Dell Inc.
PowerEdge R740xd (Intel Xeon Gold 6226R, 2.90 GHz)

| SPECspeed\textsuperscript{2017}_fp_base = 134 |
| SPECspeed\textsuperscript{2017}_fp_peak = 135 |

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

Threads

\textit{603.bwaves_s} \hspace{1cm} 32
\textit{607.cactuBSSN_s} \hspace{1cm} 32
\textit{619.lbm_s} \hspace{1cm} 32
\textit{621.wrf_s} \hspace{1cm} 32
\textit{627.cam4_s} \hspace{1cm} 32
\textit{628.pop2_s} \hspace{1cm} 32
\textit{638.imagick_s} \hspace{1cm} 32
\textit{644.nab_s} \hspace{1cm} 32
\textit{649.fotonik3d_s} \hspace{1cm} 32
\textit{654.roms_s} \hspace{1cm} 32

\textit{CPU Name}: Intel Xeon Gold 6226R
\textit{Max MHz}: 3900
\textit{Nominal}: 2900
\textit{Enabled}: 32 cores, 2 chips
\textit{Orderable}: 1.2 chips
\textit{Cache L1}: 32 KB I + 32 KB D on chip per core
\textit{L2}: 1 MB I+D on chip per core
\textit{L3}: 22 MB I+D on chip per chip
\textit{Other}: None
\textit{Memory}: 384 GB (24 x 16 GB 2Rx8 PC4-2933V-R, running at 2933)
## Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Base Seconds</th>
<th>Base Ratio</th>
<th>Peak Seconds</th>
<th>Peak Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>603.bwaves_s</td>
<td>32</td>
<td>114</td>
<td>517</td>
<td>115</td>
<td>513</td>
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<tr>
<td>607.cactuBSSN_s</td>
<td>32</td>
<td>111</td>
<td>145</td>
<td>114</td>
<td>146</td>
</tr>
<tr>
<td>619.lbm_s</td>
<td>32</td>
<td>53.3</td>
<td>98.3</td>
<td>53.4</td>
<td>98.1</td>
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<tr>
<td>621.wrf_s</td>
<td>32</td>
<td>101</td>
<td>131</td>
<td>101</td>
<td>131</td>
</tr>
<tr>
<td>627.cam4_s</td>
<td>32</td>
<td>102</td>
<td>86.8</td>
<td>102</td>
<td>86.9</td>
</tr>
<tr>
<td>628.pop2_s</td>
<td>32</td>
<td>173</td>
<td>68.8</td>
<td>173</td>
<td>68.7</td>
</tr>
<tr>
<td>638.imagick_s</td>
<td>32</td>
<td>125</td>
<td>116</td>
<td>123</td>
<td>118</td>
</tr>
<tr>
<td>644.nab_s</td>
<td>32</td>
<td>79.8</td>
<td>219</td>
<td>79.9</td>
<td>219</td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>32</td>
<td>110</td>
<td>82.9</td>
<td>110</td>
<td>82.9</td>
</tr>
<tr>
<td>654.roms_s</td>
<td>32</td>
<td>97.8</td>
<td>161</td>
<td>97.8</td>
<td>161</td>
</tr>
</tbody>
</table>

### 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 = "/home/cpu2017/lib/intel64"
- OMP_STACKSIZE = "192M"

### General Notes

Binaries compiled on a system with 1x Intel Core i9-7900X CPU + 32GB RAM memory using Redhat Enterprise Linux 7.5

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.

Transparent Huge Pages enabled by default

Prior to runcpu invocation

Filesystem page cache synced and cleared with:
- `sync; echo > /proc/sys/vm/drop_caches`
SPEC CPU®2017 Floating Point Speed Result

Dell Inc.
PowerEdge R740xd (Intel Xeon Gold 6226R, 2.90 GHz)

<table>
<thead>
<tr>
<th>SPECspeed®2017 fp_base</th>
<th>SPECspeed®2017 fp_peak</th>
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<tbody>
<tr>
<td>134</td>
<td>135</td>
</tr>
</tbody>
</table>

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

Test Date: Jan-2020
Hardware Availability: Feb-2020
Software Availability: Jun-2019

Platform Notes

BIOS settings:
Sub NUMA Cluster disabled
Virtualization Technology disabled
System Profile set to Custom
CPU Performance set to Maximum Performance
C States set to Autonomous
C1E disabled
Uncore Frequency set to Dynamic
Energy Efficiency Policy set to Performance
Memory Patrol Scrub set to standard
Logical Processor disabled
CPU Interconnect Bus Link Power Management disabled
PCI ASPM L1 Link Power Management disabled
UPI Prefetch enabled
LLC Prefetch disabled
Dead Line LLC Alloc enabled
Directory AtoS disabled

Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7edbe7e6e46a485a0011
running on linux-g3ob Fri Jan 24 14:56:27 2020

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) Xeon(R) Gold 6226R CPU @ 2.90GHz
2 "physical id"s (chips)
32 "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 : 16
siblings : 16
physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

From lscpu:
Architecture:     x86_64
CPU op-mode(s):   32-bit, 64-bit
Byte Order:       Little Endian
Address sizes:    46 bits physical, 48 bits virtual
CPU(s):           32
On-line CPU(s) list: 0-31
Thread(s) per core: 1
Core(s) per socket: 16
Socket(s):        2

(Continued on next page)
Dell Inc.

PowerEdge R740xd (Intel Xeon Gold 6226R, 2.90 GHz)

CPU2017 License: 55
Test Sponsor: Dell Inc.
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SPECspeed®2017_fp_base = 134

SPECspeed®2017_fp_peak = 135

Platform Notes (Continued)

NUMA node(s): 2
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Gold 6226R CPU @ 2.90GHz
Stepping: 7
CPU MHz: 2900.000
BogoMIPS: 5800.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 22528K
NUMA node0 CPU(s): 0,2,4,6,8,10,12,14,16,18,20,22,24,26,28,30
NUMA node1 CPU(s): 1,3,5,7,9,11,13,15,17,19,21,23,25,27,29,31
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 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 cdp_l3
invpcid_single intel_ppin ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vnmi
flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm
cqm mpx rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd
avx512bw avx512vl xsaveopt xsaves xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbb_total
cqm_mbb_local dtherm ida arat pln pts pku ospke avx512_vnnl md_clear flush_lld
arch_capabilities

/proc/cpuinfo cache data
cache size: 22528 KB

From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a
physical chip.
available: 2 nodes (0-1)
node 0 cpus: 0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30
node 0 size: 192074 MB
node 0 free: 191153 MB
node 1 cpus: 1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31
node 1 size: 193502 MB
node 1 free: 186280 MB
node distances:
node 0 1
0: 10 21
1: 21 10

From /proc/meminfo
MemTotal: 394831216 kB

(Continued on next page)
Dell Inc. PowerEdge R740xd (Intel Xeon Gold 6226R, 2.90 GHz)

SPECspeed®2017_fp_base = 134
SPECspeed®2017_fp_peak = 135

CPU2017 License: 55
Test Sponsor: Dell Inc.
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Platform Notes (Continued)

HugePages_Total:       0
Hugepagesize:       2048 kB

From /etc/*release* /etc/*version*
   os-release:
      NAME="SLES"
      VERSION="15-SP1"
      VERSION_ID="15.1"
      PRETTY_NAME="SUSE Linux Enterprise Server 15 SP1"
      ID="sles"
      ID_LIKE="suse"
      ANSI_COLOR="0;32"
      CPE_NAME="cpe:/o:suse:sles:15:sp1"

uname -a:
   Linux linux-g3ob 4.12.14-195-default #1 SMP Tue May 7 10:55:11 UTC 2019 (8fba516)
   x86_64 x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:

CVE-2018-3620 (L1 Terminal Fault): Not affected
Microarchitectural Data Sampling: Not affected
CVE-2017-5754 (Meltdown): Not affected
CVE-2018-3639 (Speculative Store Bypass): Mitigation: Speculative Store Bypass disabled via prctl and seccomp
CVE-2017-5753 (Spectre variant 1): Mitigation: __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling

run-level 3 Jan 24 04:13 last=5

SPEC is set to: /home/cpu2017
   Filesystem  Type   Size  Used  Avail Use% Mounted on
   /dev/sda2    xfs  440G   54G  387G  13% /

From /sys/devices/virtual/dmi/id
   BIOS:  Dell Inc. 2.5.4 01/13/2020
   Vendor:  Dell Inc.
   Product: PowerEdge R740xd
   Product Family: PowerEdge
   Serial:  F5BLCS2

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 SMI BIOS" standard.

Memory:

(Continued on next page)
Dell Inc. PowerEdge R740xd (Intel Xeon Gold 6226R, 2.90 GHz)

SPECspeed®2017_fp_base = 134
SPECspeed®2017_fp_peak = 135

Platform Notes (Continued)
2x 002C069D002C 18ASF2G72PD2-2G9E1 16 GB 2 rank 2933
7x 00AD00B300AD HMA82GR7CJR8N-WE 16 GB 2 rank 2933
3x 00AD063200AD HMA82GR7CJR8N-WE 16 GB 2 rank 2933
12x 00AD069D00AD HMA82GR7CJR8N-WE 16 GB 2 rank 2933

(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 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 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 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
64, Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

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

Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
64, Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 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)
(Continued on next page)
Dell Inc.  
PowerEdge R740xd (Intel Xeon Gold 6226R, 2.90 GHz)  

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Compiler Version Notes (Continued)

64, Version 19.0.4.227 Build 20190416  
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.  
Intel (R) C Intel (R) 64 Compiler for applications running on Intel (R) 64,  
Version 19.0.4.227 Build 20190416  
Copyright (C) 1985-2019 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  
644.nab_s: -DSPEC_LP64  
649.fotonik3d_s: -DSPEC_LP64  
654.roms_s: -DSPEC_LP64

Base Optimization Flags

C benchmarks:  
-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch  
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP

(Continued on next page)
SPEC CPU®2017 Floating Point Speed Result

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Base Optimization Flags (Continued)

Fortran benchmarks:
-DSPEC_OPENMP -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp
-nostandard-realloc-lhs

Benchmarks using both Fortran and C:
-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
-nostandard-realloc-lhs

Benchmarks using Fortran, C, and C++:
-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
-nostandard-realloc-lhs

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

Peak Portability Flags

Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:
619.lbm_s: -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp
-DSPEC_OPENMP

(Continued on next page)
SPEC CPU®2017 Floating Point Speed Result

Dell Inc.

PowerEdge R740xd (Intel Xeon Gold 6226R, 2.90 GHz)

SPECspeak®2017_fp_base = 134
SPECspeak®2017_fp_peak = 135

CPU2017 License: 55
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Tested by: Dell Inc.
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Software Availability: Jun-2019

Peak Optimization Flags (Continued)

638.imagick_s: Same as 619.lbm_s

644.nab_s: basepeak = yes

Fortran benchmarks:

603.bwaves_s: -prof-gen(pass 1) -prof-use(pass 2) -DSPEC_SUPPRESS_OPENMP
-DSPEC_OPENMP -02 -xCORE-AVX512 -qopt-prefetch -ipo -03
-ffinite-math-only -no-prec-div -qopt-mem-layout-trans=4
-qopenmp -nostandard-realloc-lhs

649.fotonik3d_s: Same as 603.bwaves_s

654.roms_s: basepeak = yes

Benchmarks using both Fortran and C:

621.wrf_s: -prof-gen(pass 1) -prof-use(pass 2) -02 -xCORE-AVX512
-qopt-prefetch -ipo -03 -ffinite-math-only -no-prec-div
-qopt-mem-layout-trans=4 -DSPEC_SUPPRESS_OPENMP -qopenmp
-DSPEC_OPENMP -nostandard-realloc-lhs

627.cam4_s: -xCORE-AVX512 -ipo -03 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp
-DSPEC_OPENMP -nostandard-realloc-lhs

628.pop2_s: Same as 621.wrf_s

Benchmarks using Fortran, C, and C++:

-xCORE-AVX512 -ipo -03 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
-nostandard-realloc-lhs

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

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