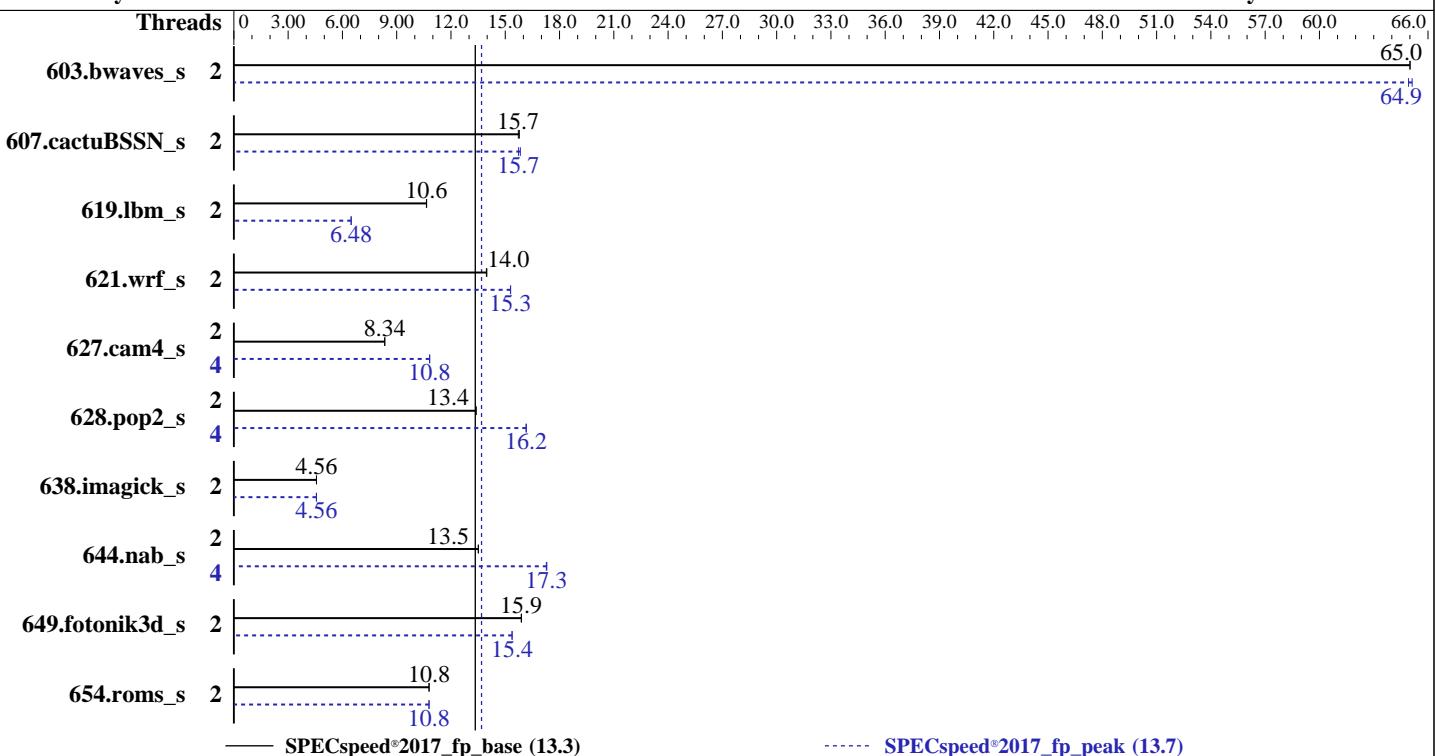
$SPECspeed®2017\_fp\_peak = 13.7$

CPU2017 License: 55
Test Sponsor: Dell Inc.
Tested by: Dell Inc.

Test Date: Apr-2019
Hardware Availability: Apr-2018
Software Availability: Feb-2019

Threads

Benchmark	Threads	base	peak
603.bwaves_s	2	65.0	64.9
607.cactuBSSN_s	2	15.7	15.7
619.lbm_s	2	10.6	6.48
621.wrf_s	2	14.0	15.3
627.cam4_s	2 / 4	8.34	10.8
628.pop2_s	2 / 4	13.4	16.2
638.imagick_s	2	4.56	4.56
644.nab_s	2 / 4	13.5	17.3
649.fotonik3d_s	2	15.9	15.4
654.roms_s	2	10.8	10.8

SPECspeed®2017_fp_base (13.3)   SPECspeed®2017_fp_peak (13.7)

Hardware

CPU Name: Intel Pentium Gold G5400
 Max MHz: 3700
 Nominal: 3700
Enabled: 2 cores, 1 chip, 2 threads/core
Orderable: 1 chip
Cache L1: 32 KB I + 32 KB D on chip per core
 L2: 256 KB I+D on chip per core
 L3: 4 MB I+D on chip per chip
 Other: None
Memory: 64 GB (4 x 16 GB 2Rx8 PC4-2666V-R, running at 2400)
Storage: 1 x 960 GB SATA SSD
Other: None

Software

OS: Ubuntu 18.04.2 LTS
 4.15.0-45-generic
Compiler: C/C++: Version 19.0.0.117 of Intel C/C++ Compiler Build 20180804 for Linux; Fortran: Version 19.0.0.117 of Intel Fortran Compiler Build 20180804 for Linux
Parallel: Yes
Firmware: Version 0.1.3 released Apr-2019
File System: ext4
System State: Run level 5 (multi-user)
Base Pointers: 64-bit
Peak Pointers: 64-bit
Other: None
Power Management: --

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Results Table

Benchmark	Base						Peak						
	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
603.bwaves_s	2	**908**	**65.0**	908	65.0			2	**909**	**64.9**	906	65.1		
607.cactuBSSN_s	2	**1060**	**15.7**	1057	15.8			2	1053	15.8	**1059**	**15.7**		
619.lbm_s	2	**492**	**10.6**	492	10.7			2	**809**	**6.48**	808	6.49		
621.wrf_s	2	946	14.0	**948**	**14.0**			2	865	15.3	**865**	**15.3**		
627.cam4_s	2	1062	8.34	**1063**	**8.34**			4	819	10.8	**819**	**10.8**		
628.pop2_s	2	**887**	**13.4**	887	13.4			4	**735**	**16.2**	735	16.2		
638.imagick_s	2	**3161**	**4.56**	3159	4.57			2	**3163**	**4.56**	3161	4.56		
644.nab_s	2	1292	13.5	**1294**	**13.5**			4	1010	17.3	**1012**	**17.3**		
649.fotonik3d_s	2	**574**	**15.9**	573	15.9			2	**593**	**15.4**	593	15.4		
654.roms_s	2	**1459**	**10.8**	1459	10.8			2	**1460**	**10.8**	1459	10.8		
SPECspeed®2017_fp_base =		**13.3**												
SPECspeed®2017_fp_peak =		**13.7**												

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"
```

General Notes

```
Environment variables set by runcpu before the start of the run:
KMP_AFFINITY = "granularity=fine,compact,1,0"
LD_LIBRARY_PATH = "/home/cpu2017/lib/ia32:/home/cpu2017/lib/intel64:/home/cpu2017/je5.0.1-32:/home/cpu2017/je5.0.1-64"
OMP_STACKSIZE = "192M"
```

```
 Binaries compiled on a system with 1x Intel Core i9-799X CPU + 32GB RAM
 memory using Redhat Enterprise Linux 7.5
 Yes: 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.
 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
```

Platform Notes

```
 BIOS settings:
 CPU Performance set to Maximum Performance
 C States set to Autonomous
```

(Continued on next page)

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Platform Notes (Continued)

```
  C1E disabled
  Sysinfo program /home/cpu2017/bin/sysinfo
  Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
  running on intel-sut Thu Apr 25 16:52:15 2019

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

  From /proc/cpuinfo
     model name : Intel(R) Pentium(R) Gold G5400 CPU @ 3.70GHz
        1  "physical id"s (chips)
        4 "processors"
     cores, siblings (Caution: counting these is hw and system dependent. The following
     excerpts from /proc/cpuinfo might not be reliable.  Use with caution.)
        cpu cores : 2
        siblings  : 4
        physical 0: cores 0 1

  From lscpu:
       Architecture:        x86_64
       CPU op-mode(s):      32-bit, 64-bit
       Byte Order:          Little Endian
       CPU(s):              4
       On-line CPU(s) list: 0-3
       Thread(s) per core:  2
       Core(s) per socket:  2
       Socket(s):           1
       NUMA node(s):        1
       Vendor ID:           GenuineIntel
       CPU family:          6
       Model:               158
       Model name:          Intel(R) Pentium(R) Gold G5400 CPU @ 3.70GHz
       Stepping:            10
       CPU MHz:             3700.261
       CPU max MHz:         3700.0000
       CPU min MHz:         800.0000
       BogoMIPS:            7392.00
       Virtualization:      VT-x
       L1d cache:           32K
       L1i cache:           32K
       L2 cache:            256K
       L3 cache:            4096K
       NUMA node0 CPU(s):   0-3
       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
```

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Dell Inc.

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Platform Notes (Continued)

```
      aperfmperf tsc_known_freq pni pclmulqdq dtes64 monitor ds_cpl vmx est tm2 ssse3 sdbg
      cx16 xtpr pdcm pcid sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave
      rdrand lahf_lm abm 3dnowprefetch cpuid_fault epb invpcid_single pti ssbd ibrs ibpb
      stibp tpr_shadow vnmi flexpriority ept vpid fsgsbase tsc_adjust smep erms invpcid
      mpx rdseed smap clflushopt intel_pt xsaveopt xsavec xgetbv1 xsaves dtherm arat pln
      pts hwp hwp_notify hwp_act_window hwp_epp flush_l1d

  /proc/cpuinfo cache data
     cache size : 4096 KB

  From numactl --hardware  WARNING: a numactl 'node' might or might not correspond to a
  physical chip.
    available: 1 nodes (0)
    node 0 cpus: 0 1 2 3
    node 0 size: 64256 MB
    node 0 free: 43989 MB
    node distances:
    node   0
      0:  10

  From /proc/meminfo
     MemTotal:       65798712 kB
     HugePages_Total:       0
     Hugepagesize:       2048 kB

  /usr/bin/lsb_release -d
     Ubuntu 18.04.2 LTS

  From /etc/*release* /etc/*version*
     debian_version: buster/sid
     os-release:
        NAME="Ubuntu"
        VERSION="18.04.2 LTS (Bionic Beaver)"
        ID=ubuntu
        ID_LIKE=debian
        PRETTY_NAME="Ubuntu 18.04.2 LTS"
        VERSION_ID="18.04"
        HOME_URL="https://www.ubuntu.com/"
        SUPPORT_URL="https://help.ubuntu.com/"

  uname -a:
     Linux intel-sut 4.15.0-45-generic #48-Ubuntu SMP Tue Jan 29 16:28:13 UTC 2019 x86_64
     x86_64 x86_64 GNU/Linux

  Kernel self-reported vulnerability status:

  CVE-2017-5754 (Meltdown):         Mitigation: PTI
```

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Dell Inc.

PowerEdge T40 (Intel Pentium Gold G5400, 3.70GHz)

SPECspeed®2017_fp_base = 13.3

SPECspeed®2017_fp_peak = 13.7

CPU2017 License: 55
Test Sponsor: Dell Inc.
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Test Date: Apr-2019
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Platform Notes (Continued)

```
  CVE-2017-5753 (Spectre variant 1): Mitigation: __user pointer sanitization
  CVE-2017-5715 (Spectre variant 2): Mitigation: Full generic retpoline, IBPB, IBRS_FW

  run-level 5 Apr 24 13:22

  SPEC is set to: /home/cpu2017
    Filesystem     Type  Size  Used Avail Use% Mounted on
    /dev/sda2      ext4  439G   36G  382G   9% /

  Additional information from dmidecode 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.
    BIOS Dell Inc. 0.1.3 04/22/2019
    Memory:
     4x 80CE000080CE M391A2K43BB1-CTD 16 GB 2 rank 2666, configured at 2400

  (End of data from sysinfo program)
```

Compiler Version Notes

```
==============================================================================
C                  | 619.lbm_s(base, peak) 638.imagick_s(base, peak)
                   | 644.nab_s(base, peak)
------------------------------------------------------------------------------
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.0.117 Build 20180804
Copyright (C) 1985-2018 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------


==============================================================================
C++, C, Fortran | 607.cactuBSSN_s(base, peak)
------------------------------------------------------------------------------
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.0.117 Build 20180804
Copyright (C) 1985-2018 Intel Corporation.  All rights reserved.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.0.117 Build 20180804
Copyright (C) 1985-2018 Intel Corporation.  All rights reserved.
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
  64, Version 19.0.0.117 Build 20180804
Copyright (C) 1985-2018 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------


==============================================================================
Fortran            | 603.bwaves_s(base, peak) 649.fotonik3d_s(base, peak)
```

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$SPECspeed®2017\_fp\_base = 13.3$

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Compiler Version Notes (Continued)

```
                       | 654.roms_s(base, peak)
--------------------------------------------------------------------------
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
  64, Version 19.0.0.117 Build 20180804
Copyright (C) 1985-2018 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 Intel(R) 64 Compiler for applications running on Intel(R)
  64, Version 19.0.0.117 Build 20180804
Copyright (C) 1985-2018 Intel Corporation.  All rights reserved.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.0.117 Build 20180804
Copyright (C) 1985-2018 Intel Corporation.  All rights reserved.
--------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:
```
icc -m64 -std=c11
```

Fortran benchmarks:
```
ifort -m64
```

Benchmarks using both Fortran and C:
```
ifort -m64 icc -m64 -std=c11
```

Benchmarks using Fortran, C, and C++:
```
icpc -m64 icc -m64 -std=c11 ifort -m64
```

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`

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Base Portability Flags (Continued)

644.nab_s: `-DSPEC_LP64`
649.fotonik3d_s: `-DSPEC_LP64`
654.roms_s: `-DSPEC_LP64`

Base Optimization Flags

C benchmarks:
`-xSSE4.2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only`
`-qopt-mem-layout-trans=3 -qopenmp -DSPEC_OPENMP`

Fortran benchmarks:
`-DSPEC_OPENMP -xSSE4.2 -ipo -O3 -no-prec-div -qopt-prefetch`
`-ffinite-math-only -qopt-mem-layout-trans=3 -qopenmp`
`-nostandard-realloc-lhs -align array32byte`

Benchmarks using both Fortran and C:
`-xSSE4.2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only`
`-qopt-mem-layout-trans=3 -qopenmp -DSPEC_OPENMP`
`-nostandard-realloc-lhs -align array32byte`

Benchmarks using Fortran, C, and C++:
`-xSSE4.2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only`
`-qopt-mem-layout-trans=3 -qopenmp -DSPEC_OPENMP`
`-nostandard-realloc-lhs -align array32byte`

Peak Compiler Invocation

C benchmarks:
`icc -m64 -std=c11`

Fortran benchmarks:
`ifort -m64`

Benchmarks using both Fortran and C:
`ifort -m64 icc -m64 -std=c11`

Benchmarks using Fortran, C, and C++:
`icpc -m64 icc -m64 -std=c11 ifort -m64`

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Tested by: Dell Inc.

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Software Availability: Feb-2019

Peak Portability Flags

```
Same as Base Portability Flags
```

Peak Optimization Flags

C benchmarks:

 619.lbm_s: `-prof-gen(pass 1) -prof-use(pass 2) -O2 -xSSE4.2`
`-qopt-prefetch -ipo -O3 -no-prec-div -ffinite-math-only`
`-qopt-mem-layout-trans=3 -DSPEC_SUPPRESS_OPENMP -qopenmp`
`-DSPEC_OPENMP`

 638.imagick_s: `-xSSE4.2 -ipo -O3 -no-prec-div -qopt-prefetch`
`-ffinite-math-only -qopt-mem-layout-trans=3 -qopenmp`
`-DSPEC_OPENMP`

 644.nab_s: `Same as 638.imagick_s`

Fortran benchmarks:

 603.bwaves_s: `-prof-gen(pass 1) -prof-use(pass 2) -DSPEC_SUPPRESS_OPENMP`
`-DSPEC_OPENMP -O2 -xSSE4.2 -qopt-prefetch -ipo -O3`
`-no-prec-div -ffinite-math-only -qopt-mem-layout-trans=3`
`-qopenmp -nostandard-realloc-lhs -align array32byte`

 649.fotonik3d_s: `Same as 603.bwaves_s`

 654.roms_s: `-DSPEC_OPENMP -xSSE4.2 -ipo -O3 -no-prec-div`
`-qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=3`
`-qopenmp -nostandard-realloc-lhs -align array32byte`

Benchmarks using both Fortran and C:

 621.wrf_s: `-prof-gen(pass 1) -prof-use(pass 2) -O2 -xSSE4.2`
`-qopt-prefetch -ipo -O3 -no-prec-div -ffinite-math-only`
`-qopt-mem-layout-trans=3 -DSPEC_SUPPRESS_OPENMP -qopenmp`
`-DSPEC_OPENMP -nostandard-realloc-lhs -align array32byte`

 627.cam4_s: `-xSSE4.2 -ipo -O3 -no-prec-div -qopt-prefetch`
`-ffinite-math-only -qopt-mem-layout-trans=3 -qopenmp`
`-DSPEC_OPENMP -nostandard-realloc-lhs -align array32byte`

 628.pop2_s: `Same as 621.wrf_s`

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Standard Performance Evaluation Corporation (info@spec.org)   https://www.spec.org/

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Peak Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++:
```
-xSSE4.2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=3 -qopenmp -DSPEC_OPENMP
-nostandard-realloc-lhs -align array32byte
```

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/Intel-ic19.0u1-official-linux64.2019-07-09.html
http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge14G-revE3.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/Intel-ic19.0u1-official-linux64.2019-07-09.xml
http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge14G-revE3.xml

For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

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